

**FINAL ENVIRONMENTAL
IMPACT STATEMENT**

By the

**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

As Lead Agency

**Concerning the
Applications to Renew**

**NEW YORK
STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM
(SPDES) PERMITS**

For the

**ROSETON 1 & 2, BOWLINE 1 & 2
AND INDIAN POINT 2 & 3
STEAM ELECTRIC GENERATING STATIONS,
ORANGE, ROCKLAND AND WESTCHESTER COUNTIES**

HUDSON RIVER POWER PLANTS FEIS

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**Final Environmental Impact Statement
for SPDES Permit Renewals at
Roseton 1 & 2, Bowline 1 & 2
And Indian Point 2 & 3
Steam Electric Generating Stations**

This Final Environmental Impact Statement (FEIS) consists of multiple sections:

- The fundamental underlying data and studies are contained in the 1999 DEIS, which is incorporated as part of this FEIS. The 1999 DEIS contains an extended description of the environmental setting, which is not duplicated in this FEIS.
- An Executive Summary immediately follows the Table of Contents.
- The first section following the Executive Summary of this FEIS is a discussion of the regulatory setting for and history of the proposed action which updates and augments the materials in the DEIS.
- The next section of this FEIS is a table in which all public comments received by the Department on the DEIS are excerpted and summarized. A list of all commentors is provided at the end of the table. The full texts of all comments received by the Department are included in Appendix F-I.
- The Department's responses to public comments complete the FEIS. In the interest of responding most effectively to the submitted comments, Department staff grouped the comments under related themes and responded to each theme.
- In addition to the public comments, other appendices provide background reports and reference materials that may not be readily available to readers.

FINAL ENVIRONMENTAL IMPACT STATEMENT

**NEW YORK
STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS**

**For the ROSETON 1 & 2, BOWLINE 1 & 2, and INDIAN POINT 2 & 3
STEAM ELECTRIC GENERATING STATIONS**

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EXECUTIVE SUMMARY

The action before the New York State Department of Environmental Conservation (Department) is the decision whether to renew State Pollutant Discharge Elimination System (SPDES) permits which would allow three steam electric generating stations to discharge waste heat, a pollutant, to the waters of the Hudson River; the permits would also allow the facilities to continue to withdraw water from the Hudson River for use as cooling water. The three facilities are:

- Bowline Point (Units 1 and 2), West Haverstraw, Rockland County;
- Indian Point (Units 2 and 3), Buchanan, Westchester County; and
- Roseton (Units 1 and 2), Newburgh, Orange County

(See Figure 1 in main text for general locations of all 3 facilities).

In December 1999, the owners and operators of the three facilities submitted a Draft Environmental Impact Statement (DEIS) to the Department which assessed the resources likely to be impacted by the facilities; evaluated alternative technologies and management strategies to mitigate impacts from each facility's operations; and proposed a preferred action intended to reduce the respective impacts. In March 2000, the Department accepted the DEIS for purposes of review and subsequently issued a Notice of Complete Application in the Environmental Notice Bulletin and in newspapers in the vicinity of each facility.

Department staff have further reviewed the DEIS and conclude that, while it was acceptable as an initial evaluation and assessment, it is not sufficient to stand as the final document, and additional information as to alternatives and evaluation of impacts must be considered. These considerations have been undertaken by Department staff to develop a final environmental impact assessment. This Final Environmental Impact Statement (FEIS) consists of the original DEIS submitted by the facilities' operators; comments received on the DEIS; the Department's responses to those comments, with similar comments grouped for response purposes; plus expanded discussions of the regulatory setting and alternatives for mitigation of impacts from the operation of the HRSA plants.

The Hudson River is rich with aquatic life, providing habitat for the early, sub-adult, and adult life stages of many aquatic species, including a number of game, commercial, and forage fish species. The Department's regulatory role includes limiting thermal discharges from each facility to ensure the survival of aquatic resources and also preventing aquatic organism mortality

resulting from impingement and entrainment at each facility's cooling water intake structure (CWIS).¹

To illustrate the magnitude of impacts of entrainment, Table 1 (below) uses data from the DEIS to calculate the average annual number of organisms of six of the fish species entrained by the three facilities.² If one assumes that all entrained fish die, as does the United States Environmental Protection Agency (USEPA) in its proposed rulemaking for cooling water intakes, then the total number of fish entrained is equal to total mortality from entrainment.³

Table 1. Estimated Average Numbers of Selected Fish Species Entrained Annually at Roseton, Indian Point, and Bowline Stations, Based on In-plant Abundance Sampling, 1981-1987.⁴

Plant Species	Roseton	Indian Point	Bowline	Total
American Shad	3,128,571	13,380,000	346,667	16,855,238
Bay Anchovy	1,892,500	326,666,667	81,000,000	409,559,167
River Herring⁵	345,714,286	466,666,667	13,814,286	826,195,238

¹ Entrainment occurs when small aquatic life forms are carried into and through the cooling system as water is withdrawn for use in a plant's cooling system; impingement occurs when larger aquatic life forms are caught against racks or screens at the intakes, where they may be trapped by the force of the water, suffocate or be otherwise injured.

² DEIS Appendix VI-1-D-2, "Estimated Total Number of Fish Entrained", and DEIS Appendix VI-1-D-1, "Estimated Number of Fish Killed Due to Entrainment", (both utilizing generator estimates of through-plant survival), and calculating the mean mortality over the years presented for each species at each facility.

³ National Pollutant Discharge Elimination System - Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities. USEPA Docket No. OW-2002-0049; see 67 FR 17122.

⁴ Figures are absolute numbers of entrainable life stages, including eggs, yolk-sac larvae, post-yolk-sac larvae, and some juveniles, of the species studied.

⁵ "River Herring" includes both Blueback Herring and Alewife, which are difficult to differentiate in their early life stages. It does not include other herring species like shad.

Striped Bass	129,857,143	158,000,000	15,571,429	303,428,571
White Perch	211,428,571	243,333,333	13,257,143	468,019,048
Atlantic Tomcod⁶	No Data This Study	No Data This Study	No Data This Study	No Data This Study
Total	692,021,071	1,208,046,667	123,989,524	2,024,057,262

The generators attempted to estimate through-plant survival, and using those adjustments, the calculations result in a slightly lower number of fish killed by entrainment mortality, as shown in Table 2 (below).

Table 2. Estimated Annual Entrainment Mortality of Six Fish Species at Roseton, Indian Point, and Bowline Stations, Using Generator Estimates of Through-plant Survival.

Plant Species	Roseton	Indian Point	Bowline	Total
American Shad	2,500,000	10,640,000	281,667	13,421,667
Bay Anchovy	1,892,500	326,666,667	78,285,714	406,844,881
River Herring	277,142,857	371,666,667	11,085,714	659,895,238
Striped Bass	40,428,571	46,500,000	4,671,429	91,600,000
White Perch	130,000,000	138,666,667	8,071,429	276,738,095
Atlantic Tomcod	No Data This Study	No Data This Study	No Data This Study	No Data This Study
Total	451,963,929	894,140,000	102,395,952	1,448,499,881

⁶ No numbers are available for Atlantic tomcod because, for the source study, no collections were made during the early part of the season when Atlantic tomcod entrainment and mortality would be a serious issue.

Based on data presented in the DEIS and analyses in that and in this FEIS, Department staff conclude that the generators' estimates represent the lower boundary of the actual mortality range, that is, the actual mortality lies somewhere between the generators' number (low end) and 100% (upper end, all entrained organisms die). Later sections of this FEIS discuss the significance of entrainment mortality; other impacts of continued operation of the HRSA generating stations, including thermal impacts; and potential control or mitigation measures.

As a result of the Department's further review of the DEIS plus the additional information and analysis provided by staff, a draft permit can be developed for each facility. Each draft permit will be based on this FEIS together with a detailed, site-specific application for that station and will contain a decision on the "best technology available" (BTA) to minimize entrainment and impingement mortality at that station. These BTA decisions are required by §316(b) of the federal Clean Water Act.⁷ Supplemental application materials relating to existing facilities and system designs are still necessary for each site. An individual draft permit will be issued for each site, but in general terms, each permit will require the covered facility to meet BTA by designating, as SPDES permit conditions, a compliance schedule to implement one or more of the technologies now available to substantially reduce entrainment and impingement mortalities from the cooling water intake at that station.

⁷ 33 U.S.C. §§ 1251 - 1376

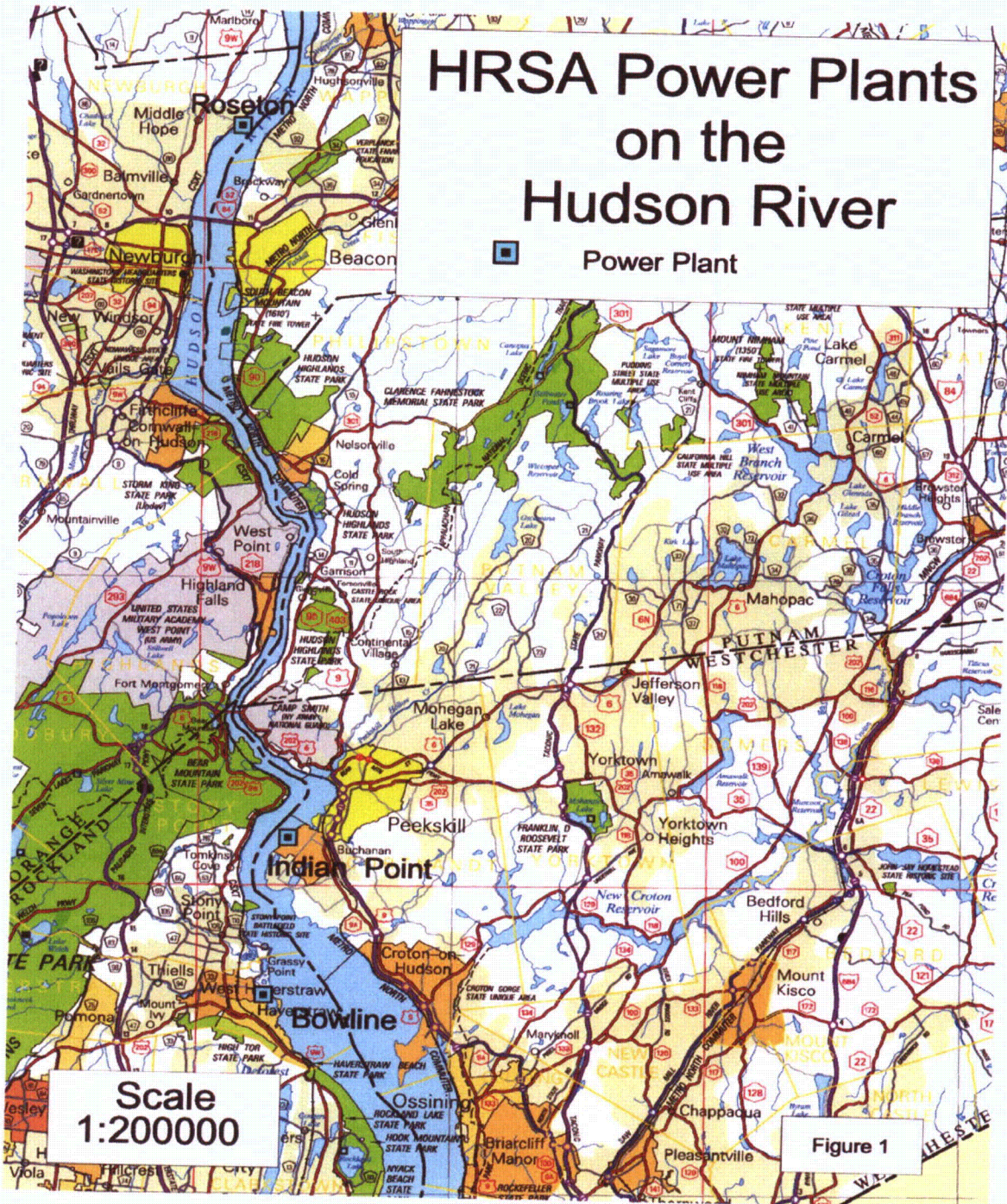
PROPOSED ACTION

The action before the New York State (NYS) Department of Environmental Conservation (Department) is the decision whether to renew State Pollutant Discharge Elimination System (SPDES) permits which would allow three steam electric generating stations to discharge pollutants, including waste heat, to the waters of the Hudson River. The permits, if renewed, would also allow the continued withdrawal of water from the Hudson River to be used as cooling water. The three facilities are:

- Bowline Point (Units 1 and 2), West Haverstraw, Rockland County;
- Indian Point (Units 2 and 3), Buchanan, Westchester County; and
- Roseton (Units 1 and 2), Newburgh, Orange County.

Figure 1, on the following page, shows the location of the three generating stations

Fig. 1. General Location of HRSA Plants⁸



⁸ Scale about 20% reduced from original.

Project History

Permitting Authority

Bowline Point, Indian Point, and Roseton steam electric generating stations are all facilities which were in operation prior to enactment of the federal Clean Water Act in 1972. The Department regulates Bowline Point, Indian Point, and Roseton pursuant to its authority as the State agency approved by the United States Environmental Protection Agency (USEPA) to issue SPDES permits. On October 28, 1975, the USEPA gave its approval to the Department to administer the federal National Pollutant Discharge Elimination System (NPDES) program by virtue of a memorandum of agreement signed by the Department's Commissioner, Ogden R. Reed, and the Acting Region II Administrator for the USEPA, Eric B. Outwater. The Department's SPDES program is set forth in Article 17 of the Environmental Conservation Law (ECL), with underlying regulations promulgated at 6 NYCRR Parts 700 et seq and 750 et seq.

The Hudson River Settlement Agreement

Prior to authorizing the NYS SPDES program, earlier in 1975, the USEPA issued NPDES permits for the Indian Point nuclear power facility and the Roseton and Bowline Point fossil fuel power facilities. All three permits contained conditions to restrict thermal discharges, that is, water heated by the process of cooling the condenser coils at the fossil plants and by the secondary cooling phase of the nuclear power generation systems. At the time those permits were issued, the operators of these Hudson River power plants, Consolidated Edison (Con Ed) for Indian Point Unit 2, the New York Power Authority (NYPA) for Indian Point Unit 3, Central Hudson Gas and Electric (CHG&E) for Roseton, and Orange and Rockland Utilities (O&R) for Bowline Point used once-through cooling systems, withdrawing cooling water directly from and discharging the warmed effluent back to the Hudson River.

Among the issues considered by USEPA in issuing those 1975 NPDES permits were concerns regarding thermal discharges, cooling water intakes, and fish mortalities associated with the cooling water intakes. The USEPA's 1975 NPDES permits would have in effect required retrofitting of cooling towers at all three of these Hudson River power plants. In 1977, Con Ed, NYPA, CHG&E, and O&R (collectively, the "generators") sought an administrative adjudicatory hearing against the USEPA draft permits to overturn those cooling water intake conditions and other requirements of the 1975 NPDES permits. That and subsequent proceedings were joined by a number of other government agencies and non-governmental organizations (NGO's).

In 1981, after a number of years of adjudicatory proceedings, the generators signed the Hudson River Settlement Agreement (HRSA) to resolve the disputes relating to the USEPA's 1975 NPDES draft permits.⁹ The HRSA was a 10-year agreement designed to obtain necessary data, impose needed analytical assessments, and develop an impact assessment to determine how best to mitigate impacts to the Hudson River from the three generating facilities. The HRSA was also executed by the USEPA, the NYS Attorney General, the Department, and involved NGO stakeholders including the Scenic Hudson Preservation Conference (Scenic Hudson), Hudson River Fishermen's Association (Riverkeeper), and the Natural Resources Defense Council (NRDC). The HRSA was effective for the ten year period from May 10, 1981 to May 10, 1991.

The HRSA provided, among other things, for mitigative measures to reduce fish mortalities at each generation facility as a result of: (a) impingement of adult and juvenile fish on racks and screens at the plants' intake structures, and (b) entrainment of fish eggs and larvae through the respective units' cooling apparatus. Those measures included seasonal "outages", or discontinuing cooling water usage by ceasing plant operations. Those measures also included installation of variable speed pumps at Indian Point Units 2 and 3 within three and one-half years after the effective date of the agreement, to keep the volumes of Hudson River water used for cooling to the minimum required for efficient operation. In addition, the HRSA established a biological monitoring program for monitoring fish species and their life stages at different Hudson River locations during each season.

Department SPDES Permits

By statute, SPDES permits for surface water discharges have a maximum duration of five years.¹⁰ In 1982, the Department issued a SPDES permit to each of the facilities covered by the HRSA, including limitations governing the release of thermal discharges, and incorporating the terms of the HRSA agreement into the permit so that the environmentally protective mitigation measures set forth in the Agreement were included as conditions. These permits expired in 1987.

In 1987, the Department issued SPDES permit renewals to each of the three HRSA generation facilities (Indian Point Units 2 and 3 were issued a single permit even though the two units had different owners). These most recent SPDES permits for Indian Point Units 2 & 3, Bowline Point Units 1 & 2, and Roseton Units 1 & 2 Generating Stations became effective on October 1, 1987, with a common expiration date of October 1, 1992. Again, along with

⁹ The complete text of the HRSA is included as Appendix F-II to this FEIS.

¹⁰ ECL §17-0817(1)

appropriate thermal discharge conditions, the HRSA agreement was incorporated into these permits and the HRSA mitigation provisions were continued as conditions for operation.

Prior to the expiration of the 1987 permits, on April 3, 1992, the generators submitted timely applications to the Department for renewal of their respective SPDES permits. Pursuant to the New York State Administrative Procedure Act (SAPA) and the Department's implementing regulations, "[w]hen a licensee has made a timely and sufficient application for the renewal of a license or a new license with reference to any activity of a continuing nature, the existing license does not expire until the application has been finally determined by the agency..."¹¹

Also prior to the expiration of the 1987 SPDES permit, by correspondence dated May 15, 1991, the Department and the generators executed an agreement to continue the mitigative measures established in the 1981 agreement until SPDES renewal permits were issued. With respect to Indian Point Units 2 and 3, the letter agreement also memorialized Con Ed's and NYPA's commitment to install special fish protective screens to reduce fish impingement at the intake structures. In addition, the agreement provided that the parties would negotiate in good faith to develop a long-term resolution of: cooling water intake structures (CWIS), thermal discharges, fish mortality reductions due to mitigative measures, the costs of mitigative measures, and alternatives. Public notice was to be given of such negotiations and the parties expressed their understanding that interveners, including such groups as the Riverkeeper and Scenic Hudson, would be involved as participants in the negotiations.

On September 13, 1991, Riverkeeper, Scenic Hudson, and NRDC filed a law suit against the Department and the four generators seeking:

- annulment of the May 15, 1991 agreement between the Department and the generators;
- participation by those three NGO entities in the permitting process; as well as
- resolution of outstanding issues regarding mitigation measures.

Consent Orders

On March 23, 1992, the parties to that legal proceeding executed a judicially approved Consent Order resolving the matter which provided that the generators would continue the HRSA mitigative measures, such as the "outages" timed to reduce impacts to certain fish species, and to continue

¹¹ New York State Administrative Procedure Act (SAPA) §401(2); 6 NYCRR Part 621.

underwriting significant Hudson River fish species studies and data acquisition.¹²

The 1992 Consent Order was extended by the parties on four separate occasions, having expiration dates of September 1, 1994, September 1, 1995, September 1, 1997, and February 1, 1998. When the Fourth Amended Consent Order expired on February 1, 1998, the parties, who were by then actively engaged in negotiations regarding elements of draft SPDES permits, did not reach agreement to continue with a fifth extension of the Consent Order.¹³ However, the generators agreed to continue the mitigative measures included in the continuing SPDES permit and provisions of the Fourth Amended Consent Order until new SPDES permits were issued to them.¹⁴

The Draft Environmental Impact Statements

On May 20, 1992, pursuant to the State Environmental Quality Review Act (SEQR), the Department issued a positive declaration requiring the generators to prepare an environmental impact statement regarding the 1992 applications for permit renewals.¹⁵ That determination was based on the Department's assessment that the measures proposed in the generators' 1992 renewal applications were less protective of the Hudson River and its aquatic resources than the HRSA terms had been. In June 1993, the generators submitted a preliminary Draft Environmental Impact Statement (DEIS) to the Department in accordance with the regulatory requirement to submit a draft environmental impact statement for the renewal of their respective SPDES permits.

On September 3, 1993, the Department advised the four HRSA generators that it had reviewed the June 1993 preliminary DEIS and that their respective SPDES renewal applications remained incomplete pending receipt of additional information. The Department advised the generators of inadequacies of the preliminary DEIS, to which the generators later responded.

¹² Natural Resources Defense Council, Inc., Hudson River Fishermen's Association, et al., v. NYSDEC, Consolidated Edison Company of New York, Inc., New York Power Authority, Orange and Rockland Utilities, Inc., and Central Hudson Gas & Electric Corp., Albany County, Index No. 6570-91.

¹³ The Fourth Amended Consent Order is attached as Appendix F-III.

¹⁴ In the remainder of this FEIS, the general term "Consent Order" will apply to the entire series of extensions unless a particular date or extension is named.

¹⁵ ECL §8-0109.4; 6 NYCRR §617.7.

From 1993 to 1999, the Department, the generators, the New York State Department of Public Service (NYSDPS), the USEPA, the National Marine Fisheries Service (NMFS), the United States Fish and Wildlife Service (USFWS), Riverkeeper, NRDC, Scenic Hudson and New York Rivers United (NYRU) participated in an extensive effort to address numerous technical and procedural issues regarding the generators' plants, including conducting technical meetings or "workshops" of experts representing each participant or group, and conducting plenary meetings of all participants to draw together the technical and legal expertise devoted to resolving issues with the SPDES renewal applications for the HRSA plants.

On December 14, 1999, CHG&E, Southern Energy New York (successor to O&R), Con Ed, and NYPA presented the Department with a revised DEIS. Department Staff reviewed the DEIS and issued a Notice of Complete Application dated February 28, 2000, which was published in the Environmental Notice Bulletin (ENB) on March 8, 2000, and in newspapers in the vicinity of the plants during the week following March 8, 2000.¹⁶ The Notice sought public comments on the DEIS, which were to be submitted to the Department by April 24, 2000.

Public Hearings

Subsequently, on May 2, 2000, the Department's Office of Hearings and Mediation Services issued a Notice of Hearing and Notice of Extension of Comment Period.¹⁵ The Notice of Hearing announced a public legislative hearing to receive unsworn statements about the DEIS at the Croton Village Hall, Croton-on-Hudson, New York, at 2:00 PM and 7:30 PM on June 8, 2000. The Notice also extended the public comment deadline from April 24, 2000 to June 24, 2000. The May 2, 2000, Notice of Hearing was also published in the ENB and in newspapers in the vicinity of the plants. These notices included the times and location of the June 8, 2000, public hearing and also identified eight locations where the DEIS was available for review by the public. Sixteen written comments were received, and seventeen individuals spoke at the hearings, including representatives of the generators, NGO's, individuals, and the Department. The Department also provided the generators with several pages of comments.

Ownership Changes

As part of NYS's energy market restructuring, the HRSA plants have undergone ownership changes since the submission of the DEIS. Indian Point Units 2 and 3 are now owned and operated by Entergy Nuclear Indian Point 2, LLC, and Entergy Nuclear Indian Point 3, LLC. Bowline Point is now owned and operated by Mirant Bowline, LLC. Roseton is now owned and operated by Dynegy Northeast Generation.

¹⁶ Notices are included in Appendix F-I to this FEIS.

Final Environmental Impact Statement

This Final Environmental Impact Statement (FEIS) consists of multiple sections. The fundamental underlying data and studies are contained in the 1999 DEIS, which is incorporated as part of this FEIS. An augmented discussion of the regulatory setting for and history of the proposed action in this FEIS augments the materials in the DEIS. The full texts of all comments received by the Department are included in Appendix F-I, and public comments are excerpted and summarized in Table 3 (page –) of this FEIS; a list of all commentors is provided at the end of Table 3. The Department's responses to public comments complete the FEIS. In the interest of responding most effectively to the submitted comments, Department staff grouped the comments under related themes and responded to each theme.

REGULATORY SETTING

Federal Clean Water Act

NPDES Permitting

The basic federal law governing water pollution control in the United States is the federal Water Pollution Control Act (FWPCA), more commonly referred to as the Clean Water Act (CWA).¹⁶ Although the FWPCA itself dates to 1948, the CWA as we now know it was largely shaped by comprehensive amendments in 1972 which completely overhauled the existing system.¹⁷ The 1972 CWA is properly viewed as the starting point for modern water pollution control law.

While the CWA has been amended several times since 1972, the heart of the Act which has remained intact is its system of regulating both direct and indirect discharges of pollutants into U.S. waters: the National Pollutant Discharge Elimination System (NPDES).¹⁸ The fundamental premise of the CWA, expressed in §301, is not to regulate an otherwise lawful activity, but to make unlawful the discharge of *any* pollutant from a point source by any person.¹⁹ Thus, the discharge of pollutants is not a right and may only be allowed as specifically provided in the CWA. The bulk of the CWA may, therefore, be viewed as a detailed and highly regulated exception to the “no discharge” rule of §301.

Pollution control standards under the Act are of two general types:

- (1) effluent standards which limit the quality and quantity of pollutants discharged from the source, also called “technology-based” standards; and
- (2) ambient standards which limit the concentration of pollutants in a defined water segment, also called “water quality-based” standards.

By establishing limits tailored to the nature of a discharge rather than its location, a uniform nationwide playing field was established that removed incentives for dischargers to relocate to other states to avoid treatment requirements.

The focus of an ambient standard is on the capacity of the receiving water to absorb or dilute a given pollutant. Thus, water quality-based standards vary according to

¹⁶ 33 U.S.C. §§ 1251 - 1376.

¹⁷ FWPCA Amendments of 1972, Pub. L. No. 92-500, 86 Stat. 816.

¹⁸ See CWA § 402; 33 U.S.C. § 1342.

¹⁹ “Pollutant” is defined as including solid, industrial, agricultural and other wastes, sewage, sludge, heat, rock, sand, and biological and radioactive materials; CWA § 502(6), 33 U.S.C. § 1362(6). “Point source” is defined as any “discernable, confined, and discrete conveyance”; CWA § 502(14), 33 U.S.C. § 1362(14).

the use of the receiving water - for example, recreational, industrial, or public drinking water - and on local conditions, such as the size and flow of the receiving water, its turbidity, and other factors unique to the segment.

Technology-based effluent standards, on the other hand, do not focus on the qualities of the receiving water, but on the treatment a pollutant receives prior to its discharge. Technology-based standards define and mandate a level of effluent quality that is achievable using pollution control technology so that a pollutant's capacity to degrade the water segment into which it is discharged is lessened. Of the two, technology-based effluent standards dominate the CWA's regulatory system.

Both of these standards are implemented and enforced through the NPDES permit program, administered by the USEPA. Under §402 of the CWA, a discharger must obtain an NPDES permit from EPA or from a state that has an EPA-approved program.²⁰ The technology-based and water quality-based standards are written into the permits and are tailored to meet the particular permittee's situation, such as the pollutant-producing operation, the type and amount of pollutants to be discharged and the condition of the receiving water.

The CWA mandated development of water quality standards for water bodies and effluent limitations based on those standards, and it set forth the mechanism for incorporating water quality standards into NPDES permits. States were required to adopt classifications of water bodies according to their best uses. They were also required to develop standards for various pollutants that would establish maximum levels of pollutants in water bodies that would be allowable so that the water bodies could retain their best uses.²¹ These standards are then, in turn, incorporated into the NPDES permit as effluent limitations, along with any other relevant technology-based effluent limitations.

NPDES permits may also contain other conditions a permittee must meet, such as requirements for monitoring and reporting effluent discharges.²² Discharge without a permit or in violation of its conditions may subject the discharger to an enforcement action by the federal or state government, which in turn may result in civil and criminal penalties.²³ A noncomplying discharger may also be subject to enforcement by private individuals or groups under the Act's citizen suit provision.²⁴ In sum, the NPDES permit program is the focal point of the CWA's regulatory system, and compliance with an NPDES permit's conditions is deemed to be compliance with almost all of the Act's regulatory provisions.²⁵

²⁰ CWA § 402(a) and (b), 33 U.S.C. § 1342(a) and (b).

²¹ CWA § 303, 33 U.S.C. § 1313.

²² 40 C.F.R. §§ 122.41 to 122.50 (permit conditions).

²³ CWA § 309, 33 U.S.C. § 1319.

²⁴ CWA § 505, 33 U.S.C. § 1365.

²⁵ CWA § 402(k), 33 U.S.C. § 1342(k).

CWA §316(b) and Cooling Water Intake Structures

§ 316(b) of the CWA provides that any "point source" discharge standard established pursuant to §§301 or 306 of the CWA must require that the location, design, construction, and capacity of CWIS reflect the "best technology available" (BTA) for minimizing adverse environmental impacts.

EPA has defined a "cooling water intake structure" as the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., extending from the point at which water is withdrawn from waters of the U.S. up to and including the intake pumps. EPA has defined "cooling water" as water used for contact or non-contact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content.²⁶ The intended use of cooling water is to absorb waste heat from production processes or auxiliary operations.

CWA §316(b) addresses the adverse environmental impact caused by the intake of cooling water, not discharges into water. Despite this special focus, the requirements of §316(b) are closely linked to several of the core elements of the NPDES permit program established under §402 of the CWA to control discharges of pollutants into navigable waters. For example, §316(b) applies to point sources (facilities) that withdraw water from the waters of the U.S. for cooling through a CWIS and are subject to an NPDES permit. Conditions implementing §316(b) are included in NPDES permits on a case-by-case, site-specific basis.

The majority of impacts to aquatic organisms and habitat associated with intake structures is closely linked to water withdrawals from the various waters in which the intakes are located. Based upon preliminary estimates from an EPA questionnaire sent to more than 1,200 existing power plants and factories, industrial facilities in the U.S. withdraw more than 279 billion gallons of cooling water each day from waters of the U.S.²⁷

The withdrawal of such quantities of cooling water affects large numbers of aquatic organisms annually, including phytoplankton (tiny, free-floating photosynthetic organisms suspended in the water column), zooplankton (small aquatic animals, including fish eggs and larvae, that consume phytoplankton and other zooplankton), fish, crustaceans, shellfish, and many other forms of aquatic life.²⁸ Aquatic organisms drawn into CWIS are either impinged on components of the CWIS or entrained in the cooling water system itself.

Impingement takes place when organisms are trapped against intake screens by the force of the water passing through the cooling water intake structure. This can result in starvation and exhaustion (organisms are trapped against an intake screen

²⁶ See 66 Fed. Reg. 65259 (Dec. 18, 2001).

²⁷ See *generally*, 65 Fed. Reg. 49071 through 4 (Aug. 10, 2000) and 66 Fed. Reg. 65262 (Dec. 18, 2001).

²⁸ 66 Fed. Reg. 65262 (Dec. 18, 2001).

or other barrier at the entrance to the cooling water intake structure), asphyxiation (organisms are pressed against an intake screen or other barrier at the entrance to the cooling water intake structure by velocity forces which prevent proper gill movement, or organisms are removed from the water for prolonged periods of time), descaling (fish lose scales when removed from an intake screen by a wash system), and other physical harms.²⁹

Entrainment usually occurs when relatively small benthic, planktonic, and nektonic organisms, including early life stages of fish and shellfish, are drawn through the cooling water intake structure into the cooling system. In the normal water body ecosystem, many of these small organisms serve as prey for larger organisms that are found higher on the food chain. As entrained organisms pass through a plant's cooling system they are subject to mechanical, thermal, or toxic stress. Sources of such stress include physical impacts in the pumps and condenser tubing, pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers, sheer stress, thermal shock, and chemical toxemia induced by antifouling agents such as chlorine.³⁰

In addition to impingement and entrainment losses associated with the operation of CWIS, another concern is the cumulative degradation of the aquatic environment as a result of:

- (1) multiple intake structures operating in the same watershed or in the same or nearby reaches; and
- (2) intakes located within or adjacent to an impaired waterbody.

Historically, impacts related to CWIS have been evaluated pursuant to CWA §316(b) on a facility-by-facility basis. While the potential cumulative effects of multiple intakes located within a specific waterbody or along a coastal segment are largely unknown, there is concern about the effects of multiple intakes on fishery stocks.³¹

²⁹ 66 Fed. Reg. 65263 (Dec. 18, 2001); see also Thurber, N.J. and D.J. Jude, *Impingement Losses at the D.C. Cook Nuclear Power Plant During 1975-1982 With a Discussion of Factors Responsible and Possible Impact on Local Populations*, Special Report No. 115 of the Great Lakes Research Division, Great Lakes and Marine Waters Center, Univ. of Mich. (1985).

³⁰ 66 Fed. Reg. 65263 (Dec. 18, 2001) citing Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig, *A Comparative Review of Entrainment Survival Studies at Power Plants in Estuarine Environments*, Environmental Science & Policy, 3:S295-S301 (2000).

³¹ 66 Fed. Reg. 65263 (Dec. 18, 2001) referring to Request by member States of Atlantic States Marine Fisheries Commission to investigate the cumulative impacts on commercial fishery stocks attributable to cooling water intakes located in coastal regions of the Atlantic in 2001.

New York State Laws

SPDES Permitting Program

Pursuant to authority granted by Congress in CWA § 402, USEPA has authority to allow states to carry out specified permitting functions, which would otherwise be performed by USEPA, for discharges into both interstate and intrastate waters. New York State received USEPA approval of such authority in the form of a Memorandum of Agreement between the state and USEPA in October 1975. The Memorandum established the basis for the SPDES permit program in New York State in lieu of a federally administered program.

Originally enacted in 1973, Article 17, Title 8 of the Environmental Conservation Law (ECL) authorizes The Department to administer the SPDES permitting program that governs the discharge of pollutants into the waters of the state at a given facility.¹ The purpose of ECL Article 17, Title 8 is:

To create a state pollutant discharge elimination system (SPDES) to insure that the State of New York shall possess adequate authority to issue permits regulating the discharge of pollutants from new or existing outlets or point sources into the waters of the state, upon condition that such discharges will conform to and meet all applicable requirements of the [FWPCA] ... and rules, regulations, guidelines, criteria, standards and limitations adopted pursuant thereto relating to effluent limitations, water quality related effluent limitations ...²

The discharge must also meet all applicable requirements of the ECL and the implementing regulations at 6 NYCRR Parts 700, et seq. and 750, et seq. The permitting objective is to prospectively control the discharge of point-source pollutants, including heat, by establishing chemical-specific limits and other requirements intended to assure that water quality standards in the receiving water body are achieved. Additional environmental objectives are to assure that aquatic communities are not unduly harmed by discharges, and to protect the public health and best usage of the water body.

Generally, thermal discharges to the waters of the State must meet water quality standards to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water.³ In addition, thermal criteria apply to all waters of the State receiving thermal discharges.⁴ These criteria may be modified upon application of a permittee to the Department if the Department finds them to be unnecessarily restrictive and that modification

³² "Pollutant" is defined as any "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, and agricultural waste discharged into water." ECL § 17-0105(17).

³³ ECL § 17-0801.

³⁴ 6 NYCRR § 704.1(a).

³⁵ NYCRR § 704.2.

would still assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made.³⁶ The discharge of heat as a pollutant, a "thermal discharge", is addressed in the Department's regulations at 6 NYCRR Part 704.

In making a modification to thermal criteria, the Department typically imposes a "mixing zone" which limits the physical extent within which heated water can exceed specific applicable criteria.³⁷ Outside of the mixing zone, thermal criteria must be met to assure compliance with water quality standards. Temperature limitations are established and imposed on a case-by-case basis for each facility subject to Part 704 jurisdiction. NYS has adopted the federal CWA §316(b) BTA requirement for CWIS as part of the Department's thermal discharge criteria at 6 NYCRR §704.5.

The HRSA facilities which are the subject of this FEIS, Indian Point, Bowline Point, and Roseton, must demonstrate their compliance with water quality standards.³⁸ Since 1981, these facilities' operations, and their resulting thermal discharges, have been conditioned by their SPDES permits. Their current permits were due to expire in 1992 but were extended under SAPA.

According to the Consent Order, the HRSA facilities were required to use their "best reasonable efforts" to operate the respective plants to keep the volumes of water withdrawn for cooling at the minimum required for efficient operation.³⁹ The original 1981 HRSA contained similar general language, and also provided charts for each facility which identified average maximum river temperatures and specified approximate flows for each unit at Indian Point and for all units at Bowline and at Roseton for different periods throughout the year.

The thermal limitations associated with the HRSA facilities' existing SPDES permits include the following:

Bowline Point:

As of the 1987 - 1992 SPDES permit term, Bowline did not exceed the thermal criteria and a mixing zone did not need to be specified to meet the water quality standard. The use of multiport high velocity diffusers provided sufficient mixing with ambient water sufficient to meet thermal criteria. As a consequence, additional specifications to meet thermal criteria have not been imposed. The SPDES permit provides a daily maximum discharge temperature (102°F).

³⁶ 6 NYCRR § 704.4.

³⁷ 6 NYCRR § 704.3.

³⁸ See App. F-II.

³⁹ See App. F-III.

Roseton:

As of the 1987 - 1992 SPDES permit term, Roseton did not exceed the thermal criteria and a mixing zone did not need to be specified to meet the water quality standard and additional specifications to meet thermal criteria were not imposed. The use of multiport high velocity diffusers provided sufficient mixing with ambient water to meet water quality criteria. The SPDES permit provides a daily maximum discharge temperature (99°F).

Indian Point:

As of the 1987 - 1992 SPDES permit term, thermal discharges from Indian Point did not meet applicable thermal criteria. To control thermal discharges, the SPDES permit for Indian Point Units 2 and 3 requires that the maximum discharge temperature for condenser cooling water not exceed 110°F. In addition, the daily average discharge temperature between April 15 and June 30 is not to exceed 93.2°F for an average of more than ten days per year during the term of the permit, beginning in 1981, provided that it not exceed 93.2°F on more than 15 days during that period in any year.

The Consent Order also provided that Indian Point give "due regard to ambient river water temperature, plant operating status, and the need to meet water quality standards or other permit conditions".¹ Figures B-1 and B-2 to Attachment D of the Fourth Amended Consent Order provide graphic representations of "Predicted Condenser Cooling Water Flow Rate Schedules to Achieve Efficient Operations of Indian Point [Units 2 and 3]". That Consent Order provides that there may be some deviation from these schedules because "the minimum flow rate for any given period is dependent upon ambient river water temperature".

These provisions alone, however, are not sufficient for Indian Point to meet thermal criteria. Thermal modeling indicates that the thermal discharge from Indian Point causes water temperatures to rise more than allowed, which is four degrees (F.) over the temperature that existed before the addition of heat, or a maximum of 83°F, whichever is less, in the estuary cross sections specified in 6 NYCRR §704.2(b)(5).² A mixing zone was not specified in the previous SPDES permit for the Indian Point facility.

Even though thermal discharges from Bowline and Roseton meet water quality criteria, their thermal contribution to the Hudson River is additive with that of Indian Point and must be taken into account in determining whether the water quality standard is met. If the standard is not met, the circumstances can trigger the water quality standard requirement to assure the protection and propagation of a balanced, indigenous population. If analyses specified in the proposed SPDES permits are unable to make this assurance to the Department's satisfaction, the next level of action would be for the Department to determine how thermal discharges would be limited to ensure that water quality standards are met.

⁴⁰ See App. F-III.

⁴¹ 1999 DEIS, Appendix VI-3-A, Thermal Modeling of Ebb and Flood Tide Thermal Plumes (CORMIX model).

New York has adopted the appropriate regulations for the operation of the SPDES permit program, including standards for the development and issuance of permits as well as for the types of effluent limitations to be imposed in these permits.⁴² In addition to the federally developed categorical effluent limitations, The Department has developed approximately 100 water quality standards for various pollutants in its regulations and less formal "guidance" values for many more pollutants.⁴³ The Department has also categorized through regulation all significant water bodies in the State, based upon the best use of each water body.⁴⁴

The Department's overall SPDES permitting activity is intended to implement the declared public policy of the State of New York that water resources not be wasted or degraded and "shall be adequate to meet the present and future needs for domestic, municipal, agricultural, commercial, industrial, power, recreational and other public, beneficial purposes."⁴⁵

Goals for water discharge permitting are also articulated in the ECL:

Reasonable standards of purity and quality of the waters of the state be maintained consistent with public health, safety and welfare and the public enjoyment thereof, the propagation and protection of fish and wildlife, including birds, mammals and other terrestrial and aquatic life, and the industrial development of the state, and to that end, to require the use of all known available and reasonable methods to prevent and control pollution, wastage and unreasonable disturbance and defilement of the waters of the state.⁴⁶

Any source proposing to discharge pollutants requiring a SPDES permit must file an application with The Department at least 180 days before the proposed commencement of the discharge⁴⁷ or, if renewing an existing SPDES permit, at least 180 days before the expiration of the existing permit.⁴⁸ Submission of a timely renewal application continues the terms of the existing SPDES permit until the renewal permit is issued by the Department.⁴⁹ If the Department determines to

⁴² See 6 NYCRR Part 750.1

⁴³ 6 NYCRR Part 703; Department Technical and Operational Guidance Series (TOGS) § 1.1.1.

⁴⁴ See 6 NYCRR Parts 701 and 800 to 941.

⁴⁵ ECL § 15-0105(3).

⁴⁶ ECL § 15-0105(7); *see also*, ECL § 17-0101.

⁴⁷ 6 NYCRR § 750-1.6

⁴⁸ 6 NYCRR § 750-1.16

⁴⁹ SAPA § 401(2).

issue the permit, it prepares a draft permit, including proposed effluent limitations and other conditions.⁵⁰

The Department is required to provide public notice of every draft SPDES permit which gives a description of the discharge and the terms of the draft permit, and sets forth a public comment period of no less than 30 days during which interested parties may submit written comments concerning the application.⁵¹ During the public comment period any person, including the applicant, may submit written comments or request a hearing. The Department is required to hold a legislative hearing to receive unsworn public comments if it determines that there is significant public interest and sufficient reason for such a hearing.⁵² If no hearing is held, only the written comment period occurs, and the Department will issue a final SPDES permit following the close of the public comment period.

In certain instances, an adjudicatory hearing may also be held, where evidence and sworn testimony is presented before an Administrative Law Judge (ALJ). Any interested party, as well as the applicant, may request an adjudicatory hearing with respect to any aspect of a draft SPDES permit so long as the request is made during the public comment period.⁵³ At such a hearing, parties have an opportunity to contest issues the ALJ has determined to be adjudicable.⁵⁴

The Department is required to determine the existence of the following facts in a SPDES permit renewal context:

1. That the permittee is in compliance with or has substantially complied with all the terms, condition, requirements, and schedules of compliance of the expiring SPDES permit;
2. That The Department has up-to-date information on the permittee's production levels, waste treatment practices, and the nature, contents, and frequency of the permittee's discharge, pursuant to new forms and applications or monitoring records and reports; and
3. That the discharge is consistent with currently applicable effluent and water quality standards and limitations, and other legally applicable requirements.⁵⁵

Upon a determination of the existence of these facts, the Department may issue a renewal permit.

The Department also has authority to modify SPDES permits for a number of reasons, including significant changes in a discharger's operations or new

⁵⁰ 6 NYCRR § 750-1.9

⁵¹ 6 NYCRR § 750-1.9

⁵² 6 NYCRR § 750-1.9

⁵³ 6 NYCRR § 750-1.1(d)

⁵⁴ 6 NYCRR § 624.4(b)(5), (c)

⁵⁵ 6 NYCRR §750-1.16

information, such as the promulgation of new standards by either the State or USEPA.⁵⁶ Permits can also be modified or revoked in response to violations of permit conditions, misrepresentations by the permittee, or changes in conditions.⁵⁷

Legislative Findings and Commissioner's Powers

In enacting legislation to preserve and protect the water resources and wildlife of the State of New York, the NYS Legislature made findings of fact and vested the Commissioner of the Department of Environmental Conservation with broad powers and authority germane to the regulation of electricity generating facility operations that use and impact such resources.

The Legislature has found:

The State of New York owns all fish, game, wildlife, shellfish, crustacea and protected insects in the state, except those legally acquired and held in private ownership. Any person who kills, takes or possesses such fish, game, wildlife, shellfish, crustacea or protected insects thereby consents that title thereto shall remain in the state for the purpose of regulating and controlling their use and disposition.⁵⁸

The general purpose of powers affecting fish and wildlife, granted to the department by the Fish and Wildlife Law, is to vest in the department, to the extent of the powers so granted, the efficient management of the fish and wildlife resources of the state. Such resources shall be deemed to include all animal and vegetable life and the soil, water and atmospheric environment thereof, owned by the state or of which it may obtain management, to the extent they constitute the habitat of fish and wildlife as defined in § 11-0103 ...⁵⁹

New York State has been generously endowed with water resources which have contributed and continued to contribute greatly to the position of preeminence attained by New York in population, agriculture, commerce, trade, industry and outdoor recreation.⁶⁰

All fish, game, wildlife, shellfish, crustacea and protected insects in the state, except those legally acquired and held in private ownership, are owned by the state and held for the use and enjoyment of the people of the state, and the state has a responsibility to preserve, protect and

⁵⁶ 6 NYCRR § 750-1.18

⁵⁷ 6 NYCRR § 750-1.20

⁵⁸ ECL § 11-0105.

⁵⁹ ECL § 11-0303(1); *see also*, ECL §§ 11-0303(2) and 11-0305.

⁶⁰ ECL § 15-0103(2).

conserve such terrestrial and aquatic resources from destruction and damage and to promote their natural propagation.⁶¹

It is in the best interests of this state that provision be made for the regulation and supervision of activities that deplete, defile, damage or otherwise adversely affect the waters of the state and land resources associated therewith.⁶²

The Department Commissioner has the power to:

Promote and coordinate management of water, land, fish, wildlife and air resources to assure their protection, enhancement, provision, allocation, and balanced utilization consistent with the environmental policy of the state and take into account the cumulative impact upon all such resources in making any determination in connection with any license, order, permit, certification or other similar action or promulgating any rule, regulation, standard or criterion.⁶³

Provide for the propagation, protection, and management of fish and other aquatic life and wildlife and the preservation of endangered species.⁶⁴

Provide for the protection and management of marine and coastal resources and of wetlands, estuaries and shorelines.⁶⁵

New York State Coastal Management Program

The NYS Coastal Management Program was developed under authority of New York State Executive Law 910-22 and 19 NYCRR Part 600. The operative sections of the Executive Law provide 11 points of policy that have been detailed in a single set of 44 decision-making criteria in the Coastal Management Program and final environmental impact statement. The Department, as a state agency, must find that all direct and funding actions, and any permitting actions that are the subject of an EIS under SEQR, are consistent with the Coastal Management Program.⁶⁶ In addition, SEQR regulations provide that, for any state agency action in a coastal area, a draft EIS must contain an identification of the applicable coastal resources/waterfront revitalization policies and a discussion of the effects of the

⁶¹ ECL § 15-0103(8).

⁶² ECL § 15-0103(13).

⁶³ ECL § 3-0301(1)(b).

⁶⁴ ECL § 3-0301(1)(c).

⁶⁵ ECL § 3-0301(1)(e).

⁶⁶ 6 NYCRR 617.9(e); 19 NYCRR 600.4(a)

proposed action on such policies.⁶⁷ The SPDES permit renewals that are the subject of this DEIS will not result in any new effects on coastal zone policies. Coastal zone consistency forms are contained in DEIS Appendix IV-5.

State law also requires that state agencies provide timely notice to local governments whenever an identified action will occur within an area covered by an approved local waterfront revitalization program (LWRP). The NYS Secretary of State is required to confer with state agencies and local governments when notified by a local government that a proposed state agency action may conflict with the policies and purposes of its approved LWRP, and may modify the proposed action to be consistent with the local plan.⁶⁸ None of these facilities is in an LWRP area.

The consistency provisions of the New York State Coastal Management Program enable the Department to consider the full range of coastal policies prior to undertaking and approving a specific action.

Hudson River Estuary Management Program

In 1987, ECL §11-0306 was amended in order to establish a Hudson River estuarine district including "the tidal waters of the Hudson River, including the tidal waters of its tributaries and wetlands from the federal lock and dam at Troy to the Verrazano-Narrows."⁶⁹ This section also directed the Department to establish a Hudson River estuary management program "in order to protect, preserve and, where possible, restore and enhance the Hudson River estuarine district."⁷⁰ The district was also to consider the remainder of the Hudson River, New York Bight, and the waters around Long Island, as they impact the Hudson River estuary.

A Hudson River estuary management advisory committee, consisting of representatives of commercial fishing, sportsmen, research, conservation, and recreation, as well as a Hudson River estuary coordinator, was created within the Department to manage the Hudson River estuary management program and assist in the development and implementation of the program.⁷¹

A Hudson River estuarine sanctuary was also established "for the purpose of protecting areas of special ecological significance within the Hudson River estuarine district and associated shorelands ...".⁷² The sanctuary also serves as a "long-term estuarine field laboratory for research and education concerning the Hudson River ecosystem."

⁶⁷ 6 NYCRR 617.14(d)(10)

⁶⁸ Executive Law 915-a.

⁶⁹ ECL §11-0306(1).

⁷⁰ ECL §11-0306(2).

⁷¹ ECL §11-0306(4).

⁷² ECL §11-0306(5)

The Department and the advisory committee were directed to develop a continuing estuary management program "for the preservation, protection, restoration and enhancement of the Hudson River estuarine district and associated shorelands including but not limited to its natural resources, its fish and wildlife and the habitats within it."⁷³ The strategy was required to include, among other things, the following:

- e. Evaluation of the impact of the uses of water on the Hudson River estuarine district including present and future demands for water and their impact on the balance of fresh and salt water in the estuary.
- f. Identification of areas of potential ecological significance which may require rehabilitation.
- g. A status report on the levels of toxicants in and their effects on important estuarine indicator species and for species that have potential or existing recreational or commercial value.
- h. Identification of the anthropogenic activities and the conservation and management problems that pose an existing or potential threat to the resources and the functioning of the estuary.⁷⁴

In enacting ECL §11-0306, the Legislature made the following findings and declarations:

The legislature further finds that the Hudson River estuary is of statewide and national importance as a habitat for marine, anadromous, catadromous, riverine and freshwater fish species and that it is the only major estuary on the east coast to still retain strong populations of its historical spawning stocks. Such species are of vital importance to the ecology and the economy of the state and to the recreational and commercial needs of the people of the New York state and neighboring states. A lack of sufficient and reliable research and documentation has resulted in recurring disputes on the movements, life cycles and habitats of these species.

The legislature further finds that the Hudson River estuary possesses a fishery of outstanding commercial and recreational value, and the economic potential of the Hudson river estuary's fishery is at present underdeveloped. Improper management and use of the Hudson River estuary will deprive present and future generations of the benefit and enjoyment of this valuable resource.

The legislature further finds that the protection of estuarine species throughout their life history; the protection of their spawning habitat, nursery habitat, wintering habitat and feeding and foraging habitat; and the protection, enhancement and restoration of the state's natural resources upon which these species and their habitat depend requires a specific program for the proper management of the Hudson River estuary.

⁷³ ECL §11-0306(6).

⁷⁴ See ECL §11-0306(6)(e)-(h).

It is hereby declared to be the policy of the state to preserve, protect and, where possible, restore and enhance the natural resources, the species, the habitat and the commercial and recreational values of the Hudson River estuary.

Hudson River Valley Greenway Program

Article 44 of the ECL was amended in 1991 to establish a Hudson River Valley Greenway Communities Council (Greenway Council) to assist Hudson River Valley communities in the 10 counties of Westchester, Putnam, Dutchess, Columbia, Rensselaer, Albany, Green, Ulster, Orange, and Rockland in their plans for development. Article 44 was enacted as companion legislation to the Hudson River estuary management program discussed earlier.⁷⁵ The statute authorizes the Greenway Council to provide and support cooperative planning to establish a voluntary regional compact among Hudson Valley localities to protect the valley's natural and cultural resources and promote regional planning. The ECL also provides that, upon compact effectiveness, state agency actions for which an EIS is being prepared under SEQR, including Department actions, must be assessed in light of the Greenway compact and applicable rules and regulations, and that the Greenway Council should review and comment in writing on the DEIS.⁷⁶ As of early 2003, six counties and several localities were actively engaged in Greenway Compact planning and programs.⁷⁷

Endangered Species Act

Past operations at the Roseton Units 1 & 2, Bowline Units 1 & 2 and Indian Points Units 2 & 3 have occasionally resulted in the impingement of shortnose sturgeon on the facilities' traveling screens. Shortnose sturgeon are currently listed as endangered under the federal Endangered Species Act.⁷⁸ In previous permit proceedings, the generators supplied the NMFS with all data on shortnose sturgeon that were collected in biological sampling programs. In testimony to the EPA in 1979, NMFS concluded in a Biological Opinion made pursuant to Section 7 of the Endangered Species Act that the once-through cooling system of the power plants did not pose a threat to the shortnose sturgeon population in the Hudson River. The generators are currently in the process of obtaining updated Incidental Take Permits from NMFS.

⁷⁵ ECL §11-0306

⁷⁶ ECL §44-0115(3).

⁷⁷ Hudson River Valley Greenway Communities Council website, <http://www.hudsongreenway.state.ny.us/commcoun/commcoun.htm>

⁷⁸ Endangered Species Act of 1973, 16 U.S.C.A. §§ 1531 - 1544.

The New York State Energy Plan

The NY State Energy Plan (SEP) is published every four years pursuant to § 6-104 of the State Energy Law (effective until January 1, 2003). The SEP was last published in 2002.

§ 6-102 of the State Energy Law creates the State Energy Planning Board. Among other things, the State Energy Law requires that the State Energy Planning Board include in the SEP twenty-year forecasts of the demand for electricity and energy supply requirements needed to supply that energy demand; an assessment of the ability of existing energy supply sources and transmission systems to satisfy such energy requirements; and identification and analysis of costs, risks, benefits and uncertainties of energy supply source alternatives for satisfying energy supply requirements which are not reasonably certain to be met by existing energy supply sources.

The SEP is intended to be a reflection of the State's policies for promoting and adopting "flexible, yet stringent, environmental policies that balance the need for more energy with the need for improved public health and safety."¹ Among its major policy strategies and recommendations, it includes supporting "the continued safe operation of nuclear, coal, natural gas, oil, and hydroelectric generation as part of a diverse portfolio of electricity generation resources".²

The SEP does not take into account the specific need to renew the Roseton, Bowline or Indian Point SPDES permits or the need to complete this EIS. However, the SEP does observe that mortalities to aquatic organisms associated with impingement and entrainment from the operation of CWIS and thermal discharges from older electricity generation facilities are negative environmental impacts for which minimization should be provided.³ The SEP finds that, since the 1998 SEP was released, the State has made significant gains in reducing the environmental impacts associated with energy generation and consumption. It also finds that the impacts of energy generation on the State's aquatic resources are analyzed and addressed through existing regulatory programs.⁴ The SEP will inform the Department's assessment of the impacts to and general alternatives for mitigation of adverse environmental impacts from the Roseton, Bowline and Indian Point generation facilities.

NYS Environmental Quality Review Act (SEQR)

SEQR requires that NYS agencies and local governments consider the potential adverse environmental impacts of decisions they make, including approval of applications from regulated entities.⁵ SEQR provided the Department's authority for

⁷⁹ 2002 SEP, p. S-1.

⁸⁰ 2002 SEP, p. S-4.

⁸¹ 2002 SEP, p. 2-56.

⁸² 2002 SEP, p. 2-58.

⁸³ ECL Article 8

requiring an EIS on the proposed renewal of the facilities' SPDES permits. Before issuing a final decision on each of the applications, the Department will be required to make findings based on this FEIS concluding whether, among other tests, the selected alternative(s) will minimize or avoid adverse environmental impacts, "... to the maximum extent practicable ...".

MITIGATION AND ALTERNATIVES

Available Mitigation Technologies

Based on information in the 1999 DEIS, including DEIS Appendices VII and VIII, and on information obtained and analyses conducted since the DEIS was prepared, the Department believes that a range of available technologies exist to minimize aquatic resource mortality from the cooling water intake structures (CWIS) at the Indian Point, Roseton, and Bowline Point generating stations. This discussion will focus on conclusions relating to potential applicability to the HRSA facilities of a range of technology and management systems to reduce impacts on aquatic organisms from their CWIS operations. The "Response to Comments" section of this FEIS contains more detailed descriptions, background and updates on several of the technologies, and several supporting reports are attached in Appendix F- V.

At present, the existing cooling water system at each of the HRSA generating stations is a "once-through" system, that is, Hudson River water is taken into the cooling system, circulated past the condenser coils to absorb waste heat from operation of the generation equipment, and discharged back to the Hudson River at a higher temperature than at the intake. In the process, some larger aquatic organisms are impinged on intake screens and many more are entrained within the circulating cooling water. Under the HRSA and Consent Orders, and currently by concurrence of the generators, Indian Point has achieved some reductions in intake volumes through the use of variable flow pumps while Roseton cycles pumps on and off to reduce water volumes used. Additionally, Indian Point has installed Fletcher-modified Ristroph traveling screens to help reduce impingement mortality at those facilities, and Bowline Point uses a seasonally-deployed fine mesh barrier net to reduce both impingement and entrainment mortality.⁸⁴ While these represent some level of improvement compared to operations with no mitigation or protection, there are still significant unmitigated mortalities from entrainment and impingement at all three of the HRSA facilities.

In addition to proposing a "Fish Protection Point" (FPP) management system as the generators' preferred alternative,⁸⁵ the DEIS presented information on a wide range of other technologies to reduce water intake volumes, prevent impingement or entrainment, or reduce thermal discharges, and also discussed a range of management options which might achieve one or more of the same goals.⁸⁶ Those alternatives described by the generators included:

- outages, that is, reduction of water demand by ceasing generation at specified plants during specified time periods;

⁸⁴ DEIS § VIII; Radle, E. W. and M. J. Calaban, 2003. Implementation of CWA 316(b) in New York. Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

⁸⁵ DEIS § VII.

⁸⁶ DEIS § VIII.

- technology to reduce water demand, including dry, wet, and wet/dry (a/k/a "hybrid") cooling towers;
- minimizing flow rates with variable speed pumps or modified pumping schedules;
- barrier systems to minimize numbers of aquatic organisms impinged or entrained, including Ristroph traveling screens, fine-mesh screens, cylindrical wedge-wire screens, barrier nets, and fine-mesh barrier systems;
- behavioral deterrent systems designed to "steer" one or more classes of aquatic organisms away from CWIS, including acoustic systems, electrical barriers, air bubble curtains, several light systems, water jet curtains, and hanging chains;
- district heating/cooling, that is, exporting waste steam to a nearby industrial or institutional user, which in effect makes the receiving steam circulation system function as a large heat diffuser and thereby reduces the need for cooling water intake from and discharge to a water body like the Hudson;
- replacement of power provided by the HRSA plants with power from other sources, which would essentially mean exporting impacts by importing power;
- a so-called "multiple choice" alternative which would have required a commitment to not extend the Nuclear Regulatory Commission (NRC) Indian Point licenses; to operate the existing Bowline Point and Roseton plants until 2015 and then repower those stations with closed-cycle cooling; and provide 32 weeks of outages annually, until the NRC licenses expire for Indian Point and until 2015 for the other two plants;
- enhancements provided elsewhere than the HRSA plants, such as fish stocking and habitat improvement; and
- dismissal of a "no action" alternative, as the Department must by law take one of only 3 actions on SPDES renewal applications - approve, approve with conditions, or deny.

Alternatives Assessment

Generally speaking, the most effective aquatic resource protection can be achieved by greatly reducing actual water usage, particularly during seasons of peak abundance of entrainable life stages.⁸⁷ Complete retrofit of the HRSA plants to closed-cycle ("dry") cooling systems would result in an approximately 95% water demand reduction and so must be given serious consideration for feasibility at each of the HRSA stations. Despite all of the benefits, however, closed-cycle systems do not come without impacts, and those potential impacts must also be weighed for each site. The success of closed-cycle cooling in other NYS deployments causes this technology to be given a relatively high level of consideration among available technologies, while not excluding other proposals.

⁸⁷ In the Matter of an Application for a State Pollutant Discharge Elimination System (SPDES) Permit by Athens Generating Company, LP, Commissioner's Interim Decision, June 2, 2000, pp. 11 - 17 (Athens Interim Decision). See *also* Wantuck, R. L., 2003. Resource Agency Views of Technology Employed to Prevent Fish Mortality at Cooling Water Intakes. Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

Among the potential impacts of closed-cycle cooling are so-called "energy penalties" associated with operation of cooling towers, that is, losses of generation efficiency under certain operating and climatic conditions plus the energy required to run component systems like fans. In addition, there are certain expenses associated with installing closed-cycle cooling.⁸⁸ Actual costs tend to vary widely depending on individual site characteristics combined with plant and tower configurations, so potential costs to install cooling towers can only be estimated based on a specific design proposal for an individual site.⁸⁹

Several classes of cooling tower system designs exist, each of which can substantially reduce water demand but also have associated "energy penalties" and other potential impacts of specific systems which must be evaluated based on individual proposals for particular sites. Dry, or closed cycle cooling systems rely on fans and air cooling with recovery of condensate for recirculation. "Wet" cooling towers use evaporative cooling, and "hybrid" or "wet/dry" towers have cooling cells with both evaporative and dry components.⁹⁰ Evaporative systems tend to produce condensate "plumes" which can be visible for considerable distances in some climatic conditions. Frequency of plume visibility and relative water losses can vary substantially depending on the operating parameters of a given system. Furthermore, evaporated water is permanently lost to the source water body; in the Hudson River system, there is evidence indicating that such losses could be sufficiently significant to affect salt levels. Thus, were a wet or hybrid tower to be proposed for any of the HRSA facilities, the potential impacts of evaporative losses, plumes, and energy losses would require careful evaluation based on a specific design proposal for that site.⁹¹

Finally, modern cooling tower systems, whether dry, hybrid or wet, require a sufficient amount of land to support a series or array of cooling "cells". Again, potential impacts would be site and design specific but include possible visibility from sensitive receptors as well as potential impacts on sensitive land resources. The mid-to-lower Hudson Valley has a number of sensitive visual receptors as identified in the Visual Impact Assessment Policy developed by the Department's Division of Environmental Permits, but the ability to more precisely evaluate potential visual impacts would depend on knowing precise height, configuration and site placement of any proposed tower system.⁹² Similarly, prediction and evaluation of potential

⁸⁸ Grogan, D. B. & Assoc., Inc. 2000. Hudson River Power Plants, Cooling Water System Design Assessment. Technical Report prepared for ESSA Technologies, Ltd., Richmond Hill, Ontario, Canada; included in Appendix F-IV of this FEIS.

⁸⁹ Maulbetsch, J. and K. Zammit, 2003. Cooling System Retrofit Costs. Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

⁹⁰ Grogan, 2000; Maulbetsch, 2003; *see also* DEIS Section VIII and appendices for basic descriptions and diagrams of cooling tower systems.

⁹¹ Grogan, 2000.

⁹² Department Program Policy DEP 00-2, Assessing and Mitigating Visual Impacts. July 31, 2000. www.dec.state.ny.us/website/dcs/policy/visual2000.pdf

land resource impacts would require that proposed site placement and size of the tower array, at least, be known.

A modification of generating station design that can be incorporated with new construction or when an existing electric generating plant is "repowered", that is, has its core combustion and generating systems replaced, is combined-cycle generation. In the most basic terms, a combined-cycle plant is designed to use some of the waste heat from the initial combustion/generation process to power a secondary turbine. Use of combined-cycle technology greatly reduces the amount of waste heat which must be managed, thereby greatly reducing the total demand for cooling and, thus, the size of the necessary cooling system.

Other approaches can also reduce water demand, usage or flow rates, which can then result in reductions in entrainment, impingement, or both. Permanent, structural measures, such as modified intake structures to reduce intake velocities, are one example of this approach. In addition, management systems and seasonal adjustments like the outage schedule employed for the HRSA plants can reduce water withdrawn during critical seasons. Monitoring and verifying such systems can require substantial recordkeeping by generators and agencies. There are also potential conflicts resulting from outage requirements in a competitive market where actual generating schedules are determined by the New York Independent System Operator (NYISO). On the other hand, such systems may be more rapidly implemented as they do not typically require major new infrastructure construction.

Structural protection can be added at intakes to reduce entrainment, impingement, or both. Traveling screens, barrier nets, "aquatic filter barriers" (AFB) like the Gunderboom® Marine Life Exclusion System™ (MLES™), and wedgewire intake structures can all protect some or many life-stages from being trapped against or entering into cooling water intake systems.⁹³ Traveling screens are used at many intakes to reduce the load of small solids entering and potentially damaging the cooling system; in some cases, like at Indian Point, those screen systems have been modified to incorporate "fish return" components.⁹⁴ These screens are most effective at reducing impingement of larger aquatic organisms but do very little to reduce entrainment. Similarly, barrier nets are typically relatively coarse mesh (3 - 5 mm opening, or wider) and are more effective in reducing impingement than entrainment. Barrier nets have been used in a range of fresh- and saltwater systems in the United States.⁹⁵ A fine-mesh barrier net (3 mm opening) has been seasonally deployed at Bowline Point under the HRSA and subsequent Consent Orders.

⁹³ See also Responses to Comments, following, plus individual technology assessments in App. xx - yy of this FEIS.

⁹⁴ Radle and Calaban, 2003.

⁹⁵ Taft, E., T. Cook, J. Black, and N. Olken, 2003. Fish Protection Technologies for Existing Cooling Water Intake Structures and Their Costs. Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

AFB's are a variant on barrier nets. Instead of relatively coarse openings, AFB's have micropores which allow water passage but block most floating or suspended organisms and objects. These micropores are sufficiently fine to act as a barrier to many fish eggs and larvae as well as other floating and suspended aquatic organisms. Depending on a facility's intake configuration, an AFB can be installed as an in-water, surface-to-bottom "curtain" surrounding an open-water intake, or as panels running along a shoreline, parallel to river flow, to screen a shoreline intake. The Department has monitored a series of deployments of a "curtain" installation of the Gunderboom® MLES™ at the Lovett generating station, also on the Hudson River, on the opposite shore and slightly downstream from Indian Point (Figure 2, following this text section). In those deployments, the MLES™ showed effectiveness approaching that of closed cycle cooling for reducing both entrainment and impingement.⁹⁶ Other researchers have identified "fouling" (clogging openings with debris or organisms) as a concern with both barrier nets and AFB's at other locations,⁹⁷ and shoreline or channel bottom modifications can be necessary for deployment. Thus, again, site- and design-specific evaluations and impact assessments must be made of any proposed installation of AFB or barrier net system, and effectiveness monitoring should be required for some time after installation.

Wedge-wire intake screens have also been shown to be very effective in reducing impingement but variably successful in reducing entrainment.⁹⁸ Wedge-wire screens essentially provide a filtering hood over an intake that both physically blocks many organisms from entering the intake and reduces intake flow rates, by essentially "spreading" the intake's draw over a relatively large surface area. How effective a specific wedge-wire screen installation will be in reducing entrainment depends on the "slot" size of the screen and on the size distribution of potentially entrainable aquatic organisms in that water body. Two millimeter (mm) slots, or openings between metal parts to provide water passage, will generally block organisms 15 mm and larger; smaller slot openings will protect smaller organisms but also reduce the flow rate through a given area of screen. Where water volume and flow rate requirements of a generating facility plus the local populations of entrainable organisms match the capabilities of the wedge-wire screen system, this can provide an effective intake protection system, however, determining that match will require detailed, site-specific analyses.

Behavioral and deterrent systems like acoustic deterrents have also shown promise for reducing mortality of some species or classes of aquatic organisms in specific

⁹⁶ See reports in Department application file for the 2003 Lovett SPDES renewal, Department # 3-3928-00010/00002 and 3-3928-00010/00045

⁹⁷ McLean, R. 2003. State of Maryland Perspectives on Cooling Water Intake Technologies to Protect Aquatic Organisms; and Henderson, P., R. Seaby and R. Somes. 2003. Filter Curtain Materials, Entrainment, Biofouling and Permeability. Both in Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

⁹⁸ Taft, E., T. Cook, J. Black, and N. Olken. 2003. Fish Protection Technologies for Existing Cooling Water Intakes and Their Costs. Proceedings (in press), A Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms. Washington, D. C., May 2003.

situations. Most notably, sonic deterrent systems have been shown to be effective in protecting adults of some herring species from impingement at intakes in Lake Ontario, on the English Channel, and in Belgium.⁹⁹ Key design criteria of these deployed systems differ widely, including operating pitches, timing, and speaker placement. Because there are still wide differences in designs and an apparently narrow range of species susceptible to sonic deterrence, application at any of the HRSA plants would require site and resource assessments to determine likelihood of success as well as followup studies to monitor effectiveness. Other deterrent technologies do not have sufficient performance records to be considered available at this time.

The most promising BTA approach for the HRSA plants at this time appears to be combinations of technologies, or technologies plus management systems, deployed in such a manner as to provide increasingly effective aquatic resource protection. This conclusion is consistent with that of other researchers working with cooling water intakes at existing power stations.¹⁰⁰

Significantly for NYS, this approach of combined technologies would also be consistent with the BTA determinations recently reached for several new or repowered electric generating stations on the Hudson River and estuary system, which have generating capacities similar to units at the HRSA facilities:

- Athens Generating Station (Athens), between Albany and Kingston;¹⁰¹
- Bethlehem Energy Center (Bethlehem), slightly south of Albany;¹⁰²
- Bowline 3, adjoining Bowline Point 1 and 2, West Haverstraw;¹⁰³
- Lovett Electric Generating Station, Stony Point;¹⁰⁴
- Astoria Generating Company (Reliant/Astoria), Queens, New York City(NYC);¹⁰⁵

⁹⁹ Radle et al, 2003; Ross, Q. E., D. J. Dunning, J. K. Menezes, M. J. Kenna, Jr. and G. Tiller. 1996. Reducing Impingement of Alewives with High-Frequency Sound at a Power Plant Intake on Lake Ontario. *North American Journal of Fisheries Management*, 16:548-559; Maes, J., A. Turnpenny, D. Lambert, J. Nedwell, A. Parmentier and F. Ollevier. 2002. The Impact of Cooling Water Abstraction On Fish At The Electobel Power Plant Doel (Belgium) After Installation Of A Fish Guidance Sound System. *Journeew D'etude Du Cebedeau*, Nov/Dec 2002. Pp. 75-78.

¹⁰⁰ Taft et al, 2003; Maulbetsch et al, 2003.

¹⁰¹ Athens Interim Decision.

¹⁰² In the Matter of The Applications for Clean Air Act Title IV and SPDES permits by PSEG Power New York, Inc. (Bethlehem Energy Center), Interim Decision, January 31, 2002.

¹⁰³ In the Matter of the Application for a SPDES permit and Air Pollution Control permits by Mirant Bowline, LLC. (Bowline 3 Decision), Decision, March 19, 2002.

¹⁰⁴ Lovett Electric Generating Station, SPDES Permit (and supporting Fact Sheets), DEC # 3-3928-00010/0002; NY-0005711; February 6, 2003.

¹⁰⁵ In the Matter of the Application of Astoria Generating Company, L.P. for a Certificate to Construct and Operate a 1,816 MW Electric Generating Plant pursuant

- Astoria Energy (SCS/Astoria), Queens, NYC;¹⁰⁶ and
- New York Power Authority (NYPA/Astoria), also in Queens, NYC.¹⁰⁷

Locations of these facilities are shown on Figures 2 and 3, following this section.

For the Athens project, a new plant employing combined-cycle technology, potential impacts on aquatic resources were found to be a very compelling concern, and a dry cooling system was determined to be BTA. At Bethlehem, a repowering incorporating combined-cycle technology, third parties voiced strong concerns over potential visibility of the taller structures required for a full dry cooling system as opposed to wet or hybrid cooling tower systems, but significant numbers of species and life stages susceptible to both entrainment and impingement were present at the site. Thus, for that project, a plan was developed and approved to construct hybrid cooling towers, install a wedgewire structure over the intake, and seasonally deploy an MLES™ to further screen the intake during peak periods of potential entrainment. The MLES™ installation at Bethlehem will be flat panels generally paralleling the shoreline.

Bowline 3, a new combined-cycle plant, will use a combination of technologies similar to that at Bethlehem. In addition, Bowline 3's sponsors propose to use discharge water from Bowline 1 and 2, when available, instead of Hudson River water for its cooling water source. This management strategy could further reduce the amount of fresh river water required for the new generating plant. At the Reliant/Astoria facility, a repowering project on the Queens side of the East River, combined-cycle generation with hybrid towers plus intake protection will be provided; the towers will use a reverse osmosis treatment system to minimize salt drift impacts. The SCS/Astoria and NYPA/Astoria projects, both new plants employing combined-cycle generation, will use dry cooling.

In each of these recent decisions, consistent with established law, the aquatic and other natural resources present at and site-specific constraints of each project factored into the individual BTA determination. Each BTA decision must also be found to maximize fish protection while minimizing or avoiding other impacts "... to the maximum extent practicable ..." to satisfy SEQR as well as CWA §316(b). These decisions reiterate that each SPDES permit application involving a CWIS will present an opportunity to make an independent BTA decision.¹⁰⁸ By their very nature, BTA decisions are application-specific, based on site-specific characteristics rather than

to Article X of the Public Service Law (Reliant/Astoria Decision), Recommended Decision, April 3, 2003.

¹⁰⁶ In the Matter of an Application by Astoria Energy LLC for a Certificate to Construct and Operate a 1000 MW Electric Generating Plant pursuant to Article X of the Public Service Law (SCS/Astoria Decision), Order and Opinion Granting Certificate, November 21, 2001.

¹⁰⁷ In the Matter of an Application by the New York Power Authority for a Certificate to Construct and Operate a 500 MW Electric Generating Plant pursuant to Article X of the Public Service Law (NYPA/Astoria Decision), Recommended Decision, December 17, 2001.

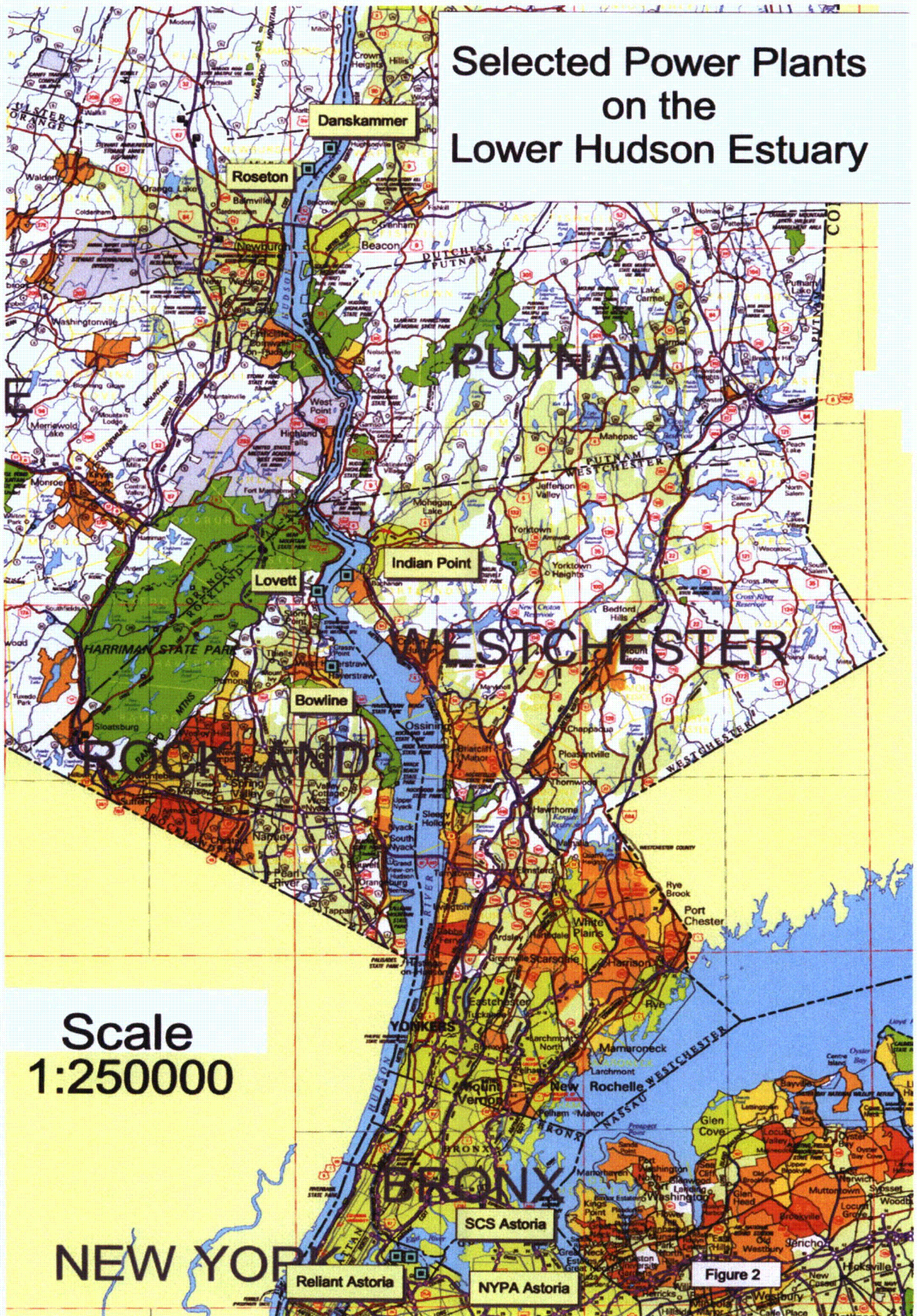
¹⁰⁸ Athens Interim Decision, p.12.

pre-established quantitative goals applicable to applications generally. This appropriately addresses the unique physical and regulatory aspects of each site, including issues that are land-based and water body-specific, as well as its particular technological limitations or parameters.

Fig.3, facing page. Locations of Selected New and Existing Power Plants on the Lower Hudson Estuary, Hudson River, NY.¹⁰⁹

¹⁰⁹ Scale reduced from original by about 55%.

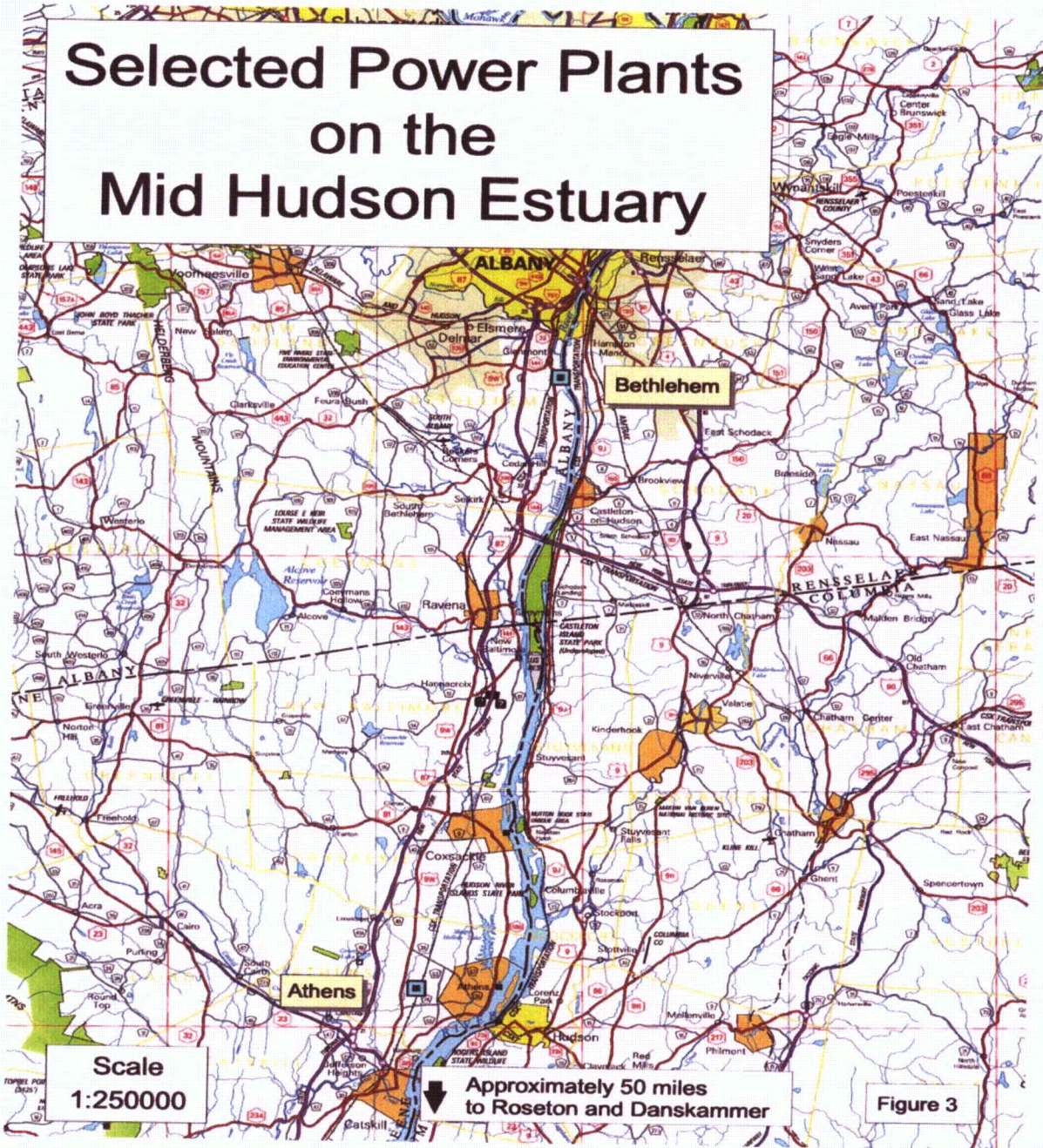
Selected Power Plants on the Lower Hudson Estuary



Scale
1:250000

Figure 2

Fig.3. General Location Map, Athens Generating Station and Bethlehem Energy Center, Hudson River, NY¹¹⁰



¹¹⁰ Scale reduced from original by about 20%.

PUBLIC COMMENT SUMMARY

Table 3 (following pages) presents a summary of comments received on the 1999 DEIS, both in writing and orally, at the June 8, 2000, legislative hearing. Comments addressing similar themes are grouped together. The final page of this summary contains a list of all commentators with a key to name abbreviations. Full texts of all written comments plus the hearing transcripts are attached in Appendix F-I.

Table 3. Summary of Public Comments Received on DEIS¹¹¹

TOPIC ↓	PUBLIC COMMENTS
FISH POPULATIONS	
<p>1. "Cropping" (that, is, consumption of some portion of one or more populations) by power plants is not a legitimate use of NYS's fisheries and other aquatic resources.</p>	<p><u>EA</u>: continued operation of plants at current levels of entrainment and impingement are inconsistent with prior NYS statements that power plants should not "crop" fish stocks <u>NMFS</u>: alternatives discussion weakened by presumption that "cropping" aquatic resources by power plants is acceptable <u>Riverkeeper</u>: DEIS provides no basis for concluding that mitigation measures should be accepted instead of closed-cycle cooling - technology and policy have advanced to point where [continued] fish mortality at power plants is an unnecessary anachronism</p>
<p>2. Many species in the Hudson River system are actually declining. While the striped bass (SB) population is up, that increase may be the result of other management decisions and activities. Historic baseline or trend data not substantially discussed.</p>	<p><u>EA</u>: some fish stocks actually showing declines - utilities' own data shows substantially reduced year classes and abundance for several species <u>PISCES</u>: DEIS seriously underestimates potential impacts on bay anchovy, especially early in season <u>Riverkeeper</u>: DEIS assessment of health of populations and estuary "overly sanguine" - system actually far from equilibrium with several species in decline; shad and tomcod deserve "more sober assessment" of current low levels <u>Scenic</u>: plants have killed billions of fish over last 20 years; evidence of long-term declines</p>

¹¹¹ A list of all commentators and abbreviations is included at the end of this table.

<p style="text-align: center;">TOPIC</p> <p style="text-align: center;">↓</p>	<p style="text-align: center;">PUBLIC COMMENTS</p>
<p>3. Several commentors question one or more of the assumptions used in one or more of the population models; in particular, density-dependence is unproven.</p>	<p><u>DEC</u> (@ hearing): accepting DEIS for comment doesn't mean agency agrees with it <u>EA</u>: concur with Riverkeeper's conclusion that assumptions for models are flawed so underestimate impacts of plants on Hudson River fish; because analyses do not include pre-power plant conditions, no basis for saying plants have not changed conditions <u>PISCES</u>: large changes in fish species abundance over time plus small decrease in total species richness/diversity suggest that Hudson estuary far from equilibrium; density-dependence unproven, and in SB probably causes serious understatement of importance of numbers of fish killed; by assuming density-dependence and not considering other factors, models ignore disproportionate impacts of reductions in strong year classes <u>Riverkeeper</u>: model does not accurately represent impacts of entrainment so should not be basis for decisions; does not account for year-to-year variability in year class strength; models force-fit some data, with biased or unsupportable conclusions</p>
<p>4. Climate, disease, and the changing ecology of the Hudson River system are not considered in the population models</p>	<p><u>ASA</u>: 20+ years of studies and data are represented in the DEIS <u>DEC</u> (@ hearing): accepting DEIS for comment doesn't mean agency agrees with it <u>Jacobs - M</u>: cites Croton Landfill cleanup <u>NMFS</u>: SB analyses neglect other factors in assessing current abundance - need to take a wider view <u>Riverkeeper</u>: their experts conclude that the DEIS 'contains a naive ecological analysis which completely ignores the role of climate and disease in determining population'</p>
<p>5. Thermal analyses need to be updated to reflect recent, more extreme conditions</p>	<p><u>PISCES</u>: use of 1981 thermal data for far-field model may seriously underestimate thermal impacts <u>Riverkeeper</u>: thermal model based on older data so don't reflect extreme summer conditions of later years; DEIS does not address general warming in Hudson estuary</p>

TOPIC ↓	PUBLIC COMMENTS
FISH PROTECTION POINTS	
6. Fish protection points (FPP) would provide operational flexibility but even less protection than conditions in the Hudson River Settlement Agreement (HRSA)	<p><u>ASA</u>: existing technologies at all 3 plants plus proposed operating schemes would achieve future fish protection levels similar to those required in last 20 years</p> <p><u>DEC</u> (@ hearing): accepting DEIS for comment doesn't mean agency agrees with it</p> <p><u>EA</u>: HRSA levels not sufficient level of protection; FPP likely to lead to larger fish kills so is not sound approach</p> <p><u>NMFS</u>: FPP are comparable to HRSA standards, but those standards were only intended to be interim and should not now be considered as meeting objectives of the Clean Water Act (CWA); should be looking to "... build[s] on the prior successes rather than simply taking advantage of them"</p> <p><u>NRDC</u>: DEIS scheme would weaken fish protection in Hudson</p> <p><u>PISCES</u>: FPP appear designed more to benefit power plants than fish and may result in increased entrainment and impingement mortality; "banking" between years could lead to excessive population impact if critical year classes hit by disproportionate entrainment</p> <p><u>Riverkeeper</u>: their experts conclude that FPP system is really just a way to trade credits and has "serious weakness and seems designed to aid power plant profitability rather than to protect fish"; could actually result in greater harm being inflicted on fish populations, for example, trading credits among years could lead to devastating impacts on strong year classes; represents an extreme initial negotiating position</p> <p><u>Scenic</u>: concur with NRDC & Riverkeeper; continuation of Settlement Agreement conditions not acceptable objective; DEIS scheme would weaken fish protection in Hudson</p>

TOPIC ↓	PUBLIC COMMENTS
MITIGATION	
7. DEIS includes little information on acoustic deterrence and barrier systems.	<u>PISCES</u> : insufficient information on acoustic deterrents
8. DEIS significantly overstates costs and energy impacts of closed cycle cooling	<u>NRDC</u> : have changed opposition to cooling towers with changes in technology since the 1970's <u>NYRU</u> : cooling tower analyses should include more analysis of their potential environmental impacts <u>Riverkeeper</u> : cooling technology changes have eliminated prior objections to towers

TOPIC ↓	PUBLIC COMMENTS
9. DEIS alternatives and proposed action do not present a fair picture of available alternatives	<p><u>ASA</u>: once-through with protection measures best balance of all interests</p> <p><u>CHV</u>: tragedy to allow continued killing of billions of fish by antiquated cooling technologies; require plants to be brought up to modern standards</p> <p><u>COE</u>: look at boom in Tompkins Cove</p> <p><u>DEC</u> (@ hearing): accepting DEIS for comment doesn't mean agency agrees with it; draft permits and supporting documents will consider multiple alternative technologies</p> <p><u>Downs</u>: plants should get on schedule to either convert to dry cooling or close</p> <p><u>NMFS</u>: alternatives discussion weakened by presumption that "cropping" aquatic resources by power plants is acceptable; accepting these proposals would not meet CWA obligation to protect public trust resources</p> <p><u>NYRU</u>: Gunderboom ® should be included in DEIS; incorporate results of river flow pattern research into mitigation alternatives; restoration projects must be regional in scope and on same scale as impact</p> <p><u>PISCES</u>: insufficient treatment of barriers</p> <p><u>Riverkeeper</u>: their experts conclude that the DEIS "constructs an argument in favor of the lack of impact ..."; DEIS provides no basis for concluding that mitigation measures should be accepted instead of closed-cycle cooling - technology and policy have advanced to point where [continued] fish mortality at power plants is an unnecessary anachronism</p> <p><u>Scenic</u>: DEIS does not consider pre-plant conditions; permits should require closed-cycle or 32-week outages</p>

TOPIC ↓	PUBLIC COMMENTS
OTHER TOPICS	
<p>10. The DEIS needs to consider effects of New York’s recent conversion to a competitive energy market, take the State Energy Plan into account, or impose parity among facilities.</p>	<p><u>Downs</u>: if permits create easier standards for older plants, competitive market will not shift generation to newer, less-impacting plants</p> <p><u>EA</u>: conversion to market system means there will be pressures to run as much as possible so imperative that renewal permits include conditions “highly protective of Hudson River fish ...”; in deregulated market, there would be increased incentive for these plants to run in preference to newer, more protective units unless these plants are compelled to retrofit to closed-cycle or shut down</p> <p><u>Gordon/Kennedy/Lee</u>: competitive market increases urgency to impose environmental controls on older facilities</p> <p><u>NRDC</u>: should be parity of permit conditions between these “old” and newer plants on Hudson; look to Athens decision for model; need to now move rapidly to final decision</p> <p><u>NYRU</u>: outages or reduced operations can be “alternatives to reduce cooling water use”, but deregulated market may make harder to control or achieve so should factor that uncertainty into permit terms or conditions</p> <p><u>Riverkeeper</u>: need to follow Athens decision model and truly minimize impacts</p>

<p style="text-align: center;">TOPIC</p> <p style="text-align: center;">↓</p>	<p style="text-align: center;">PUBLIC COMMENTS</p>
<p>11. Radiation discharges are not discussed in the DEIS, but should be.</p>	<p><u>Baiman</u>: history of radiation discharges causes multiple concerns (cites NYS Health Department reports); should shut down all the nuclear plants</p> <p><u>EA</u>: submitted NYS Health Department radiation survey numbers</p> <p><u>Elie</u>: [DEIS] should consider radiation</p> <p><u>Gabrielle</u>: wants more information on radiation impacts especially on reservoirs; do not renew Indian Point permits</p> <p><u>Jacobs - B</u>: monitoring of leak from Indian Point 1 should be included in this permit</p> <p><u>Jacobs-M</u>: EIS needs to consider radioactive discharges, including results of monitoring reports from NYS Department of Health which show increased levels in summer; renewals should prohibit all pollutant discharges</p> <p><u>Likes</u>: concerned that any radioactive release is permissible; prefer that plants be closed; actual discharge should be monitored for radioactivity</p> <p><u>Schepart</u>: should consider reports by NYS DOH on radiation levels in Hudson - records show radiation discharges in excess of health limits; should include radiological limits in new permits</p> <p><u>Weinstein</u>: look at radioactive discharges and chemicals used in piping system</p>

TOPIC ↓	PUBLIC COMMENTS
12. Several commentors expressed generalized opposition to renewal for one or more facilities	<p><u>Carlin</u>: downwind - close Indian Point</p> <p><u>Downs</u>: ironic to be looking at continuation of these withdrawals in face of Athens decision</p> <p><u>Goodman</u>: do not permit Indian Point</p> <p><u>Jacobs - S</u>: evacuation plans appear inadequate; laws should be fully enforced</p> <p><u>Jordan</u>: don't renew Indian Point - poorly maintained facilities should be shut down</p> <p><u>Mirabito</u>: do not issue permits</p> <p><u>Moon</u>: concerns with Indian Point plant safety (radiation leaks, old equipment); shut the plant down</p> <p><u>Nelson-Epstein</u>: close Indian Point</p> <p><u>Riverkeeper</u>: 10-year SPDES permit term as proposed in DEIS would be illegal; thermal discharges, at least at Indian Point, do not meet water quality standards so should not renew permit(s)</p> <p><u>Scenic</u>: power plant entrainment & impingement not a valid use of resources; 10-year permit would be illegal</p> <p><u>Smalley</u>: move from unconscionably hazardous energy sources; shut plants down</p> <p><u>Wren</u>: oppose nuclear power so don't renew Indian Point permit</p>

List of Commentors

Oral Comments

Benas, Richard (DEC) for NYS Department of Environmental Conservation
Clempner, Jean
Downs, Roger with Susquehanna shad restoration project
Elie, Marilyn of Westchester Citizens Awareness Network
Gabrielle, Susan
Hudson Riverkeeper (Riverkeeper) by David Gordon, Esq.
Jacobs, Barbara
Jacobs, Mark of Westchester Greens and of WESTPAC (Westchester People's Action Coalition)
Jacobs, Stanley
Kennedy, Katherine for Natural Resources Defense Council (NRDC)
Lee, Cara for Scenic Hudson (Scenic)
Likes, Philip
Moon, Dan
Schepart, Margo of Westchester Citizens Awareness Network
Smallev, Jillian [phonetic sp, from transcript]
Weinstein, Lucille
Young, John (ASA) for generators/utilities

Written Comments

Baiman, Sydney
Carlin, Lynne
Citizens for the Hudson Valley (CHV) by Dimitri Sevastopoulo
Environmental Advocates (EA) by Kyle Rabin
Gabrielle, Susan
Goodman, Sidney J.
Hudson Riverkeeper (Riverkeeper) by David Gordon, Esq.
Jacobs, Mark of Westchester Greens and of WESTPAC (Westchester People's Action Coalition)
Jordan, John of Catskill Alliance for Peace
Likes, Philip
Mirabito, Stephen
National Marine Fisheries Service (NMFS), by Michael Ludwig
Natural Resources Defense Council (NRDC) by Katherine Kennedy
Nelson-Epstein, David
New York Rivers United (NYRU) by Ivan Vamos
PISCES Conservation Ltd (PISCES) by Peter Henderson, Ph.D., for Riverkeeper, Scenic Hudson, and Natural Resources Defense Council
Scenic Hudson (Scenic) by Cara Lee
Schepart, Margo
U. S. Army Corps of Engineers (COE), by Richard L. Turner
Wyler, Megan

RESPONSES TO COMMENTS

Consolidated responses follow to each of the comment themes identified in Table 3 (preceding). Each topical response is considered to reply to all of the comments identified within that theme group.

Fish Populations - 1. "Cropping" (that, is, consumption of some portion of one or more populations) by power plants is not a legitimate use of NYS's fisheries and other aquatic resources.

Some commentators have suggested that fish populations should not be "cropped" by power plants. In other words, they object to any argument that electric generating facilities be permitted to cause injury or death to any life stages of fish and other aquatic organisms, provided only that specified populations of adult fish of selected species be maintained.

The Department agrees that fish should not be "cropped" by power plants. Instead, the Department asserts, and is supported through statute, regulation, policy and practice, that it is in the public interest to minimize the loss of fish and other aquatic resources at electricity generation facilities. The Department further asserts that significant impacts to aquatic resources are not an inevitable result of electric power generation.

The mission of the Department is to provide for the best uses of the State's waters and of its fish and wildlife resources. These resources belong to the people of the State and are held in trust for the use and enjoyment of current and future generations of New Yorkers. The Department's obligations regarding fish and wildlife are described in ECL Articles 11 and 13; its obligations regarding the waters of the State are described in ECL Articles 15 and 17. (See also FEIS Regulatory Setting - Legislative Findings and Commissioner's Powers.)

The State's fish and wildlife

Fish and wildlife are the property of the State but numerous uses of fish and wildlife which result in their deaths are permitted. Recreational and commercial fishing, hunting, trapping, scientific collection, and relief from nuisance or damage are examples. In each instance, the permissible methods of take are defined explicitly in statute or regulation.

Fishing, hunting, trapping and scientific collection are highly regulated. The species, age (or its surrogate, size) and sometimes even the sex of the animal to be taken are specified. The time of year is also determined for most species of game, through "open seasons." Generally, breeding seasons are avoided and the "crop" of fish or wildlife is made available to its human consumers when populations are highest or the values in flesh or fur are at their peaks. In order to ensure that populations are

not over-exploited, populations are monitored, either directly or indirectly. At a minimum, the goal of management for such harvested species is to ensure sustainable populations.

Similar considerations apply when permitting the destruction of wildlife which pose a threat to human safety or property. Generally, the taking of such wildlife is permitted either as a last resort or where the magnitude of the take is believed to be insignificant to the species' population or its ecological function.

That fish should not be wasted as a part of energy production was made clear by former Commissioner Jorling, in 1991 letters to the generators, in which he stated: "The inadvertent mortality of fish by utilities is not a legitimate use of fishery resources. Therefore, the Department will not allocate a portion of fishing mortality to utilities and will seek elimination if possible, and otherwise minimization, of mortality caused by utilities..."¹¹²

The State's waters

The waters of New York, too, are the property of the State. Numerous uses are recognized and permitted. New York's waters are used for human consumption, recreation, agriculture, industry, commerce, navigation, and as habitat for fish and wildlife. New York State laws and regulations recognize these uses and provide a regulatory framework which ensures that water quality is maintained at levels which can support particular uses. Generally, the "cleaner" waters are classified for those activities which require the highest water quality, such as for drinking. The goal of the regulatory program is to maintain or improve water quality to enable the designated "best usage."¹¹³

The waters near the Hudson River plants have been classified as either Class A, B, C, SB, or SC. Each of these classifications has "fishing" as at least one of the designated best use(s). Each also includes the condition that, "... These waters shall be suitable for fish propagation and survival ...".

Historically, the water classification system recognized industrial cooling and process water as "best usages" for Class D water supplies. The listing of these activities as "best usages" was removed by amendments to the regulations prior to 1972. Currently, the least protective designation in NYS is Class D. In fresh surface waters, the best usage of even Class D waters is fishing and the waters must be "... suitable for fish survival ...".¹¹⁴

If a water cannot achieve the usages for which it has been designated, it is deemed to be impacted. Pursuant to § 305(b) of the CWA, the Department biennially publishes a report on the State's water quality which, among other things, describes

¹¹² Copies of letters in Appendix F-V.

¹¹³ 6 NYCRR Parts 800 - 941.

¹¹⁴ See 6 NYCRR § 701.9

such impairments.¹¹⁵ The NYS Water Quality Report for 2002 lists the Hudson River downstream from the federal dam at Troy as being impacted by cooling water use by power plants. As discussed more thoroughly below and in several other responses, the effects of the use of Hudson River water for generating plant cooling include the loss each year of a substantial percentage of annual fish propagation. Under alternative density-dependent hypotheses, maximum sustainable yield of shad could double if entrainment mortality at all generation facilities was eliminated.¹¹⁶ Thus, current levels of impingement and entrainment impair and may preclude the best usage components of propagation and survival. The thermal effects of power plants on Atlantic tomcod and rainbow smelt also appear to preclude or impair fish survival.¹¹⁷

Ecosystem values

Numerous public agencies have formally recognized the especially significant values of the Hudson's fisheries. For example, the NMFS has designated the Hudson an Essential Fish Habitat, in recognition of the role it plays in maintaining 34 commercially important fish species. The National Oceanic and Atmospheric Administration has designated four sections, Piermont Marsh, Iona Island, Tivoli Bays and Stockport Flats, as a National Estuarine Research Reserve. NYS Department of State has designated 41 sections of the Hudson as significant tidal habitat, and the USFWS has recognized a number of regionally significant habitats along the River, including Papscaene Marsh, Vosburg Swamp and the Esopus Estuary.

Impacts on the aquatic community

Hudson River fish populations have been studied both intensively and extensively. Survival and mortality investigations have been conducted over long periods of time to measure the impacts, primarily mechanical and thermal, of the power plants on particular fish populations. Although the DEIS asserts that the generating facilities have caused no harm to the aquatic community, numerous findings suggest otherwise. Henderson and Seaby (2000) summarize the differing views:

"The DEIS concludes that there is no evidence of community change that can be attributed to the power stations. While changes in the composition and abundance of this fish community have been observed,

¹¹⁵ CWA § 305(b); 33 U.S.C. § 1315.

¹¹⁶ Deriso, R., K. Hattala & A. Kahnle, 2000. Hudson River Shad Assessment and Equilibrium Calculations: Revision of the 1995 Report to include data through 1997. *In*: ESSA Technologies, Ltd. 2000. Review of the Draft Environmental Impact Statement for SPDES Permits for the Bowline Point 1 & 2, Indian Point 2 & 3, and Roseton 1 & 2 Steam Electric Generating Stations. Report to the Parties to the Application. Prepared by ESSA Technologies, Ltd., Richmond Hill, ON, for NYSDEC, Albany, N.Y. 31 pp. plus appendices.

¹¹⁷ See Atlantic Tomcod and Rainbow Smelt discussions under response 4 in this section of the FEIS.

all appear attributable to factors other than power plant operations.' (VI-36) Second, a key conclusion in the DEIS is that the Hudson ecosystem is healthy. For example, the DEIS states: 'The relatively large number of taxonomic groups collected in these surveys as post yolk-sac larvae demonstrates that the Estuary is a species rich environment and is consistent with the Hudson being [a] healthy ecosystem.' (V-159). The conclusion relies on no particular measure of ecological quality and probably represents a simplistic assumption that because there are many fish present it must still be in good health. This observation would be more convincing if it considered how many species would be expected in the estuary in a completely natural state.

...

"From these observations it is concluded that: 'the fish community in the system remains healthy and robust' ([1999 DEIS] Section VI page 36). All the observed changes are attributable to causes other than those linked to the operation of power plant[s] including, water chestnut growth, zebra mussel invasion, changes in commercial fishing, increases in salinity and improved water quality in New York harbour.

"The available facts can be interpreted differently. The following account better reflects the available data.

"Large temporal changes in fish species abundance together with a small decrease in total species richness and diversity suggest that the Hudson estuary ecosystem is far from equilibrium. There is a small long-term decline in both species richness and diversity within the fish community. These losses are not confined to rare or infrequent visitors. A number of common or once abundant fish have long-term trends of declining abundance including tomcod, Atlantic sturgeon, bluefish, weakfish, rainbow smelt, white perch and white catfish. The rate of decrease in abundance of a number of these species is in their [sic] range of 5-8% per annum. If these trends were to continue, they will quickly result in profound changes in the fish community.

"Since the improvement in water quality in New York harbour [from sewage treatment plant completion], blue crab, Atlantic silversides and striped bass have increased in abundance. In the case of striped bass this is probably related to a decrease in fishing pressure as well as increased habitat for juveniles at the mouth of the estuary. The power stations can affect the fish populations by increasing mortality, principally via entrainment, so that the populations are no longer able to fully replace themselves. For the species which breed in the Hudson estuary and have young stages vulnerable to entrainment, the estimated power station mortality rate is sufficiently high to cause a significant reduction in adult numbers.

"Because the tomcod is a short-lived fish which stays for its entire life within the Hudson estuary, is not commercially fished and suffers the highest level of entrainment mortality of any fish in the estuary, it is a key species to study for the detection of power station effects. The

population of this fish is in long-term decline and entrainment losses must be considered a probable contributory cause. This would not be the case if strong density-dependence were operating after the early juvenile stages. However, there is no compelling evidence in favor of density-dependence and good reasons to believe it is not operating. Not least of which is the rapid decline in abundance.

...

"In conclusion, it is not possible to dismiss the influence of the power plants on the fish community, particularly when it is proposed to further increase fish mortality rates. The present community is far from equilibrium and undergoing considerable change. The DEIS's simple declaration [of] it as 'healthy' is a complacent over-generalization."¹¹⁸

The aquatic resource mortality from power plants is not comparable to the "selective cropping" that occurs in a regulated fishing or hunting season. Under such regulation, only selected species are harvested, and the forage base remains intact or is improved because fewer individuals higher on the food chain are available to consume lower food chain organisms. Furthermore, fishing and hunting seasons are generally established during that part of the annual cycle which provides both maximum benefit to the users and ensures the sustainability of the population. Mortality at these Hudson River power plants is not limited to a specific, benign season; it occurs throughout the annual cycle, whenever the plants operate their "once-through" pumps. Finally, although impingement and entrainment mortality is measured, it is typically measured only for several of the 140 species of fishes found in the Hudson. Information about the impact on the full suite of aquatic organisms is limited.

Rather than "selective cropping", the impacts associated with power plants are more comparable to habitat degradation; the entire natural community is impacted. These "once-through cooling" power plants do not selectively harvest individual species. Rather, impingement and entrainment and warming of the water impact the entire community of organisms that inhabit the water column.

For example, these impacts diminish a portion of the forage base for each species that consumes plankton (drifting organisms in the water column) or nekton (mobile organisms swimming through the water column) so there is less food available for the survivors. In an intact ecosystem, these organisms serve as compact packets of nutrients and energy, with each trophic (food chain) level serving to capture a diffuse resource and make it more concentrated. Ichthyoplankton (fish eggs, larvae and very small fish which drift in the water column) and small fish feed on a base of zooplankton (drifting animal life) and phytoplankton (drifting plant life). The loss of these small organisms in the natural community may be a factor that leads to

¹¹⁸ Henderson, P. A. and R. M. Seaby, 2000. Technical Comments on the Draft Environmental Impact Statement for the State Pollutant Discharge Elimination System Permit Renewal for Bowline Point 1 & 2, Indian Point 2 & 3, and Roseton 1 & 2 Steam Generating Stations. June 2000, Pisces Conservation Ltd. (PISCES report; included in App. F-I.)

harmful algal blooms.¹¹⁹ The small fish themselves serve as forage for the young of larger species, which serve as forage for larger individuals, and so on up the food chain, more correctly understood as a "trophic pyramid".

Once-through cooling mortality "short-circuits" the trophic pyramid and compromises the health of the natural community. For example, while an individual bay anchovy might ordinarily serve as food for a juvenile striped bass or even for a common tern, entrainment and passage through a power plant's cooling system would render it useful only as food to lower trophic level organisms. It could no longer provide its other ecosystem functions of consuming phytoplankton, digesting and concentrating it into its tissues, and ranging over a wide area, distributing other nutrients as manure. This is just a single example from a very complex natural system, where the same basic impact is multiplied millions of times over more than one hundred fish species.

The direct reduction of the quantity of organisms within the water column by water intakes is known as draw-down. The draw-down of organisms can be understood from the work which HydroQual performed for one of the generators to quantify probabilities of entrainment or re-entrainment for passive particles such as plankton.¹²⁰ This study produced multiple profiles of the velocities at various depths across multiple sections of the Hudson in the vicinity of the HRSA generating stations. The measurements were done continuously through time and gave an hourly, three-dimensional profile of water particle travel through time and space in the Hudson; both high flow and low flow conditions were considered. Figures 4 and 5 demonstrate the probability of any single egg or larva or other plankton organism being entrained within seven days of momentarily occupying a single location.¹²¹

The actual draw-down is likely even greater because the three HRSA generating plants (combined with other facilities in the same river reaches) act cumulatively on the entire aquatic community; many organisms live in this reach of the River for more than seven days; and any organisms coming from upstream, such as tomcod, would also be subject to the draw-down from the Danskammer and Lovett Stations (located in the same river reach but not part of the HRSA nor the subject of this FEIS; see Fig. 2 at end of Regulatory Setting). The most important effect of drawdown is that it dramatically reduces food availability within the ecosystem and, thus, survivability of multiple species over significant stretches of the Hudson River.

¹¹⁹ Capriulo, G. M., G. Smith, R. Troy, G. H. Wikfors, J. Pellet, and C. Yarish. 2002. The planktonic food web structure of a temperate zone estuary, and its alteration due to eutrophication. *Hydrobiologia* 475/476: 263-333.

¹²⁰ HydroQual, Inc. 1999. Modeling the Entrainment of Passive Particles Into Hudson River Power Plants. For Orange and Rockland Utilities, February 1999, by HydroQual, Inc., Mahwah, NJ.

¹²¹ From HydroQual, 1999.

¹²² HydroQual, 1999.

Fig. 4. Entrainment Probability at Low Flow¹²²

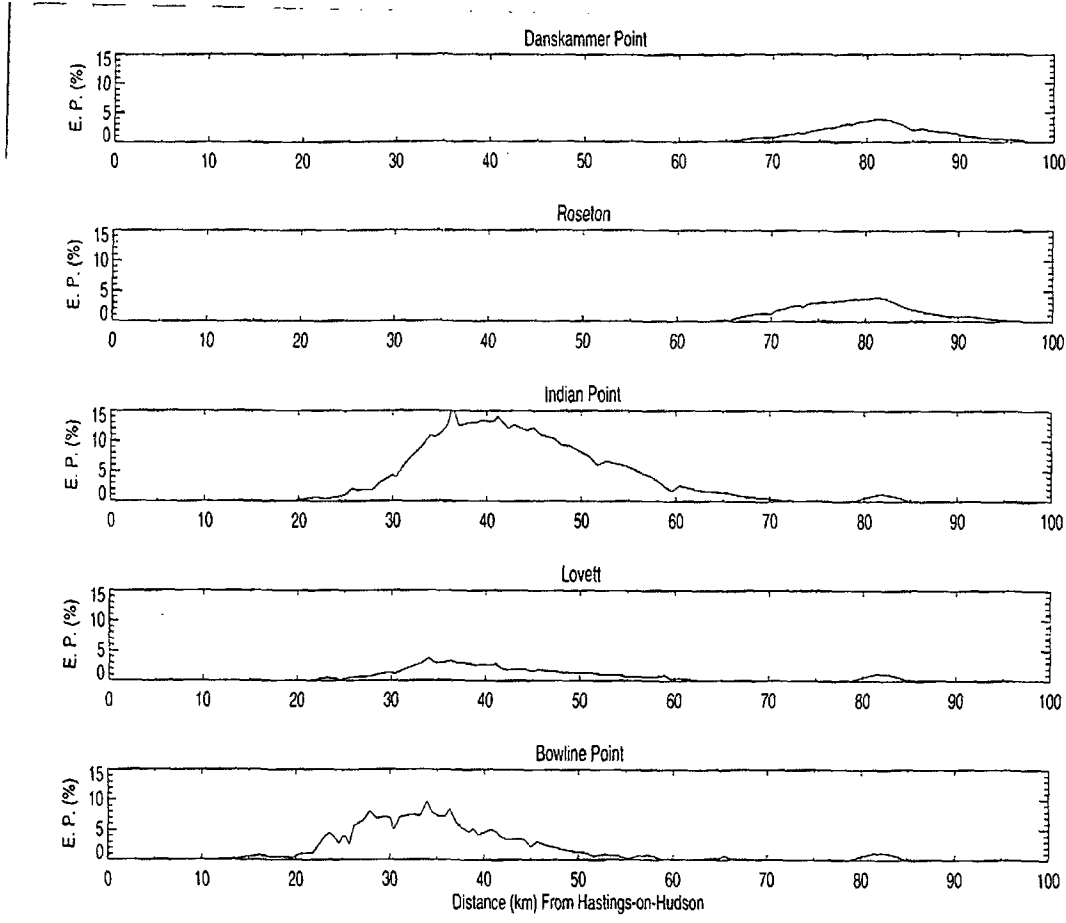


Figure 3-7. Entrainment probability (E. P.) at each of the five power plants versus particle releasing locations along the main river channel under the low-flow condition.

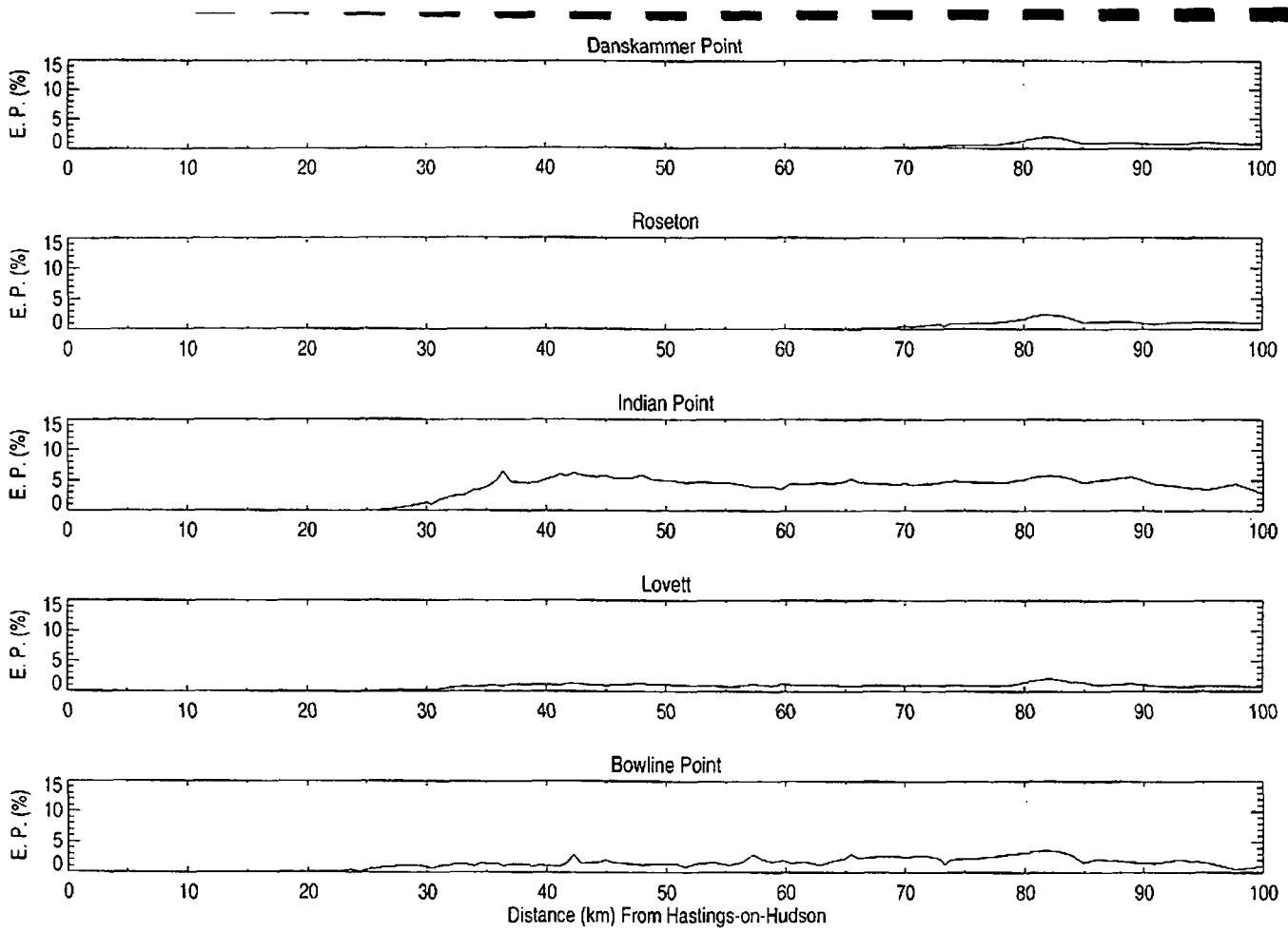


Figure 3-8. Entrainment probability (E. P.) at each of the five power plants versus particle releasing locations along the main river channel under the high-flow condition.

Fish Populations - 2. Many species in the Hudson River system are actually declining. While the striped bass (SB) population is up, that increase may be the result of other management decisions and activities. Historic baseline or trend data is not substantially discussed.

In Section VI (p. 36), the DEIS concludes that "...the fish community in this system remains healthy and robust, and consistent with that expected in a large temperate estuary like the Hudson." It further states that "While changes in the composition and abundance of this fish community have been observed, all appear attributable to factors other than power plant operation."

The Hudson River has been the subject of more than 25 years of fisheries investigations, and, as such, is one of the most intensively studied rivers in the world. These studies have revealed that, although overall species richness (the total number of species) is high, with more than 200 species recorded, diversity (which incorporates consideration of abundance and distribution amongst the species) is relatively low; most of the River's fish production is concentrated among a few of these species. Overall species richness and overall abundance of fish larvae in the river have increased since 1974. However, increases in species richness are mainly due to an increase in use of the River by marine species, and increases in abundance can be attributed to increases in but two species, striped bass and Atlantic silversides. Species richness and abundance in both young-of-year and older fish have decreased over this same period, especially among freshwater species, as described below.¹²⁴

Several species of fish in the Hudson River estuary, such as American shad, white perch, Atlantic tomcod and rainbow smelt, have shown trends of declining abundance.¹²⁵ The American shad stock in the Hudson river has been in decline since the early 1990's. White perch eggs, yolk-sac and post yolk-sac larvae abundance has remained stable since the mid 1980's; however, indices of young-of-year and older fish have shown declines since the late 1970's.¹²⁶ Atlantic tomcod juvenile abundance has shown no trend, but adult abundance over the last 10 years has been lower than in previous years and continues to show high interannual

¹²⁴ Dey, W., S. Jinks and N. Decker, 2003. Changes in the Fish Community Throughout the Hudson River Estuary. At Hudson River Environmental Society Presents: Hudson River Fishes & Their Environment. March 20-21, 2003, Marist College, Poughkeepsie, NY. No published proceedings.

¹²⁵ ASA Analysis and Communications. 2002. 1999 Year Class Report for the Hudson River Estuary Monitoring program. August 2002.

¹²⁶ Wells, A. W. 2003. Status of White Perch in the Hudson River. At Hudson River Environmental Society Presents: Hudson River Fishes & Their Environment. March 20-21, 2003, Marist College, Poughkeepsie, NY. No published proceedings.

variability.¹²⁷ Rainbow smelt have been virtually absent from the collections from the long river and fall shoals surveys since 1995.¹²⁸

Declines in the abundances of several species and changes in species composition raises concerns and questions regarding the health of the River's fish community. The Hudson River environment has undergone a number of significant changes in recent decades. In addition to changes directly attributable to power plants, these changes include: water quality, especially as a result of major improvements in sewage treatment; invasions by exotic species such as water chestnut and zebra mussels; hazardous substances contamination, especially PCBs, organochlorine pesticides and heavy metals; global climate change, which includes both increasing annual mean temperatures and higher frequencies of extreme weather events; and the management of individual species, such as striped bass, which have undergone strict regulation for both the recreational and commercial fisheries. Each is a stressor, to a greater or lesser extent, on the River's biota. For example, the zebra mussel invasion, which began in 1991, is thought to have caused very large reductions in the biomass of plankton and non-zebra mussel macroinvertebrates. Overall, it is estimated that the biomass of these forage invertebrates has dropped by approximately 50 percent, leading to large changes in the fish community.¹²⁹

The impingement, entrainment and thermal impacts caused by the HRSA facilities are well-documented elsewhere in this FEIS and in other portions of the HRSA proceedings. The millions of fish that are killed by power plants each year represent a significant mortality and are yet another stress on the River's fish community. Although the primary cause of these population changes cannot conclusively be attributed entirely to the operation of these three steam electric generating stations, the mortality that they cause must be taken into account when assessing these population declines.

¹²⁷ Young, J., M. T. Mattson, Q. E. Ross and D. J. Dunning. 2003. Population Fluctuation of Atlantic Tomcod in the Hudson River Estuary. *At Hudson River Environmental Society Presents: Hudson River Fishes & Their Environment*. March 20-21, 2003, Marist College, Poughkeepsie, NY. No published proceedings.

¹²⁸ The "long river", or Longitudinal River Ichthyoplankton Survey (LRS) encompasses the entire length of the Hudson River Estuary, from the Battery (River Mile, RM, 1) to the Federal Dam in Troy (RM 152). The LRS yields ichthyoplankton data to support calculations of standing crop, temporal and geographical indices, and growth rates for selected Hudson River species (Atlantic tomcod, American shad, striped bass, white perch and bay anchovy). LRS sampling is concentrated during the spring, summer and early fall when eggs and larvae of the selected species have been historically abundant. Fall Shoals Survey (FSS) samples are collected every other week from the Battery to the Federal Dam in Troy from mid-summer through the fall. The FSS objective is to provide data on young-of-year (YOY) fish to support calculation of standing crop and temporal and geographical indices of for selected Hudson river species (Atlantic tomcod, American shad, striped bass and white perch). *From ASA 2002.*

¹²⁹ Strayer, D. L., N. F. Caraco, J. J. Cole, M. L. Pace, S. Finlay, K. A. Hattala, and A. W. Kahnle. 2003. Ecological Changes From Two Recent Species Invasions in the Freshwater Tidal Hudson River. *At Hudson River Environmental Society Presents: Hudson River Fishes & Their Environment*. March 20-21, 2003, Marist College, Poughkeepsie, NY. No published proceedings.

Fish Populations - 3. Several commentors questioned one or more of the assumptions used in one or more of the population models; in particular, density-dependence is unproven.

The DEIS relies on fish population modeling to support the generators' conclusion that entrainment mortality is not significant for two species, tomcod and striped bass, based upon compensatory density dependence.¹³⁰ Bay anchovy do not have a population model presented in the DEIS. However, a Production Foregone model that is based upon data from the Chesapeake Bay predicts that bay anchovy populations in the Hudson River could remain stable if there were an annual influx of migrants from a general east coast population. A population dynamics model is not presented for white perch in the DEIS. Thus, estimated impacts of entrainment and impingement for this species are highly speculative. The American shad population model in the DEIS shows significant variation in abundance between 1990 and 1997; the stock apparently has not recovered from low numbers in recent years and may be over-exploited unless high density-dependence is assumed. Models were not prepared for other species.

The Department concludes that the models and analyses presented in the DEIS are somewhat useful, but that there are significant questions and concerns regarding the inputs and assumptions for each species analysis which may result in very different conclusions than those presented in the DEIS. It is noteworthy that the analyses and conclusions performed by three different sets of professional fisheries population modelers, in three different countries and with different backgrounds, all point out significant concerns within each model and that alternative results could easily be presented. These modelers represent the generators, the Department and ESSA Technologies, Ltd., and environmental organizations; this is a diverse group that is not predisposed toward a common outcome. What is clear from the data and analyses presented in the DEIS is that entrainment and impingement, primarily the former, are eliminating a significant portion of the above-listed species in their egg and larval forms, as well as many more species which spawn or spend part of their life stages in the lower Hudson River. While it is reasonable to conclude that some of these losses may be compensated for by increased survival of organisms not killed, it is not possible to determine the impact of these losses on adult populations with much confidence.

Fisheries scientists are keenly aware of dramatic natural changes in fish populations, both on an annual basis and long term. There are a great many natural reasons for these changes. The Hudson River is a dynamic system with many environmental

¹³⁰ The *Dictionary of Ichthyology*, Brian W. Coad and Don E. McAllister, Revised: 13 May 2003, provides the following definitions:
Density dependence = the dependence of a factor influencing population dynamics (such as survival rate or reproductive success) on population density. The effect is usually in the direction that contributes to the regulative capacity of a stock.
Compensatory survival = a decrease in the rate of natural mortality that some fish show when their populations fall below a certain level. This may be caused by less competition for food and living space.

For a general discussion of the concepts, see Boreman, John. 2001. Surplus Production is a Myth. 10 pp. Included in Appendix F-V.

parameters differing from apparently natural causes each year. Flow, temperature, salinity, dissolved oxygen, nutrients and others fluctuate markedly. Many of these same parameters are influenced by human activities, too. Addition or deletion of pollutants, invasion by exotic species of plants and animals, habitat management, and fishing pressure and regulations all combine with the withdrawal of billions of gallons of water each day, for cooling purposes at steam electric stations as well as for other industrial or public water supply uses, and with very large amounts of thermal inputs, to contribute to changes in the River. Attempts to identify, measure and understand specific impacts are complicated by the array of interacting and potentially confounding variables. The inherent uncertainties of data management and especially population models cast further doubt on available information and analyses.

Data in the 1999 DEIS and comments on the topic of population dynamics and modeling identify entrainment rates for fish eggs and larvae as significant impacts. They also indicate that neither the terms of the HRSA and subsequent Consent Orders nor the applicants' proposed actions would reduce this impact to levels consistent with BTA requirements. The body of analyses in the fish population models presented in the DEIS indicates that the models overestimate the role of density dependence and thereby underestimate impacts associated with entrainment and impingement. This leads the Department to conclude that this modeling effort alone will not conclusively show whether or not fish populations are significantly affected by entrainment and impingement. Therefore, the Department has determined to not rely on these models to make conclusions for this FEIS or for the SPDES permits to be issued for each of the three HRSA power plants.

Detailed reviews of population dynamics models are presented in the ESSA Technologies, Ltd. report *Review of the Draft Environmental Impact Statement*, dated October 20, 2000, and the reviews of the Atlantic Tomcod, Bay Anchovy, Striped Bass, and American Shad models appended to it.¹³¹ Additional comment on the models, as well as other topics, was provided by Dr. Peter Henderson of Pisces Conservation, Ltd. representing the Riverkeeper, Scenic Hudson and NRDC.¹³²

¹³¹ ESSA Technologies, Ltd. 2000. Review of the Draft Environmental Impact Statement for SPDES Permits for the Bowline Point 1 & 2, Indian Point 2 & 3, and Roseton 1 & 2 Steam Electric Generating Stations. Report to the Parties to the Application. Prepared by ESSA Technologies, Ltd., Richmond Hill, ON, for NYS DEC, Albany, NY. 31 pp plus Appendices; the full set of ESSA reports is included as Appendix F-V to this FEIS.

¹³² PISCES, 2000.

Atlantic Tomcod

The Atlantic Tomcod population in the Hudson River appears to be declining rapidly. This conclusion is supported in the DEIS by 1989-97 early life-stage data.¹³³ The DEIS further asserts that, "... Adult abundance in recent years is distinctly lower than it was in the 1970s ...".¹³⁴ Because this species is at the southern edge of its geographic range, observed declines could be the result of increasing river temperatures, whether from thermal discharges, global climate change, or other unidentified factors. Nevertheless, the population stability predicted by the population model in the DEIS is predicated upon a conclusion that significant density-dependent mortality occurs for this species at the life stage *after* most entrainment mortality has occurred. If the conclusion proves to be based upon limited data or errors in analysis (as suggested by ESSA Technologies, Ltd. in their initial DEIS review),¹³⁵ then the Hudson River tomcod population is *not* determined by this density-dependent mortality and the generators proposed actions could instead increase the conditional entrainment mortality rate (CEMR) of this species.¹³⁶

¹³³ 1999 DEIS, p. V-43, Figure V-65

¹³⁴ 1999 DEIS, p. VI-11

¹³⁵ Parnell, I., D. Marmorek, and R. Deriso. 2000. Review of the Assessment of Atlantic Tomcod. Companion Report to Chapter 3 in ESSA, 2000.

¹³⁶ Conditional Entrainment Mortality Rate (CEMR) is the probability of a fish dying from passage through the cooling water system of a power plant. It is expressed as a percentage and measures how many fewer Hudson River fish exist at the end of their first year of life (actually at September 1) than would exist if not for the loss to entrainment. The actual computations are based on measurements of mortality rates of all life stages of fish. These stages include eggs, larvae, juveniles and even some small adults; larger fish usually do not become entrained because they can swim well enough to escape from the intake current or are protected by mechanical devices such as racks or screens installed expressly to prevent entrainment. Because much of the raw data involves early life stages, the mortality rates of eggs and larvae are "normalized" to a rate expected of young-of-the-year fishes on September 1. This statistical process is based on existing information about expected mortality (or its inverse, survival) of each life stage from natural causes, such as predation.

This survival information varies among species. For most species, natural mortality of early life stages is very high. For example, for striped bass, about 75 percent of eggs die before they hatch to become yolk sac larvae. Similarly, mortality can be as high as 89 percent as the yolk sac larvae mature to become post-yolk sac larvae. This natural attrition continues throughout the life cycle. Typically, only two-hundredths of one percent of striped bass eggs would survive to become juveniles on September 1; this is a survival rate of .0002. The CEMR, then, accounts for such natural mortality rates when it is used to calculate mortality attributable to entrainment at power plants.

See Public Service Electric and Gas Company (PSE&G). 1999. 316(b) Demonstration for the Salem Nuclear Generating Station. Appendix L in Application for Certification of a Major Electric Generating Facility Under Article X of the New York State Public Service Law, Appendix 8b. 2000. TRC Environmental for KeySpan Energy.

Population declines could continue and ultimately result in the elimination of this species in the lower River.¹³⁷

Striped Bass

The DEIS presents arguments in support of the generators' proposed action, and the resulting mortality of this species due to entrainment and impingement, that are based upon the assumption of strong density dependence within the striped bass population in the Hudson River. ESSA Technologies, Ltd. has noted that this conclusion is based upon data and model assumptions that, if not faulty, may not be the only data and assumptions that could be employed in the model.¹³⁸ For example, fishing mortality estimates presented in the model are inconsistent with recent tagging analyses and stock assessments developed for Atlantic coast stocks.¹³⁹ An alternative analysis could be presented that indicates much lower density-dependence; such an indication would lead to a prediction of a much greater impact from entrainment and impingement.

White Perch

A population dynamics model was not prepared for this species because the Technical Workshops concluded that the data do not support development of a defensible model. However, juvenile and age-1 abundance indices suggest that white perch numbers in the Hudson River are declining.¹⁴⁰ This contrasts with the DEIS conclusion that the population appears resilient enough to sustain its population in the future under similar levels of power plant mortality. These conditional mortality rates (CMR) are stated to be approximately 21 percent over the period of analysis presented. As with other species, use and interpretation of other available information can easily result in very different conclusions regarding impacts

¹³⁷ See also Everly, A. W. and J. Boreman. 1999. Habitat use and requirements of important fish species inhabiting the Hudson River Estuary: Availability of Information. NOAA Tech. Memorandum NMFS-NE-121. US Dept. of Commerce, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA.

<http://www.nefsc.noaa.gov/nefsc/publications/tm/tm121/tm121.pdf>

Of the 140 species that occur in the Hudson River Estuary, Everly and Boreman also chose Atlantic Tomcod as one of their 11 representative species for their study. Tomcod were chosen as important and representative of the fish community of the Hudson River as euryhaline nonmigratory species. The life history synopsis on p.14 illustrates the exposure of this species to entrainment, impingement, and thermal pollution impacts from once-through cooling, by virtue of its life cycle in the Hudson River.

¹³⁸ Deriso, R., D. Marmorek, and I. Parnell. 2000. Review of the Assessment of Striped Bass. Companion Report to Chapter 5, in ESSA, 2000.

¹³⁹ Deriso et al, 2000.

¹⁴⁰ Parnell, I. and D. Marmorek. 2000. Review of the Assessment of White Perch. Companion Report to Chapter 6, in ESSA, 2000.

of entrainment and impingement. In their earlier reviews, the HRSA technical workshops and the review by ESSA Technologies, Ltd. recommended that topics and issues stemming from data limitations be considered in the DEIS analysis. This was not done.

American Shad

American shad population impact analysis in the DEIS is based upon Hudson River Shad Assessment and Equilibrium Calculations: Revision of the 1995 Report to Include Data Through 1997, by Dr. Richard Deriso, Kathryn Hattala, and Andrew Kahnle.¹⁴¹ Ms. Hattala and Mr. Kahnle are Department staff and Dr. Deriso is a consultant to ESSA Technologies, Ltd., the Department contractor that assists in review of population dynamics modeling, among other topics. This analysis was the only model which employed more than one level of density dependence to determine abundance. The DEIS concludes that the American shad population appears healthy and able to sustain itself within the constraints of the proposed action. This is the least conservative conclusion that can be drawn from the data presented. More likely is the conclusion that the stock has not shown any recent recovery from very low levels ("At the present time, shad stocks in the Hudson River are at an all-time low"¹⁴²), and both entrainment and fishing mortality rates need to be minimized.

Bay Anchovy

Bay anchovy population modeling presented in the DEIS was developed to analyze this species in the Chesapeake Bay and used data from that water body, not from the Hudson River. The model's author, Dr. Kenneth Rose, presented many analytical caveats that should be used in the application of the model; the model is very sensitive to different assumptions. The discussion of the model results presented in the DEIS, however, does not acknowledge these limitations. This model estimates production foregone, in contrast to other population dynamics models. The analysis overestimates the predatory demand of striped bass and bluefish because their populations have increased so markedly and suggests that anchovy spawner immigration serves to avoid population extinction caused by entrainment and impingement in the Hudson; this immigration would come from the Atlantic coast stock. This assumption appears to ignore entrainment and impingement impacts from the many other coastal power plants which affect the coastal anchovy population. Therefore, the conclusions concerning bay anchovy presented in the DEIS are not sufficiently supported by the model.

¹⁴¹ Appended to ESSA, 2000.

¹⁴² DEIS, p. V-101

Fish Populations - 4. Climate, disease, and the changing ecology of the Hudson River system are not considered in the population models.

Any measurement of ecological impacts attributable to power generating stations is confounded by the changing ecosystem itself. As will be discussed here and in following sections, the Hudson River ecosystem has undergone numerous profound changes in the last few decades, many of which are continuing. The population models presented in the DEIS do not account for such fundamental and dynamic ecosystem influences as climate, disease, water quality, flow and invasive species. For example, in the years since the 1999 DEIS was published, Atlantic tomcod have continued to decline, contrary to the predictions of the model presented in the DEIS.¹⁴³ Rainbow smelt numbers, too, have declined significantly during this period.

In addition, many assumptions in the model and the selective use of datasets for the various models cast doubt on the validity of many of the conclusions presented in the DEIS.¹⁴⁴ For example, different years of data are used throughout the DEIS in order to demonstrate a lack of correlation between post-yolk sac (PYS) and juvenile fish of a selected species. Although the DEIS asserts that this relationship between PYS and juveniles demonstrates density-dependent compensation, other, more plausible explanations are available.

If one is to entertain the concept of density-dependent compensation as a mechanism by which fish populations respond to changing stressors within their environment, it must be evaluated against the many changes which can impact the population, not only the indiscriminate cropping imposed by cooling water intakes. Even if density dependent compensation exists, it cannot be presumed that the ability to make up for natural and anthropogenic induced mortality is infinite. The factors above, which are only recent examples of changes affecting fish in the Hudson, illustrate how many factors can consume portions of any compensation ability fish populations may have.

Climate Change

Over the past decade a large body of data has been collected in a variety of scientific disciplines which indicates that climatic changes are occurring on a global scale.¹⁴⁵ Growing evidence suggests that temperature has increased over the past century at an accelerated rate. One indicator of this change has been increased ocean temperatures. Of the marine waters of the world, coastal areas and estuaries are most susceptible to climatic changes due to their relatively shallow depth and proximity to land. These coastal areas are also the most biologically productive as

¹⁴³ ASA, 2002.

¹⁴⁴ PISCES, 2000.

¹⁴⁵ Kennedy, V., et al. 2002. Coastal and Marine Ecosystems and Global Change. Prepared for the Pew Center on Global Climate Change, Arlington, VA.

the majority of marine fishes spawn, and many mature in near shore or inshore areas. Though estuaries only represent approximately 0.5 percent of the world's marine environment, they support about 5 percent of global fish production.¹⁴⁶

Many scientists believe that the accelerated increase in global temperatures is due primarily to anthropogenic impacts. Chief among these is the emission of "greenhouse gases" produced by burning fossil fuels. The accumulation of these emissions in the atmosphere causes air temperatures to increase; this indirectly increases temperatures of oceans, estuaries and other surface waters. Because of their proximity to land, estuaries and coastal waters are also directly influenced by other human activities which may increase temperature, such as by storm water runoff from impervious surfaces, wastewater effluent and cooling water discharges. A review of data collected over a 51-year period indicates increases in water temperature of the Hudson River Estuary in the last half of the twentieth century.¹⁴⁷

Very small changes in water temperature have been shown to affect many species of fish, particularly during early life stages.¹⁴⁸ Temperature changes may influence spawning success, early life stage development, and survival of ichthyoplankton and adults.¹⁴⁹ Most vulnerable would be cold water species, and impacts upon these species would be an early indicator of changes which could eventually affect any and all species inhabiting a water body.

Rainbow Smelt

Rainbow smelt may be disappearing from some reaches of the Hudson because of thermal discharges from electric generating stations. The rainbow smelt (*Osmerus mordax*) is a small soft-bodied species which inhabits coastal areas of North America from Labrador to as far south as Virginia. Smelt also occur naturally as landlocked populations in some lakes in New England and eastern Canada. In 1912, smelt were introduced into Crystal Lake in Michigan. From there they spread throughout the Great Lakes where they are now found in abundance.¹⁵⁰ Coastal populations support

¹⁴⁶ Kennedy, 2002.

¹⁴⁷ Ruggiero, R. Hudson River Temperature Data Collected at the City of Poughkeepsie Water Treatment Facility. Unpublished; submitted to Department March 6, 2003. Copy in Appendix F-V.

¹⁴⁸ Kennedy, 2002.

¹⁴⁹ USEPA - New England, 2002. CWA NPDES Permit Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA. July 22, 2002.

¹⁵⁰ Buckley, J. L. 1989. Species Profiles: Life Histories and Environmental Requirements of Coastal Fishes and Invertebrates (North American) Rainbow Smelt. USFWS Biological Report 82(11.106) TR EL-82-4.

recreational fisheries and modest commercial fisheries in New England.¹⁵¹ Ecologically, smelt serve as forage for species such as striped bass and bluefish.¹⁵²

Research conducted by the Massachusetts Division of Marine Resources has documented relatively stable populations of smelt in several rivers located in Massachusetts through 2000.¹⁵³ Studies conducted by Dominion Nuclear Connecticut, Inc. as a requirement of the operation of the Millstone Power Station also demonstrate a stable population of smelt in the Niantic River and adjacent areas of Long Island Sound through 2000.¹⁵⁴ In contrast, data collected by the Hudson River Estuary Monitoring Program, contained in the 1999 Year Class Report, document the apparent local disappearance of rainbow smelt.¹⁵⁵

Because the Hudson River is located in the southern portion of the rainbow smelt's east coast range, one might reasonably conclude that observed increases in ocean and coastal water temperatures, as from global climate change, have caused a range shift northward, with the smelt abandoning its southernmost range. However, smelt populations at nearly the same latitudes as the Hudson River Estuary remain stable. This fact may indicate that localized influences have caused the apparent local disappearance of this species in the Hudson River. Thermal discharges, as from power plants, may be a principal factor in the disappearance of this species from the Hudson estuary. Such a trend, if continued, could impact other species. This circumstance warrants review of thermal contributions to the Hudson River Estuary.

Atlantic Tomcod

Atlantic tomcod declines, too, may be attributable to the effects of cooling water intakes at electric generating stations in the Hudson River. Like smelt, the Atlantic tomcod (*Microgadus tomcod*) is a cold water species that has declined dramatically since 1995.¹⁵⁶ Tomcod populations in the Hudson River have been monitored since 1974 with a mark-recapture program using box traps. In 1982, trawling, primarily south of the George Washington Bridge, was added as a means of collecting fish. The population of tomcod fluctuated but remained abundant through 1995, after

¹⁵¹ Chase, B. and C. Childs, 2001. Rainbow Smelt (*Osmerus mordax*) Spawning Habitat in the Weymouthfore River. Massachusetts Division of Marine Fisheries Technical Report TR-5.

¹⁵² Buckley, 1989.

¹⁵³ Chase & Childs, 2001.

¹⁵⁴ Keser, M. 2001. Monitoring the Marine Environment of Long Island Sound at Millstone Power Station, 2000 Annual Report. Environmental Laboratory, Millstone Power Station, Dominion Nuclear, Waterford, CT.

¹⁵⁵ ASA, 2002.

¹⁵⁶ ASA, 2002, and prior (1996-99) Hudson River Year Class Reports. Normandéau Associates, Inc. (NAI). Letter reports and field data from M. Ricci to J. Kelly on the Striped bass and Atlantic tomcod Mark Recapture Program; April 26, 2002, and April 22, 2003.

which a steady decline has occurred. During the 2001-2002 and 2002-2003 sampling seasons, tomcod have become virtually absent.¹⁵⁷

The tomcod has a much shorter life span in the Hudson River than in more northern systems, living only about 2 years. Three-year and older fish represent a tiny fraction of the population (0.6 percent in 1995-96 season) and the majority of the spawning stocks are 1-year-old fish.¹⁵⁸ In contrast, stocks in other areas in New England and Canada are much longer-lived and spawning stocks are dominated by 2-year-and-older fish.

Numerous studies have been conducted investigating anthropogenic impacts upon tomcod inhabiting the Hudson River Estuary and have revealed a very high incidence of liver cancer.¹⁵⁹ Recent research indicates a synergistic effect from elevated levels of polycyclic aromatic hydrocarbons (PAHs), which appear to damage hepatic DNA, leaving the fish more susceptible to PCB-induced early life-stage toxicities.¹⁶⁰

In addition to chemical contaminants, other impacts upon the Atlantic tomcod population which have been investigated include: reductions in food sources; predation; and mortality due to cooling water intakes estimated at approximately 22 percent of each year class (1974-1997). The Hudson River is the southern extreme of the range for tomcod. While stocks in Massachusetts waters appear to be stable, preliminary observations suggest that the abundance of tomcod in Connecticut has declined.¹⁶¹ As discussed above, these declines in populations at the southernmost portion of the species range could indicate temperature-induced impacts from climatic changes acting to shrink the species range. In the Hudson River this effect could be exacerbated by the addition of thermal discharges from power plants.

Atlantic tomcod spawning begins in mid-February and extends into mid-March in the Hudson River. The area of peak spawning is in the Highlands section of the river

¹⁵⁷ NAI, 2002-03.

¹⁵⁸ Lawler, Matusky and Skelly Engineers (LMS), 1999. Abundance and Stock Characteristics of Atlantic Tomcod Spawning Population in the Hudson River, Winter 1995-1996. Prepared for NYPA, White Plains, NY.

¹⁵⁹ Schreibman, M. and J. Young. 2002. Physiology Investigations of the Atlantic Tomcod. Aquatic Research and Environmental Assessment Center and ASA Analysis & Communications, Inc.

¹⁶⁰ Wirgin, I. 2003. Contaminants: Use of Atlantic Tomcod as a Model to Evaluate the Possible Toxic Effects of Pollutants on Hudson River Populations. At Hudson River Environmental Society Presents: Hudson River Fishes & Their Environment. March 20-21, 2003, Marist College, Poughkeepsie, NY. No published proceedings.

¹⁶¹ Simpson, D. 2003. Personal communication from Connecticut Department of Environmental Protection to this Department regarding Connecticut information on Atlantic tomcod abundance in tributaries to Long Island Sound. Included in Appendix F- V.

near Con Hook approximately 5 river miles upriver from Indian Point.¹⁶² When eggs and yolk sac larvae drift down river, in addition to being exposed to entrainment, they are also exposed to a thermal plume from Indian Point Units 2 and 3 which extends the entire width of the river on flood tide and across more than two thirds of the width on ebb.¹⁶³ In years of high freshwater floods, larvae are transported down river by current into the Haverstraw region or the Tappan Zee region while maturing. Post yolk sack tomcod then concentrate near the leading edge of the salt front (approximately 1 ppt salinity) and move with the tidal flow.¹⁶⁴ In dry years with low freshwater input, this front can be located in the Indian Point region. This results in tomcod larvae congregating in the leading edge of the salt front, being repeatedly moved past the Indian Point station discharge and intakes, potentially increasing the thermal and entrainment effects of the plant on this species.¹⁶⁵ Less than average rainfall from 1995 into 2002 reduced the freshwater flow in the Hudson River. This period corresponds to the period of rapid decline in numbers of Atlantic tomcod in the Hudson River.

Many factors are impacting tomcod populations: climatic trends leading to increased water temperatures; decreases in available food resources caused by improvements in waste water treatment and the invasion of zebra mussels; increased predation from increased striped bass populations; and the physiological effects of chemical pollutants.¹⁶⁶ These multiple stressors can exacerbate the effects of heat discharged from generating stations, particularly during low freshwater flow periods. Not only could increases in river temperatures decrease the survival of larval tomcod, but higher temperatures could also depress the growth rate of this species. Since the fecundity of females is proportional to size, higher water temperatures could result in fewer young produced. Should these factors, in combination with the mortality induced by entrainment, significantly depress tomcod populations in the Hudson River, further ecological repercussions could be expected to follow on populations including striped bass, for which tomcod are a significant food source.¹⁶⁷ Neither the tomcod nor the striped bass population model proposed in the DEIS, however, has any means to integrate these variables.

Comb Jellies

Members of the phylum Ctenophora are commonly known as comb jellies and are found in the Hudson River. In most years they become abundant in the lower reaches of the River and New York Harbor from June to September when increases

¹⁶² Dew, B. C. 1991 Early Life History and Population Dynamics of Atlantic Tomcod (*Microgadus tomcod*) in the Hudson River Estuary, New York. Doctoral thesis submitted to the City University of New York, NYC, NY.

¹⁶³ DEIS, Appendix VI

¹⁶⁴ Dew, 1991.

¹⁶⁵ Dew, 1991.

¹⁶⁶ Wirgin, 2003.

¹⁶⁷ Dew, 1991.

in salinity and temperature typically occur. Comb jellies are a voracious predator feeding on invertebrates and larval fishes. In areas of high comb jelly density, ichthyoplankton samples collected contain few larval fish.

An analysis of data collected to assess the impacts of the Brayton Point station located on Mount Hope Bay in Massachusetts determined that water temperature increases resulted in an increase in the population of comb jellies, as well as the extent of their range and the length of time they were present. The warming was directly attributable to the cooling water discharge of the plant.¹⁶⁸

Observations of the comb jelly population in the Hudson River over the past 10 years indicate that a similar trend is occurring. While the warming climate may be influencing the abundance and distribution of comb jellies, thermal discharges, particularly in spawning and nursery areas of the Hudson River, should not be discounted.

Zebra Mussels

Zebra mussels (*Dreissena polymorpha*), an invasive species of bivalve first observed in the Hudson River in 1992, appear to have caused very significant reductions in primary production (plant life, including phytoplankton) in the freshwater portion upriver of River Mile 63. Between 1987 and 1991, before the invasion of zebra mussels, summertime concentrations of chlorophyll averaged 30 mg/m³. During 1993 and 1994, concentrations dropped to 5 mg/m³.¹⁶⁹ This ecological change is not presented in the DEIS or reflected in the models offered in the DEIS.

Densities of both phytoplankton and small zooplankton (rotifers, tintinnids, and copepods) dropped to 10 to 20 percent of their previous levels after zebra mussels invaded the Hudson.¹⁷⁰ This reduction directly affects planktivorous fishes and early-life-stages of fishes which feed upon small zooplankton. The copepod population did not change with the arrival of zebra mussels, however, *Bosmina* (a genus of water flea) declined by 50 percent.¹⁷¹ The continued presence of copepods, a preferred prey of young fish, may have insulated higher trophic levels in the Hudson from the negative effects of the zebra mussel population.¹⁷² However, in contrast to Dr. Strayer's assumption, the 1999 Hudson River Year Class Report provides clear evidence of several anadromous and resident species of fish in decline during the

¹⁶⁸ USEPA, 2002.

¹⁶⁹ Caraco, N. F., et al. 1997. Zebra Mussel Invasion in a Large, Turbid River: Phytoplankton Response to Increase Grazing. *Ecology* 78(2), 1997, pp. 588-602. Ecological Society of America.

¹⁷⁰ Caraco et al., 1997.

¹⁷¹ Strayer, D. L., et al. 1999. Transformation of Freshwater Ecosystems by Bivalves, A Case Study of Zebra Mussels in the Hudson River. *BioScience*, volume 49(1), pp. 19 - 27.

¹⁷² Strayer et. al., 1999.

post-zebra mussel invasion period.¹⁷³ One group of organisms which has increased significantly since the appearance of zebra mussels is bacteria, but no information on any pathogenic effects upon fishes in the Hudson has been found.¹⁷⁴

¹⁷³ ASA, 2002.

¹⁷⁴ Strayer et. al., 1999.

Fish Population - 5. Thermal analyses need to be updated to reflect recent, more extreme conditions.

The Department concurs with this comment. Thermal discharges were inadequately addressed in the DEIS. The DEIS asserts, with no supporting evidence, that "... [t]he surface water orientation of the plume allows a zone of passage in the lower portions of the water column, the preferred habitat of the indigenous species." Other data and analyses cast doubt on this assertion.

The sheer volumes of water necessary to meet the HRSA plants' cooling requirements are enormous. Together, Indian Point, Roseton, and Bowline are authorized to withdraw 1.69 trillion gallons per year for cooling water, and they discharge 220 trillion BTU of waste heat per year.¹⁷⁵ The volume of once-through cooling water is raised between 15° and 18° F, depending on the plant,¹⁷⁶ or an average of 16.2°F.¹⁷⁷

Some graphics and imagery effectively illustrate the basis for the Department's concerns. A study by HydroQual, Inc., examined passive particle movement and also investigated thermal and salinity profiles in several river reaches, including the portion of the Hudson River where the HRSA plants are located.¹⁷⁸ Figures 6 and 7 of this FEIS (following pages), excerpted from that study, show two vertical temperature profiles of the Hudson River from NYC to just above the northernmost of the HRSA plants, one during a spring and the other during a neap tide. Based on these representations, it appears that there may be times and conditions where effluent-warmed waters occupy nearly the entire vertical water column.

The surface extent of thermal discharges from the HRSA plants is also a concern. Figure 8 is an aerial thermal image of the plume from Indian Point, Unit 3 only, on the east side of the Hudson plus the smaller plume from Lovett on the west bank.¹⁷⁹ In this image, the two plumes came very close to meeting on the surface, even with Indian Point running at less than its full capacity.

Because the HRSA facilities and two other steam electric generating stations are essentially clustered in two relatively compact stretches of the Hudson River, there

¹⁷⁵ Power Plants with SIC code 4911, in Appendix F-V. Indian Point, Roseton, and Bowline are the first-, sixth, and seventh-largest users of water in the State, with a combined intake flow of 7,177 CFS (cubic feet per second).

¹⁷⁶ DEIS Chapter IV-B, Tables IV-6, IV-9, and IV-11. NOTE: ΔT (change in temperature) should read °F not °C.

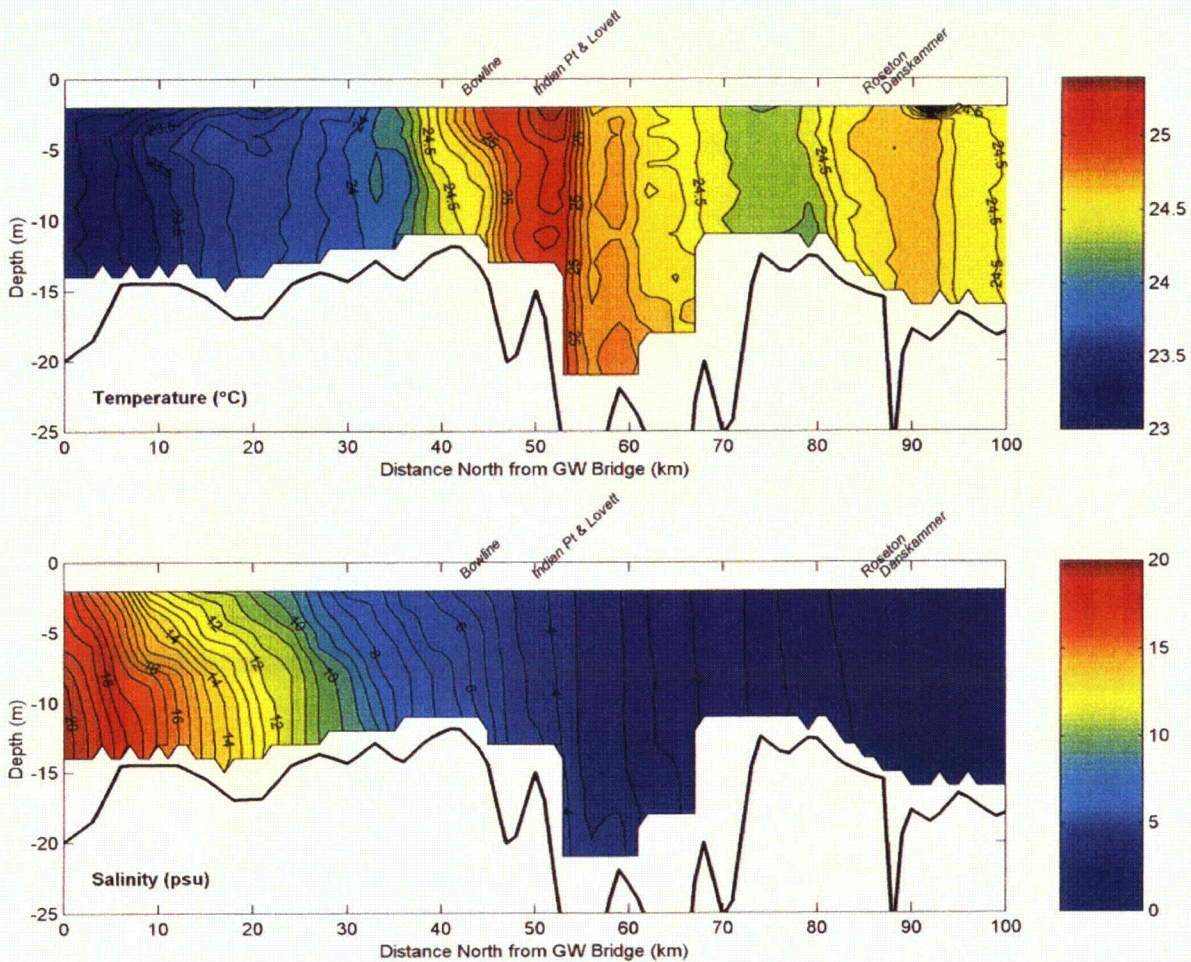
¹⁷⁷ $\sum (\text{volume each plant} * \Delta T \text{ each plant}) / (\sum \text{volume of the 3 plants}) = \text{mean } \Delta T$

¹⁷⁸ HydroQual, 1999.

¹⁷⁹ Note that Unit 2 discharge canal is cold, so the plume shown resulted from generation and discharge at Unit 3, only, at Indian Point, plus Lovett.

is a strong potential for thermal effects on the river and its aquatic resources to be additive. Given the extent of warming shown in the HydroQual graphs, combined with the recent dramatic declines in tomcod and rainbow smelt as discussed previously, the Department believes it prudent to seek additional thermal discharge data for each facility, including a mixing zone analysis, and anticipates requiring tri-axial thermal studies as conditions to each of the SPDES renewals. Depending on the results of those analyses, additional controls may be required to minimize thermal discharges.

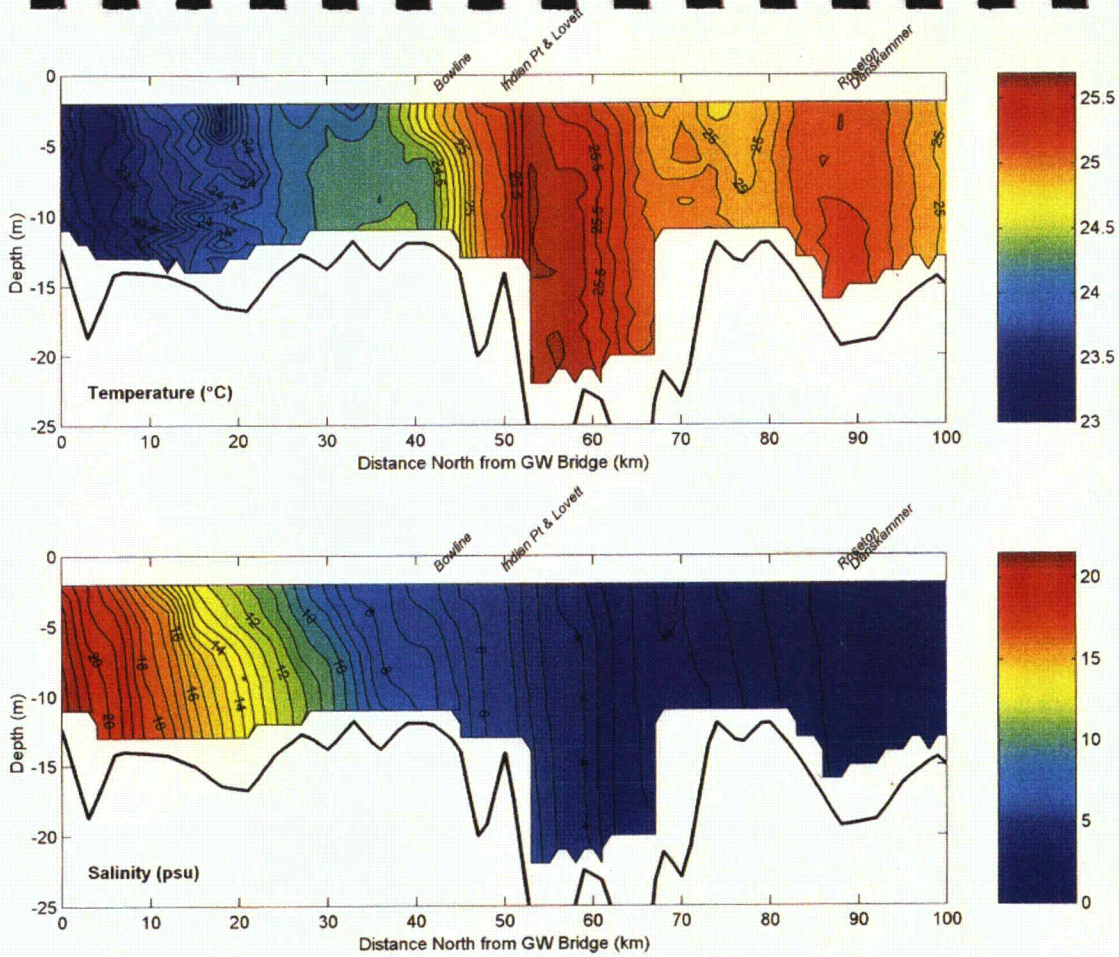
Fig. 6. Temperature Profile of the Hudson River, NYC to Newburgh, During a Spring Tide¹⁸⁰



Entrainment of Passive Particles into Hudson River Power Plants

Figure 12. (continued) Contours of the along-river temperature (upper panel) and salinity (lower panel) from the neap tide farfield survey, August 28, 1997. (Contour intervals 0.1 °C and 0.5 psu).

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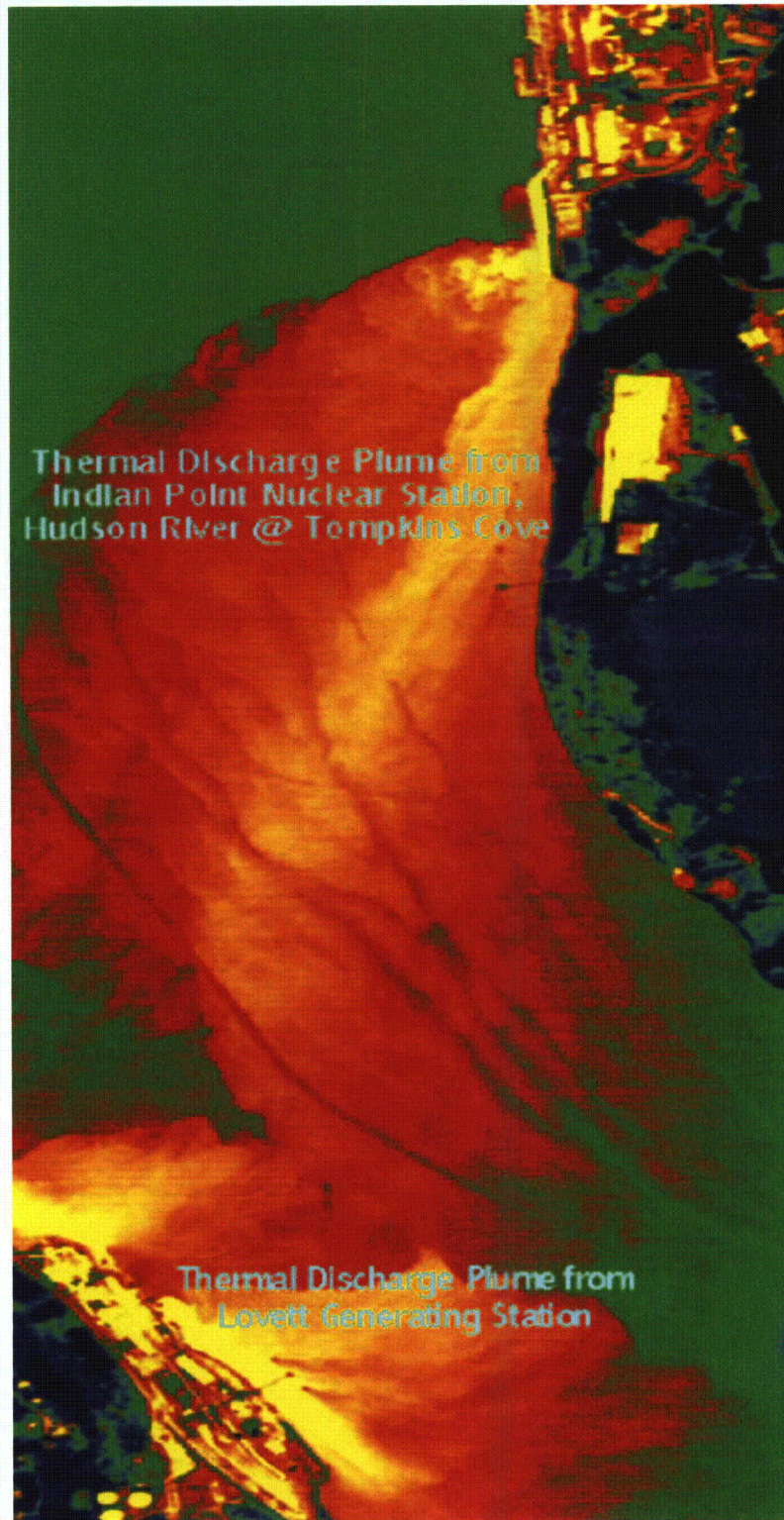


Entrainment of Passive Particles into Hudson River Power Plants

Fig. 7 Temperature Profile of the Hudson River, NYC to Newburgh, During a Neap Tide¹⁸¹

Figure 12. Contours of the along-river temperature (upper panel) and salinity (lower panel) from the spring tide farfield survey, August 21, 1997. (Contour intervals 0.1°C and 0.5 psu).

**Fig.8. Thermal Plumes from Indian Point, Unit 3,
and Lovett Station, Tompkins Cove, Hudson River, New York State.**



(Original
Vista Corp, with permission)

photo ©Spectra

Fish Protection Points - 6. Fish protection points (FPP) would provide operational flexibility but even less protection than conditions in the Hudson River Settlement Agreement (HRSA).

The Fish Protection Point system proposed by the generators in the 1999 DEIS would allow a great deal of operational flexibility for the three HRSA plants. While some consideration of the need for generation capacity is warranted, particularly during periods of high electricity demand, the proposed system would sacrifice reductions in fish mortality in order to maximize freedom of plant operations. As proposed, the DEIS' preferred alternative would be less protective of aquatic resources than measures under the HRSA and subsequent Consent Orders.

Tables 4-A, B and C (following) compare several alternative operating scenarios and entrainment or impingement mitigation strategies for the HRSA plants. The tables display predictions of conditional mortality rates for 6 fish species, the volume of water used, and the volume of water lost to evaporation under a variety of mitigation strategies at each of the 3 plants. The tables use italicized text to indicate those values which would result from the implementation of the strategies agreed upon in the 1981 Settlement Agreement; they serve as the basis for comparison. Values which would reduce environmental impacts, by providing a higher level of fish protection or by using less water, are indicated by bold text. Values which cause greater environmental harm, by providing lower levels of fish protection or using more water, are indicated by both bold text and gray shading. It is instructive to note that, with respect to fish protection, only the proposed Fish Protection Points strategy would result in lower levels of protection than would be provided by the 1981 Settlement Agreement strategies. At Bowline Point, a single species would suffer greater losses, but at both Roseton and Indian Point, protection would be reduced for 3 of the 6 species.

Table 4. Comparisons of Selected Mitigation Alternative Strategies

Key:

- x.xx Same as 1981 Settlement Agreement
- y.yy Better than 1981 Settlement Agreement
- z.zz** Worse than 1981 Settlement Agreement
- CEMR Conditional Entrainment Mortality Rate¹⁸²
- MGD Million Gallons per Day

A. BOWLINE POINT								
	Striped Bass	American Shad	River Herring	Bay Anchovy	Atlantic Tomcod	White Perch	Water Volume	Water Evaporated
Alternative	CEMR	CEMR	CEMR	CEMR	CEMR	CEMR	MGD	MGD
1981 Settlement conditions	0.80	0.05	0.19	3.93	6.39	1.01	910.00	5.18
Hybrid Towers (full year)	0.10	0.00	0.00	0.14	0.53	0.02	43.20	12.96
Hybrid Towers (seasonal)	0.10	0.00	0.00	0.14	0.53	0.02	369.30	10.04
Fish Protection Points	0.77	0.02	0.12	3.93	7.13	0.27	910.00	5.18
Gunderboom (full year)	0.18	0.01	0.04	0.86	1.39	0.22	910.00	5.18
Gunderboom (seasonal)+ net	0.10	0.00	0.17	0.14	0.53	0.12	910.00	5.19
32-week Outage	0.00	0.00	0.00	0.00	0.00	0.00	349.80	1.99

Notes:

- GG. Values for the CEMR for 1981 Settlement Conditions, Hybrid Towers and the Fish Protection Points are from the 1999 DEIS.
- HH. Values for seasonal use of the Hybrid Towers (seasonal) are based on their use February 15 to September 15 (approximate dates) and were computed by Department staff.
- II. Values for Gunderboom assumed an 80 percent efficiency, with full flow to the facility and were computed by Department staff.
- JJ. Values for the 32-week outage are based on an outage from February 15 to September 15 (approximate dates) and were computed by Department staff.

¹⁸² See Footnote 134 of this FEIS.

Table 4 (cont). Comparisons of Selected Mitigation Alternative Strategies

Key:

- x.xx Same as 1981 Settlement Agreement
- y.yy Better than 1981 Settlement Agreement
- z.zz Worse than 1981 Settlement Agreement
- CEMR** Conditional Entrainment Mortality Rate¹⁷⁵
- MGD** Million Gallons per Day

B. ROSETON								
	Striped Bass	American Shad	River Herring	Bay Anchovy	Atlantic Tomcod	White Perch	Water Volume	Water Evaporated
Alternative	CEMR	CEMR	CEMR	CEMR	CEMR	CEMR	MGD	MGD
1981 Settlement conditions	2.40	0.78	3.28	0.51	1.67	4.92	923.00	5.18
Hybrid Towers (full year)	0.37	0.02	0.13	0.03	0.12	0.39	25.90	12.96
Hybrid Towers (seasonal)	0.37	0.02	0.13	0.03	0.12	0.39	370.00	10.04
Fish Protection Points	3.32	0.45	3.21	1.01	1.59	6.39	923.00	5.18
Gunderboom (full year)	0.50	0.16	0.68	0.11	0.35	1.03	923.00	5.18
32-week Outage	0.00	0.00	0.00	0.00	0.00	0.00	355.00	1.99

Notes:

- AA. Values for the CEMR for 1981 Settlement Conditions, Hybrid Towers and the Fish Protection Points are from the 1999 DEIS.
- BB. Values for seasonal use of the Hybrid Towers (seasonal) are based on their use February 15 to September 15 (approximate dates) and were computed by Department staff.
- CC. Values for Gunderboom assumed an 80 percent efficiency, with full flow to the facility and were computed by Department staff.
- DD. Values for the 32-week outage are based on an outage from February 15 to September 15 (approximate dates) and were computed by Department staff.

Table 4(cont). Comparisons of Selected Mitigation Alternative Strategies

Key:

- x.xx Same as 1981 Settlement Agreement
- y.yy Better than 1981 Settlement Agreement
- z.zz** Worse than 1981 Settlement Agreement
- CEMR Conditional Entrainment Mortality Rate¹⁷⁵
- MGD Million Gallons per Day

C. INDIAN POINT								
	Striped Bass	American Shad	River Herring	Bay Anchovy	Atlantic Tomcod	White Perch	Water Volume	Water Evaporated
Alternative	CEMR	CEMR	CEMR	CEMR	CEMR	CEMR	MGD	MGD
1981 Settlement conditions	7.82	0.64	1.20	10.38	12.04	4.94	2505.0	12.82
Hybrid Towers (full year)	1.20	0.01	0.04	0.45	1.16	0.26	69.00	34.56
Hybrid Towers (seasonal)	1.20	0.01	0.04	0.45	1.16	0.26	982.00	26.40
Fish Protection Points	10.69	0.18	0.81	13.22	13.95	4.35	2419.00	12.82
32-week Outage	0.00	0.00	0.00	0.00	0.00	0.00	964.00	4.94

Notes:

- AA. Values for the CEMR for 1981 Settlement Conditions, Hybrid Towers and the Fish Protection Points are from the 1999 DEIS.
- BB. Values for seasonal use of the Hybrid Towers (seasonal) are based on their use February 15 to September 15 (approximate dates) and were computed by Department staff.
- CC. Values for Gunderboom assumed an 80 percent efficiency, with full flow to the facility and were computed by Department staff.
- DD. Values for the 32-week outage are based on an outage from February 15 to September 15 (approximate dates) and were computed by Department staff.

The proposed system would allow the trading of fish protection credits among the HRSA plants and their operators. Such trading would alter fish protection significantly in years in which one plant was off-line because credit for the inactive facility could be applied to one or both of the other two. The nature of the aquatic resource impacts would change because the different plant locations support different species and different life stages of fish. For this reason, trading among facilities and different operators could lead to unpredictable and probably less effective mitigation. As of the writing of this FEIS in mid-2003, Roseton and Bowline operate as peaking load facilities, as opposed to base load operation which was the case when the DEIS was published in 1999. If trading of credits among facilities and operators were to be incorporated into the permits of the HRSA facilities, credits from Bowline and Roseton could allow Indian Point to operate with little or no mitigation. This scenario would be contrary to the site-specific nature of BTA determinations required by 6 NYCRR Part 704 and CWA §316(b). Carrying credits accumulated in one year forward to subsequent years would *not* be a change from HRSA requirements. However, as proposed in the DEIS, credits could be carried forward and transferred to another facility. As discussed above, trading credits between the three facilities would add a new dimension of uncertainty to fish protection. Allowing credits accumulated at one facility in one year to be credited to another facility in a subsequent calendar year would be likely to compound this uncertainty.

Fish protection credit would also be added for the difference between SPDES flows (maximum pumping rate) and efficient flows at Indian Point, in contrast to the HRSA where credits were earned by operating Indian Point at mitigative flows (less than efficient). This change would lower the baseline from which credit for mitigation is measured. While not necessarily a reduction in fish protection from HRSA levels in and of itself, it would be coupled with a proposed level of protection less than HRSA levels. The lower starting point would mask some of the resultant reduction in fish protection.

The proposed measures specific to Indian Point would provide a significant reduction of fish protection by eliminating any requirement for outages (days off line). The preferred alternative proposes to achieve fish protection at that site solely through flow reductions without any outages. This would eliminate the previous HRSA requirement for 42 unit-days off line each calendar year.

The cumulative effect of the three changes described above would produce a scenario much less protective than current conditions. In addition, no new measures to reduce fish mortality at Roseton and Bowline are proposed. These relaxations in mitigation appear inconsistent with "anti-backsliding" prohibitions of the Clean Water Act.¹⁸³

The following excerpt from the review of the 1999 DEIS written by ESSA Technologies Inc., for the Department, summarizes differences between the generators' preferred alternative and HRSA conditions.

¹⁸³ CWA §303(d)(4)(B); 33 U.S.C. §1313(d)(4)(B); *see also* 40 CFR 131.12, 40 CFR 122.62, and 40 CFR 122.44.

"The proposed action put forward in the DEIS is a derivative of the Settlement Agreement scheme with some very critical differences. The proposed action:

1. translates the prior entrainment mitigation outage targets based on units of days to targets based on the aggregate Conditional Mortality Rate (CMR) due to entrainment for five target species: striped bass, American shad, bay anchovy, river herring and tomcod;
2. proposes that unlike the prior Credit Points, the new Fish Protection Points (FPPs) may be carried forward across years as well as traded between stations;
3. consistent with stipulated maximum flow requirements in the 1981 and 1987 SPDES permits for Indian Point, the proposal calculates and adds to the protection target the number of FPPs equivalent to the difference between "SPDES flows" and efficient flows for Indian Point Units 2 & 3;
4. proposes to continue the operation of current Modified Ristroph screen technology at the Indian Point Station for reduction of impingement mortality;
5. proposes to continue deployment of the barrier net at the Bowline Station for reduction of impingement mortality;
6. proposes to continue the management and mitigation regime for "thermal and chemical" discharge as carried out under the prior 1981 and 1987 permits, and
7. proposes to meet the requirements for entrainment mitigation exclusively through the management of station flows without necessarily invoking requirements for unit outages as previously required."¹⁸⁴

¹⁸⁴ ESSA, 2000; Section 2.2.

Mitigation - 7. DEIS includes little information on barrier systems and acoustic deterrents.

The Department concurs that additional information and updates to the data used in the DEIS are necessary. Additional information on several technologies follows.

Wedge-Wire Screens

Recent designs in water withdrawal technology have included development of wedge-wire screens to "filter" water prior to entrance into a system. Wedge-wire screens usually are designed with small openings, for example 2 mm slot width, but they can be designed with larger or smaller openings. Screening of water being withdrawn from a source water body is standard practice to eliminate fouling and clogging of pumps and cooling systems by detritus or large fishes, thus older power generation facilities typically employed traveling screens with approximately 3/8 inch mesh openings. This design excludes sticks, macrophytes (large aquatic plants) and large fishes from being entrained with the cooling water but does not exclude smaller organisms or particles. Bowline Point, Roseton and Indian Point facilities incorporate various types of large-mesh traveling screens, often with improved collection mechanisms and fish/detritus return mechanisms, in their intake designs.

The advantage of fine mesh wedge-wire screens is that the small openings prevent small aquatic organisms from being entrained into the circulating water system. Two millimeter slot width has been employed in new facility designs and it is expected that this opening will prevent ichthyoplankton larger than 15 mm from being entrained. In general, fishes greater than 15 mm length are greater than 2 mm in width, and are thus not susceptible to entrainment. The velocity of the water drawn into a system is directly associated with the size of the slot through which it is drawn. The Department imposes a low through-slot velocity to ensure that organisms are not impinged on the screen because they cannot swim away from the intake velocity. EPA recommends a through-slot velocity of 0.5 fps or less, but the Department has issued recent permits for intakes that generally have halve that velocity.¹⁸⁵ Additional protection is afforded by the current from tides or river flow on a wedge-wire screen because it assists in moving organisms away from the influence of the intake.

New power generation facilities recently approved in New York are all combined-cycle designs with closed-cycle cooling.¹⁸⁶ Combined-cycle facility produces two thirds of its power with a gas turbine (which does not require cooling), only one third of the facility requires cooling. This cooling requirement is further reduced by approximately 95 percent by employing closed-cycle cooling. Thus, typical cooling water requirements are 7 to 9 million gallons of water per day (MGD). This volume can be accommodated with two T-shaped sets of cylindrical screens six feet in diameter with 1 mm slot openings, with through-slot velocity of 0.2 feet per second.

¹⁸⁵ Athens Interim Decision.

¹⁸⁶ Athens Interim Decision.

In contrast, a single-cycle power generating facility using once-through cooling, such as Roseton Generating Station, requires a maximum of 926 MGD for cooling at full flow operation (less at efficient flow). For such a once-through cooling system, even with larger screens at higher intake velocities, a great number of wedge-wire screens would be required to supply the necessary cooling water; engineering challenges, higher costs and loss of generating capacity would likely result.

Fish Barriers

Since the preparation and filing of the DEIS in 1999, a new technology for eliminating aquatic organisms from a cooling water intake structure has emerged and been permitted by the Department. The technology is known generally as an "aquatic filter barrier" (AFB); the Gunderboom® Marine Life Exclusion System™ (MLES™) is the system which has been deployed, studied and permitted in NYS. Despite its name, use of the MLES™ is not restricted to marine systems.

The MLES™ is a semi-permeable fabric barrier which surrounds an intake structure and allows water to enter while excluding most very small particles, including aquatic organisms. Additional components of the MLES™ include: the structures necessary to maintain the barrier in place, such as anchors and floatation; a cleaning device; monitoring equipment; and other miscellaneous equipment as necessitated by the specific site conditions. Because the system is flexible, it may be shaped to follow desired water depth or to increase surface area. The barrier may be constructed in sections, allowing easier maintenance, installation and retrieval. At present, only one company, Gunderboom, has a patent to construct this type of barrier. Thus, an MLES™ is commonly referred to by the "Gunderboom®" trade name.

Gunderboom® MLES™, alone and in combination with other technologies, have been determined to be BTA at a number of facilities on the Hudson River, and requirements for installation have been written into the SPDES permits. Those with MLES™ requirements include the new electric generation facilities at Bowline Unit 3 (700 MW combined cycle) and Bethlehem Energy Center (750MW combined cycle). The Empire State Newsprint Project, a 500 MW combined-cycle facility in Rensselaer, New York, was issued a draft permit for an MLES™ in 2001. Lovett Generating Station Units 3-5, an existing facility with a 450 MW generating capacity, was issued a SPDES permit which included an MLES™ in February, 2003.

The Bowline Unit 3 MLES™ may generally be described as a straight line fabric screen, 137 feet in length and 27 feet deep, that allows 7.5 MGD of intake flow (maximum). ® Flow-through velocity is predicted to be approximately 0.004 fps with a flow rate of approximately 1.4 gallons per minute per square foot. An air-flow backwash system, strain gauges, water level monitors, and special bottom sealing fabric are required as part of the system. Seasonal deployment of the MLES™, from February 15 through September 30, will allow protection during the reproductive seasons of major Hudson River fish species.

The Bethlehem Energy Center facility will employ a different MLES™ design, yet still use Gunderboom fabric material as the principal screening device. A 16' by 145' rectangular H-pile and sheet pile structure will be constructed to support twelve

removable filter panels orientated to the river flow. The structure is sized for a maximum of 8.5 MGD flow with a fabric flow-through rate of 3.1 gallons per minute per square foot. (0.007 fps). Seasonal deployment of the MLES™ from April through August will be necessary for adequate protection to organisms. These filter panels will be removed mechanically for maintenance and at the end of each seasonal deployment; monitoring by the plant operator to ensure water passage, of strain on the panels, and related variables will be required.

The SPDES permit issued for the existing Lovett Generating Station requires the permittee to provide information, analyses and plans necessary to install, operate and maintain an MLES™. It is anticipated that this structure will be a Gunderboom curtain in the river that surrounds the intakes of Units 3,4 & 5. This means the curtain will be subject to tidal influence and will have some movement with river currents and wind. Close attention to operational parameters and maintenance will be required. The permit includes a protocol for operation, maintenance, monitoring, and responses.

The draft permit for the proposed Empire State Newsprint Project (ESNP) specifies an MLES™ that is somewhat different from those already permitted. The intake will be constructed a distance into the river along the bottom. The proposed Gunderboom® barrier of the MLES™ will necessarily be offshore, too, surrounding the wedge-wire intake screens in an oval shape 90' by 60' and be attached to 16 fender piles permanently installed in the river. This system is designed for a maximum of 9.7 MGD, with a through-screen flow of 0.01 feet per second and a flow rate of approximately 4.0 gallons per minute per square foot through the Gunderboom® fabric. The MLES™ would be deployed and operational during the primary fish spawning season in that section of the Hudson River, April 15 - June 30.

The Department is working with other facility owners toward investigating this method of aquatic mitigation at other existing generation facilities within New York State where an MLES™ could potentially reduce impingement and entrainment mortality.

Acoustic Deterrent System

A number of behavioral deterrent systems (e.g. fish hammers, hanging chains, bubble curtains, strobe lights, mercury lights etc.) have been studied by utilities in New York State for reducing impingement impacts at cooling water intakes. High frequency sound is the only behavioral deterrent technology shown to be effective and currently in use as an impingement mitigation technology in New York. The technology is in use at the J. A. Fitzpatrick Nuclear Generating Station (NGS), located on the south shore of Lake Ontario, and has effectively reduced the impingement of alewife at the station. The fish deterrent system, known by the trademark "Fish Startle System", emits a high frequency, broadband sound (122 - 128 KHz) at a source level of 190 decibels. The system has three major components: the integrated projector assemblies (IPAs), the power cable running from shore to intake, and the control panel. The IPAs contain the signal generators and transducers that emit the high frequency, broadband sound which has been shown to be strongly avoided by members of the clupeid family.

In 1989, the New York Power Authority, which owns and operates the Fitzpatrick NGS, started developing the mitigation system after learning that high frequency sound evoked a strong avoidance effect in some species of herring. Laboratory testing was successfully conducted on alewife, then a temporary sound system was developed and tested in Lake Ontario in 1991. Preliminary results showed that the number of fish in front of the intake was reduced by 81 to 87 percent when the system was operated. Between April and July 1993, a second full scale test was conducted. Paired impingement samples were collected with the system on and off and compared against impingement samples collected at the nearby Nile Mile Point Unit 1 NGS (control facility). The Nile Mile Point station is a similar sized NGS, with a similar offshore intake structure. The 1993 study reported the overall effectiveness of the system to be 84 percent (i.e., an 84 percent reduction in impingement as compared to the control facility).¹⁸⁷

In 1995, the Department determined the acoustic deterrent system to be BTA for minimizing adverse environmental impact at the Fitzpatrick NGS, and the system was therefore incorporated as a condition of its SPDES permit. Because sound at this frequency and decibel level has been shown to be effective for certain clupeid species only (alewife, blueback herring and American shad), the technology by itself has limited application. However, in combination with other mitigative technologies, its application may be more widespread.

British researchers have been testing an acoustic deterrent system on a number of species at a nuclear generating station in Belgium since 1997. The effectiveness of the system is stated to vary among species, due to species-specific hearing sensitivities and the levels at which a species will react to a sound stimulus. System efficiencies (deflection of fish) from 21 percent for flatfish, to up to 98 percent for herring are reported.¹⁸⁸ This work is promising if it proves to be effective over a wide range of species.

¹⁸⁷ Ross et al, 1996; Radle et al, 2003.

¹⁸⁸ Maes et al, 2003.

Mitigation - 8. The DEIS significantly overstates costs and energy impacts of closed cycle cooling.

A discussion of cooling tower design and operation was presented in Section VIII and Appendix VIII of the DEIS. The Department requested ESSA Technologies, Ltd., to review these analyses. This work was performed by D.B. Grogan Associates, Inc. and is included in Appendix V to this FEIS.

The information presented in the DEIS regarding cooling tower design and cost estimates is generally reasonable, based upon the assumptions used for this analysis. In order to determine BTA for individual sites, these assumptions should be modified or expanded to present further site-specific cooling tower alternatives which will result in different construction and operational costs, as well as different environmental impacts. Such additional analyses should include: tower designs based on a variety of wet/dry bulb scenarios; wet towers; a variety of tower fill and nozzle scenarios modified to increase operational efficiency; pre-treatment of cooling tower makeup water; and historical operation information from large, existing wet/dry (hybrid) systems.

The different closed-cycle cooling alternatives each result in different environmental impacts, including land use, aesthetics, fogging, evaporative losses, drift impacts, composition of the blowdown discharge, and thermal effects on the river. Energy efficiency, too, varies among the cooling technologies. For example, wet/dry cooling tower systems create a larger parasitic load when compared with wet systems. This results in a need for replacement power from other facilities whose air and water emissions may have an adverse environmental impact.

Costs of both construction and operation of closed systems are a concern when analyzing cooling system alternatives. The operational costs have been presented in the DEIS, but D.B. Grogan Associates, Inc. points out that the cost of lost electric generation may be significantly different in the present era of power deregulation and may be seriously underestimated in the DEIS.¹⁸⁹ Alternative designs that minimize this loss would significantly change the cost projections.

A recent EPA update, published on March 19, 2003, concerning 40 CFR Part 125, *Proposed Regulations To Establish Requirements for CWIS at Phase II Existing Facilities; Notice of Data Availability; Proposed Rule*, provides additional information on the cost of connecting a new facility to a closed-cycle system. It noted that the period of time for interconnections to be made for installations at existing facilities should be increased from EPA's earlier estimate and could require up to seven months at nuclear facilities. This could significantly increase the cost of closed-cycle systems unless very detailed planning and construction schedules are carried out to expeditiously complete this activity. Other revisions in EPA's analysis, however, show that compliance costs may actually be lower regarding energy penalties than originally forecast.

¹⁸⁹ Grogan, 2000.

Mitigation - 9. DEIS alternatives and proposed action do not present a fair picture of available alternatives.

The Department concurs strongly with this comment. As discussed in the "Mitigation and Alternatives" section earlier in this FEIS, based on the more specific descriptions of newer technologies and recent advances in established technologies discussed in preceding responses, and on discussions in the original DEIS, including DEIS Sections VII and VIII and Appendix VIII, the Department contends that a range of alternatives exist from which site-specific aquatic resource protection programs can be developed which will meet the requirements for BTA. Furthermore, the Department maintains that some of the most promising approaches for existing plants like these three Hudson River facilities will be in combinations of technologies, or technologies combined with improvements to management systems.

Other Topics - 10. The DEIS needs to consider effects of New York's recent conversion to a competitive energy market, take the State Energy Plan into account, or impose parity among facilities.

The concept of parity, or leveling the playing field between two or more separate holders of the same type of permit, is not a Department policy *per se*; nor is it required in law or regulation. For each SPDES permit application that includes a cooling water intake structure, the Department must determine whether the location, design, construction, and capacity of the cooling water intake structure reflects the "best technology available" (BTA) to minimize adverse environmental impact.¹⁹⁰ The Department makes each BTA decision on a case-by-case, site-specific basis, without necessarily applying the technology(s) or methodology(s) to minimize impacts between separate facilities in a rote manner that supports comparisons.¹⁹¹

To make a BTA decision, the Department must assess the proposed action (issuance or renewal of a SPDES permit) against the environmental impacts (direct, indirect and cumulative) and determine whether the applicant's proposed method of addressing impacts outweighs alternative methods. This is necessarily a site-specific endeavor that requires examination of technologies having the potential to "fit" the facility and minimize adverse impacts to the extent warranted by the environmental harm in the source water body. A particular mitigative technology may not produce comparable reductions of impacts between two otherwise comparable facilities. Furthermore, for any particular mitigative technology a success differential is likely to exist between facilities with different types of generation systems, CWIS, and/or cooling systems.

Mandating parity between existing facilities and new facilities subject to BTA determinations would require that an agency be able to resolve inherent difficulties and numerous issues, such as: (a) environmental impacts may not be the same, (b) construction, operation, and maintenance costs may not be the same (even using the same technology), (c) water bodies may be different, (d) public reaction to the project and/or perception of the need for minimization of impacts may be different, and (e) impacts to the State's energy capacity may be different. Such a mandate would also limit a decision maker's flexibility to prescribe BTA remedies within the boundaries of the statute, which does not require parity between facilities or BTA decisions.

In cases where the issues listed above are not present, in other words, where there is a strong basis for comparison between facilities, it is reasonable to expect that similar technologies and associated costs would be involved in prescribing a BTA remedy. However, this does not necessarily translate to "parity" because it is more likely to occur between the same types of facilities (i.e., between existing facilities or new facilities but not between an existing facility and a new facility). The

¹⁹⁰ 33 U.S.C. §1326(b); 6 NYCRR §704.5.

¹⁹¹ Athens Interim Decision

distinguishing issues listed above as examples are more likely to create discrepancies that interrupt attempts to level the playing field between or among separate BTA determinations.

Parity thus does not present itself as a clear component of mitigation remedies in making a BTA determination. That does not prevent a decision making agency from assessing whether the level of costs imposed on an existing facility can generally be measured in terms of costs of mitigative technology installed by other (new or existing) facilities. However, the apparent physical, engineering discrepancies between an existing and a new facility and the potential biological differences between source water bodies militate against direct comparisons of such facilities.

In conclusion, parity is not defined in the context of making a BTA determination. Absent a policy or administrative or judicial decision which identifies an acceptable equation for leveling out inherent discrepancies, the differences between existing and new facilities (and, potentially, the source water bodies) present significant obstacles to imposing parity to make newer, less polluting facilities cost competitive with older facilities.

Other Topics - 11. Radiation discharges are not discussed in the DEIS, but should be.

Under the Atomic Energy Act of 1954 (AEA/1954), authority to regulate nuclear discharges is reserved to the federal government.¹⁹² Discharges of cooling water from Indian Point Units 2 and 3 are regulated by NYS as SPDES discharges to the extent they contain effluent substances regulated pursuant to 6 NYCRR Part 703. Because Indian Point is a nuclear power generating facility, its construction, operation, and maintenance are regulated by the federal Nuclear Regulatory Commission(NRC), pursuant to the AEA/1954.

In 1962, the Atomic Energy Commission (AEC), the NRC's predecessor agency, and then-Governor Nelson A. Rockefeller, executed an "Agreement . . . for Discontinuance of Certain Commission Regulatory Authority" (Agreement). Pursuant to that Agreement the AEC discontinued its regulatory authority over certain radioactive materials ("byproduct materials, source materials, and special nuclear materials in quantities not sufficient to form a critical mass") so that NYS could apply its own licensing program to those substances. However, the AEC retained its licensing authority with respect to, among other things, the construction and operation of any production or utilization facility, including nuclear power generation facilities. Consequently, radioactive releases or discharges from nuclear power generation facilities are regulated, today, by the NRC, not NYS.

Under the authority of the AEA/1954 and 10 CFR Part 50, the NRC issues licenses and license extensions to nuclear power generating facilities and regulates any releases of radioactive material from licensed facilities. The current NRC licenses for Indian Point Unit 2 and Indian Point Unit 3 expire in 2013 and 2015, respectively.¹⁹³ The New York State SPDES permit for Indian Point Units 2 and 3 will control effluent discharges as to all substances controlled by the regulations set forth in 6 NYCRR Part 703 that are not otherwise controlled by the federal NRC authority in 10 CFR Part 50. Thus, the Department does not have the authority to require a SPDES permit renewal application to identify discharges that do not fall within its SPDES jurisdiction.

The 1962 Agreement fostered the creation of a licensing program at the state level for limited purposes where NYS had demonstrated to the AEC that sufficient technical expertise had been developed with regard to a short list of regulated substances. It bears repeating that in 1962, NYS did not undertake to acquire the AEC's authority to license nuclear power generation facilities or any radiation releases or discharges that could be associated with them, nor does NYS presently have or seek to develop the expertise necessary to administer such a licensing program.

¹⁹² Atomic Energy Act of 1954, 42 U.S.C. 2021; see §2021(c)(1).

¹⁹³ Entergy Nuclear Indian Point 2 and Entergy Nuclear Indian Point 3, operators of the respective nuclear generation plants, have stated in the media that they expect to begin the process of NRC license extension in 2006. Department staff understand from an independent inquiry to NRC staff that the 2006 date projected to start license extension is a reasonable one.

As noted above, New York State's SPDES permit renewal process is entirely separate from the federal NRC license extension process. However, the Department does have a role in the NRC license extension process. Because these facilities discharge cooling water into navigable waters of the United States, the Department's role in the NRC license extension proceeding will be to process and issue or deny the licensee's application for a state water quality certificate, pursuant to §401 of the Clean Water Act¹⁹⁴. Obtaining a state water quality certificate is a prerequisite to extending an NRC license. For the NRC to make a decision to grant or deny license extension, Entergy Nuclear Indian Point 2 and Entergy Nuclear Indian Point 3 will need to deliver a NYS water quality certificate to the NRC applicable to both Units 2 and 3. In considering whether to issue or deny a water quality certificate for Indian Point Units 2 and 3, the Department will apply the water quality standards set forth in 6 NYCRR Part 700, et seq.

In light of the foregoing, concerns for possible radioactive releases in the cooling water discharged from Indian Point, or concerns for possible health effects from radioactive emissions, should be addressed directly to the NRC, not the Department, either as a license compliance matter or in the course of license extension proceedings. Such concerns cannot be addressed in conditions to a SPDES permit.

¹⁹⁴ 33 U.S.C. §1341

Other Topics - 12. Several commentors expressed generalized opposition to renewal for one or more facilities.

These comments, while clearly deeply felt, did not raise substantive issues which can be addressed in the context of the issues and information included in this FEIS. Accordingly, no response or analysis is offered.

List of Appendices

Please note that appendices are not available on the website. However, you may request one or more of the appendices by contacting Betty Ann Hughes at bahughes@gw.dec.state.ny.us.

F-I. Notices and Comments on 1999 DEIS

- DEIS Notices
- Full texts of written public comments
- Public hearing transcripts
- Department comments (on CD; hard copy available on request)

F-II. Text of HRSA

F-III. Fourth Amended Consent Order

F-IV. ESSA reports

- On CD; hard copy available on request.

F-V. Other cited references and letters not readily available:

- 1991 letters by former Commissioner Jorling to HRSA utility executives
- Article by John Boreman
- Normandeau Associates, Inc. letter/reports
- Simpson letter
- List of Industrial Code 4911 Facilities in NYS
- On CD; hard copy available on request:
 - ASA 2002 (1999 year class report)
 - City of Poughkeepsie Hudson River Temperature Data (spreadsheet)

[Back to FEIS Sections](#)

APPENDIX F - V.

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STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

THOMAS C. JORLING
COMMISSIONER

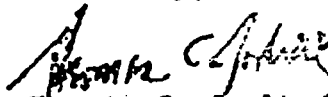
APR 29 1991

Dear Mr. Bayne:

Over the last several years some electric generating utilities have expressed the opinion that mortality imposed upon a fishery by utilities as a result of their electric generating operations is a legitimate harvesting of the resources. These opinions have been expressed in comments on the Atlantic States Marine Fisheries Commission Draft Revised Interstate Striped Bass Management Plan, comments on the state's proposed striped bass commercial and recreational fishing regulations, and in documents prepared by consultants for utilities on matters related to entrainment and impingement issues in the Hudson River. This erroneous view has led some to conclude that utilities should be allocated a fraction of annual mortality goals in fishery management plans.

It is the Department's position that the inadvertent mortality of fish by utilities is not a legitimate use of fishery resources. Therefore, the Department will not allocate a portion of fishing mortality to utilities and will seek elimination if possible, and otherwise minimization, of mortality caused by utilities. You may contact Kenneth Wich (518-457-5690) or Gordon Colvin (516-751-7775), Directors of the Divisions of Fish and Wildlife and Marine Resources, respectively, if you have questions on this position.

Sincerely,



Thomas C. Jorling

Mr. J. Phillip Bayne
President and Chief Operating Officer
New York Power Authority
123 Main Street
White Plains, NY 10601

Post- HRSA

C 11211



THOMAS C. JORLING
COMMISSIONER

STATE OF NEW YORK
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION
ALBANY, NEW YORK 12233-1010

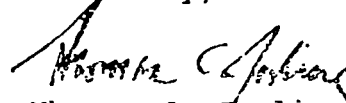
APR 29 1991

Dear Mr. Smith:

Over the last several years some electric generating utilities have expressed the opinion that mortality imposed upon a fishery by utilities as a result of their electric generating operations is a legitimate harvesting of the resources. These opinions have been expressed in comments on the Atlantic States Marine Fisheries Commission Draft Revised Interstate Striped Bass Management Plan, comments on the state's proposed striped bass commercial and recreational fishing regulations, and in documents prepared by consultants for utilities on matters related to entrainment and impingement issues in the Hudson River. This erroneous view has led some to conclude that utilities should be allocated a fraction of annual mortality goals in fishery management plans.

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Sincerely,


Thomas C. Jorling

Mr. James F. Smith
Chairman and Chief Executive Officer
Orange & Rockland Utilities
35 Jefferson Avenue
Pearl River, NY 10965

~~7/16/91 McGrath letter (Coc 62)~~

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 BROADWAY
ALBANY, NEW YORK 12233-1010

In the Matter

- of -

a Renewal and Modification of a State
Pollutant Discharge Elimination System
("SPDES") permit pursuant to Environmental
Conservation Law ("ECL") Article 17 and Title
6 of the Official Compilation of Codes, Rules
and Regulations of the State of New York ("6
NYCRR") Parts 704 and 750 et seq.

-by-

**Entergy Nuclear Indian Point 2, LLC and
Entergy Nuclear Indian Point 3, LLC,**

Permittee.

DEC No: 3-5522-00011/00004
SPDES No. NY-0004472

INTERIM DECISION OF THE ASSISTANT COMMISSIONER

August 13, 2008

INTERIM DECISION OF THE ASSISTANT COMMISSIONER¹

Entergy Nuclear Indian Point 2, LLC and Entergy Nuclear Indian Point 3, LLC (collectively, "Entergy" or "Permittee") seek to renew a State Pollutant Discharge Elimination System ("SPDES") permit for the Indian Point nuclear powered steam electric generating stations 2 and 3 (the "Stations"). The Stations are located on the east side of the Hudson River in the Village of Buchanan, Westchester County, New York. Staff of the New York State Department of Environmental Conservation ("Department" or "DEC") has proposed various modifications to the SPDES permit for the Stations, including new conditions to implement measures to minimize impacts to aquatic organisms from the Stations' cooling water intake systems.

Administrative Law Judge ("ALJ") Maria E. Villa issued a Ruling on Proposed Issues for Adjudication and Petitions for Party Status on February 3, 2006 ("Issues Ruling") in which she identified various issues for adjudication.

In the Issues Ruling, ALJ Villa directed that any participant in the proceeding that wished to appeal the Issues Ruling file a notice of appeal. By letters dated February 17, 2006, Department staff, Entergy, and a consolidated group of three environmental petitioners (Riverkeeper, Inc., Scenic Hudson, Inc., and Natural Resources Defense Council, Inc.; collectively, "Riverkeeper") filed notices of appeal. By letters dated February 17, 2006 and February 22, 2006, respectively, Assemblyman Richard L. Brodsky and the African American Environmentalist Association ("AAEA") provided notice that they did not intend to appeal the Issues Ruling.

Appeals were subsequently filed by Department staff, Entergy and Riverkeeper. Replies to appeals were filed by Department staff, Entergy, Riverkeeper, AAEA, and Assemblyman Brodsky.

Based upon consideration of the appeals, I hereby modify the Issues Ruling, as discussed below. By this interim decision, various issues are advanced to adjudication.

¹ By memorandum dated April 2, 2008, Commissioner Alexander B. Grannis delegated decision making authority in this proceeding to Assistant Commissioner J. Jared Snyder. A copy of the memorandum is being forwarded to the issues conference participants together with this interim decision.

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BACKGROUND AND PROCEEDINGS

The Stations are equipped with separate cooling water systems that withdraw water from the Hudson River and discharge that water back to the river through a shared discharge canal.

In each of these "once-through" non-contact cooling systems, the water is taken into the system and circulates past the condenser coils to absorb heat from operation of the generation equipment. The water is then discharged back to the river at a higher temperature than at the intake. Up to 2.5 billion gallons of water per day are withdrawn from the Hudson River through three intake structures along the shoreline. The heated non-contact cooling water is discharged to the river through sub-surface diffuser ports located along the wall of the discharge canal, south of the intake structures.

Department staff issued a SPDES permit for the Stations in 1987. In April 1992, Consolidated Edison and the New York Power Authority filed a timely SPDES renewal application with the Department. As a result, the Stations have continued to operate pursuant to section 401(2) of the State Administrative Procedure Act. The Issues Ruling outlines the history with respect to the SPDES permit issued for the Stations, including the transfer of permits for the Stations to Entergy in 2000 and 2001, the development of the Hudson River Settlement Agreement, and related litigation. See Issues Ruling, at 2-6.

In December 1999, the owners and operators of three steam electric generating facilities along the Hudson River submitted, pursuant to the requirements of the State Environmental Quality Review Act ("SEQRA"), a draft environmental impact statement ("DEIS") with respect to the renewal of SPDES permits for the three facilities. The three facilities included Bowline Point (units 1 and 2), Indian Point (stations 2 and 3), and Roseton (units 1 and 2). The final environmental impact statement was prepared by Department staff and adopted on June 25, 2003.

Draft Permit

On November 12, 2003, Department staff circulated a draft SPDES permit for the Stations. The draft permit contains conditions that address conventional industrial-wastewater pollutant discharge, thermal discharge, and cooling water intake.

For the Stations, Department staff has determined that a closed cycle cooling system is the site-specific best technology available ("BTA") to minimize the adverse environmental impact of

the cooling water intake structures² (with respect to entrainment³ and impingement⁴). Closed cycle cooling systems recirculate the water taken from the water source (after allowing it to cool in a tower or reservoir). Water is added to the system only to replace the water that is lost through evaporation. As a result, closed cycle cooling systems use far less water from the water source than once-through cooling.

The draft permit contains new conditions that address the thermal discharge and the implementation of measures that the Department has determined to be BTA for minimizing impacts to aquatic organisms from the cooling water intake system, including the installation of a closed cycle cooling system at the Stations. Specifically, special condition 28 of the draft permit provides, in part, that Entergy submit a pre-design engineering report within one year of the permit's effective date that addresses:

² Operators of facilities in New York State with cooling water intake structures that are subject to SPDES permits are required to comply with section 316(b) of the federal Clean Water Act ("CWA") and 6 NYCRR 704.5. Codified at section 1326(b) of title 33 of the United States Code ("USC"), CWA § 316(b) reads as follows: "Any standard established pursuant to [33 USC § 1311, "Effluent limitations"] or [33 USC § 1316, "National standards of performance"] and applicable to a point source shall require that the location, design, construction and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact" (emphasis added).

Section 704.5 of 6 NYCRR states: "[t]he location, design, construction and capacity of cooling water intake structures, in connection with point source thermal discharges, shall reflect the best technology available for minimizing adverse environmental impact" (emphasis added).

³ "Entrainment" is the process by which smaller organisms including larval fish and fish eggs are carried along with the intake water through any intended exclusion technology (such as screens) into the cooling system where they may be damaged or killed. See Matter of Athens Generating Co., LLP ["Matter of Athens"], Interim Decision of the Commissioner, June 2, 2000, at 12-13.

⁴ "Impingement" occurs when larger organisms, such as fish, are trapped against intended exclusion technology (such as screens) by the force of the intake water flows, which may result in either suffocation of, or injury to, the organisms. See Matter of Athens, Interim Decision of the Commissioner, June 2, 2000, at 13.

- (i) the potential relocation of a segment of the Algonquin Gas Company's gas pipeline to construct closed cycle cooling;
- (ii) the potential need for blasting to construct closed cycle cooling and the potential impacts of such blasting;
- (iii) particulate emissions from cooling towers;
- (iv) sequential construction outages at units 2 and 3, as opposed to simultaneous construction outages;
- (v) the potential impacts to energy reliability and capacity associated with anticipated construction outages as well as the 42 day annual operating outages; and
- (vi) additional measures to reduce potential impacts to energy reliability or capacity. See Draft SPDES Permit, Issues Conference Exhibit ("IC Exh") 11C, Special Condition 28(b).

Within one year after submission of the pre-design engineering report, Entergy must submit complete design plans that address all construction issues for conversion of the cooling water systems to closed cycle cooling. See id., Special Condition 28(e). However, the draft permit also allows Entergy, within one year of the effective date of the permit, to submit a pre-design engineering report for an alternative technology that will minimize adverse environmental impact to a level equivalent to that which can be achieved by closed cycle cooling. See id., Special Condition 28(c) & (d).

While steps are being taken to implement BTA, Entergy would be required to schedule and take annual generation outages between February 23 and August 23 of each year (which are the times when the highest level of entrainment occurs). Entergy must operate fish impingement mitigation measures and, to reduce entrainment, must reduce flows throughout the year according to a schedule specified in the permit. See IC Exh 3B, "DEC Fact Sheet," November 2003, at 3.

Issues Ruling

Pursuant to 6 NYCRR 624.5, the parties to any adjudicatory hearing include the applicant, Department staff and those who have been granted party status. In this proceeding, the ALJ granted party status to Riverkeeper, AAEA and Assemblyman Richard Brodsky. The ALJ denied a motion made by Entergy to join the New York State Department of Public Service ("DPS") as a party to the proceeding.

Entergy, Riverkeeper, AAEA and Assemblyman Brodsky all proposed issues for adjudication.

Entergy disputed a number of substantial terms and

conditions in the draft SPDES permit. The ALJ determined that twelve of the matters proposed by Entergy were adjudicable. In addition, Entergy requested clarification of four areas of the draft permit. Three of these were resolved or otherwise did not require adjudication. However, no resolution was reached regarding Entergy's request for deletion of Condition 29 of the draft SPDES permit, which would require Entergy to pay \$24 million into an escrow account established for the benefit of the Hudson River Estuary Restoration Fund. As a result, the ALJ advanced this matter to adjudication. See Issues Ruling, at 40-41.

With respect to the proposed issues raised by other parties, the ALJ identified four issues raised by Riverkeeper for adjudication. Assemblyman Brodsky raised the same issues for adjudication as Riverkeeper. In light of the foregoing, the ALJ directed Assemblyman Brodsky to confer with Riverkeeper to coordinate the presentation of evidence at the hearing. See id. at 55.

AAEA raised three issues for adjudication. The ALJ concluded that those three issues would be consolidated as one issue: "whether the draft SPDES permit has considered adequately the impacts on air quality if a closed-cycle cooling system is installed at the Stations." Id. at 49.

Subsequent to the issuance of the Issues Ruling, Entergy submitted a letter dated April 6, 2006 ("April 2006 Letter") in which it sought corrections or clarification with respect to the ruling. In part, Entergy requested a clarification that it may introduce evidence that established its compliance with the Phase II rule, which the United States Environmental Protection Agency ("EPA") had issued and which established requirements governing cooling water intake structures at large, existing power plants. Entergy also requested clarification that "all environmental impacts and other relevant SEQRA considerations may be addressed (in consideration of Entergy Issue 12) relating to the Department's implementation of SEQRA." April 2006 Letter, at 8. By letter dated April 17, 2006, Department staff responded to Entergy's submission. Staff requested that both of Entergy's requests be denied.

ALJ Villa, by memorandum dated April 26, 2006, addressed Entergy's requests. The ALJ stated that the determination in the Issues Rulings that the Phase II Rule was not applicable to this proceeding (see Issues Ruling, at 24-25) is the law of the case unless successfully challenged in a subsequent appeal. The ALJ noted that Entergy, in its appeal from the Issues Ruling, did not

challenge her determination that the Phase II Rule was inapplicable to this proceeding. In light of the foregoing, the ALJ determined that evidence concerning Entergy's compliance with the Phase II Rule would not be received at the adjudicatory hearing. The ALJ also stated that Entergy's request to adjudicate topics other than impacts on aesthetics, air quality and the electric system went beyond the scope of the Issues Ruling, which specifically restricted adjudication to those topics. Accordingly, the ALJ concluded that no clarification was required.⁵

Appeals

Appeals from the Issues Ruling were filed by Department staff, Entergy and Riverkeeper ("Staff Appeal," "Entergy Appeal," and "Riverkeeper Appeal," respectively). Replies to appeals were filed by Department staff, Entergy, Riverkeeper, AAEA, and Assemblyman Brodsky ("Staff Reply," "Entergy Reply," "Riverkeeper Reply," "AAEA Reply," and "Brodsky Reply," respectively).

STANDARDS FOR ADJUDICATION

Pursuant to 6 NYCRR part 624, which governs permit hearings, an issue is adjudicable where:

"(i) it relates to a dispute between the department staff and the applicant over a substantial term or condition of the draft permit;

"(ii) it relates to a matter cited by the department staff as a basis to deny the permit and is contested by the applicant; or

"(iii) it is proposed by a potential party and is both

⁵ By correspondence dated September 15, 2006, Entergy submitted to ALJ Villa a copy of an amicus curiae brief that Entergy had filed on August 31, 2006 with the United States Supreme Court in Commonwealth of Massachusetts v Environmental Protection Agency. Department staff submitted a letter in which it requested that the brief be precluded from the record of this proceeding. By letter dated September 26, 2006, Louis Alexander, Assistant Commissioner for Hearings and Mediation Services, advised Entergy and Department staff that no other submissions had been authorized, other than those provided for in the Issues Ruling. Accordingly, the amicus curiae brief and related correspondence would not be considered at this stage in the proceeding.

substantive and significant." 6 NYCRR 624.4(c)(1)(i-iii).

Accordingly, in this case, disputes between the permit renewal applicant and Department staff will be adjudicated where the dispute concerns a material term or condition of the draft permit. Where a dispute between applicant and Department staff concerns a legal issue that can be resolved without resolution of fact issues in material dispute, such a legal issue may be decided at the issues conference stage of the proceeding. See 6 NYCRR 624.4(b)(2)(iv).

Where contested issues are proposed by third parties, an issue must be both substantive and significant to be adjudicable. See 6 NYCRR 624.4(c)(1)(iii). An issue is substantive if there is sufficient doubt about the applicant's ability to meet statutory or regulatory criteria applicable to the project, such that a reasonable person would require further inquiry. In determining whether such a demonstration has been made, the ALJ must consider "the proposed issue in light of the application and related documents, the draft permit, the content of any petitions filed for party status, the record of the issues conference and any subsequent written arguments authorized by the ALJ." 6 NYCRR 624.4(c)(2).

An issue is significant "if it has the potential to result in the denial of a permit, a major modification to the proposed project or the imposition of significant permit conditions in addition to those proposed in the draft permit." 6 NYCRR 624.4(c)(3).

Where Department staff has reviewed an application and finds that a component of the applicant's project, as proposed or as conditioned by the draft permit, conforms to all applicable requirements of statute and regulation, the burden of persuasion "is on the potential party proposing any issue related to that component to demonstrate that it is both substantive and significant." 6 NYCRR 624.4(c)(4).

In areas of Department staff's expertise, its evaluation is an important consideration in determining whether an issue is adjudicable. See Matter of Halfmoon Water Improvement Area No. 1, Decision of the Commissioner, April 2, 1982, at 2; Matter of Bonded Concrete, Inc., Interim Decision of the Commissioner, June 4, 1990, at 2.

With respect to the proof offered by a potential party, even where supported by a factual or scientific foundation, such offer of proof may be rebutted by the application, the draft permit and

proposed conditions, Department staff's analysis, the SEQRA documents, the record of the issues conference, and authorized briefs, among other relevant materials and arguments. See Matter of Thalle Industries, Inc., Decision of the Deputy Commissioner, November 3, 2004, at 19-20.

As to legal and policy issues, the Commissioner has discretion in the interim appeals process to offer legal and policy guidance "to optimize the permitting process and focus the hearing." Matter of the Saratoga County Landfill, Second Interim Decision of the Commissioner, October 3, 1995, at 3. On legal and policy issues, it is appropriate for the Commissioner to undertake a more probing review. See Matter of Hyland Facility Associates, Interim Decision of the Commissioner, August 20, 1992, at 2.

BTA ANALYSIS

The central issue raised on the appeals concerns the BTA analysis for the Stations. Because of recent developments in the law concerning BTA, a discussion of the applicable analysis is warranted.

BTA determinations by the Department have been conducted on a site-specific, case-by-case basis utilizing a four-step analysis. See, e.g., Matter of Dyneqy Northeast Generation, Inc. (Danskammer) ("Matter of Dyneqy"), Decision of the Deputy Commissioner, May 24, 2006, at 20; Matter of Athens, Interim Decision of the Commissioner, June 2, 2000, at 4; see also letter dated January 24, 2005 from DEC Deputy Commissioner Lynette Stark to EPA Assistant Commissioner Benjamin H. Grumbles. The four-step analysis involves the following determinations:

- (1) whether the facility's cooling water intake structure may result in adverse environmental impact;
- (2) if so, whether the location, design, construction and capacity of the cooling water intake structure reflect BTA for minimizing adverse environmental impact;
- (3) whether practicable alternate technologies are available to minimize the adverse environmental effects; and
- (4) whether the costs of practicable technologies are wholly disproportionate to the environmental benefits conferred by such measures.

The first step of a BTA determination under 6 NYCRR 704.5

considers whether an adverse environmental impact exists. In this analysis, "adverse environmental impact" relates exclusively to the impact on aquatic organisms from impingement and entrainment.

The second step of the BTA determination relates to whether the location, design, construction and capacity of the cooling water intake structure reflect BTA for minimizing entrainment and impingement. In the context of the second step, the term "minimizing" means the reduction to the smallest amount, extent or degree reasonably possible.

The third step of the BTA analysis addresses whether practicable alternate technologies are available to minimize impingement and entrainment. Availability of a technology is analyzed in the context of its suitability for the particular application, including its ability to be installed and operated at the site. In this regard, for example, the impacts of a technology on a facility's operation (that is, can it be engineered such that the facility will operate efficiently) are part of the BTA analysis. See, e.g., Matter of Dynegy, Decision of the Deputy Commissioner, May 24, 2006, at 14 (where cooling tower configurations could not be effectively integrated into facility's operations without detrimental effect, such configurations were not available technology). Whether adequate space exists to construct and operate the technology, or whether physical or other site constraints are present, are similarly relevant to the consideration of whether a technology is available. See id. at 8-14; see also Matter of Dynegy, Issues Ruling, at 17, 60-62 (where a component of a retrofit configuration would not fit on the site, the configuration is not available for consideration of the BTA determination).

The "wholly disproportionate" standard in the fourth step of the State's BTA analysis is not a simple cost-benefit analysis. See Matter of Athens, Interim Decision of the Commissioner, at 14-15; see also Issues Conference Transcript ("IC Tr"), at 102-103. It gives "presumptive weight" to the value of environmental benefits and places the burden on a permit applicant to demonstrate that the relative costs are unreasonable. See id. at 15. However, in light of the Second Circuit's decision in Riverkeeper, Inc. v EPA, 475 F3d 83 (2007) ("Riverkeeper II"), and its rejection of cost-benefit analysis, I am clarifying the application of the "wholly disproportionate" language in the fourth step of the BTA analysis.

As background, on July 9, 2004, EPA published in the Federal Register the Phase II Rule, which established requirements for

cooling water intake structures at large, existing power plants.⁶ The Phase II Rule became effective as of September 7, 2004. By implementation of this rule, the adverse environmental impact of cooling water intake structures was to be minimized by reducing the number of aquatic organisms lost as a result of water withdrawals associated with these structures. See "Summary," 69 Fed Reg 41576 (July 9, 2004). The Phase II Rule did not require such facilities to install closed cycle cooling systems, but facilities with closed cycle cooling systems were considered to be in compliance with the rule. See Riverkeeper II, at 93.

In Riverkeeper II, the Second Circuit remanded the Phase II Rule to EPA on various grounds. See Riverkeeper II, at 130-31. The Second Circuit expressly rejected the use of a cost-benefit analysis when making a BTA determination. It held that CWA § 316(b) "plainly indicates that facilities must adopt the best technology available [and] that cost-benefit analysis cannot be justified in light of Congress's directive." Riverkeeper II, at 98-99 (emphasis in original). Section 316(b) was construed to "expressly require[] a technology-driven result." Id. at 99. Accordingly, the court did not see consideration of costs in relation to benefits as consistent with the statutory provision.

Notwithstanding its rejection of the use of cost-benefit analysis, the Second Circuit stated that "cost" could be permissibly considered in two ways: "(1) to determine what technology can be 'reasonably borne' by the industry and (2) to engage in cost-effectiveness analysis in determining BTA." Id. at 99. According to the Court, once the most effective technology that may reasonably be borne by the industry is determined, other factors "including cost-effectiveness" may be considered to select a less expensive technology that achieves essentially the same results. Id. at 100.

Effective July 9, 2007, the EPA suspended nearly the entire Phase II Rule in response to the Second Circuit's decision. See 72 Fed Reg 37107-37109 (July 9, 2007). On April 14, 2008, the United States Supreme Court granted Entergy's petition for a writ of certiorari with respect to whether section 316(b) of the federal Clean Water Act (33 U.S.C. § 1326[b]) authorizes the EPA to compare costs with benefits in determining the best technology available for minimizing adverse environmental impact at cooling

⁶ The Phase I Rule, which was addressed by the Second Circuit in Riverkeeper, Inc. v EPA, 358 F3d 174 (2d Cir 2004) ("Riverkeeper I"), addressed cooling water intake structures at new power producing facilities.

water intake structures. Entergy Corp. v EPA, - US -, 128 S Ct 1867, 2008 WL 1699464.

Unless overturned or otherwise modified by the United States Supreme Court, the Second Circuit's construction of the federal Clean Water Act with respect to cost-benefit analysis governs this proceeding. Moreover, even if the United States Supreme Court were to determine that the federal Clean Water Act allows for cost-benefit analysis in determining BTA, New York State may, pursuant to section 510 of the federal Clean Water Act, adopt or enforce through its federally delegated SPDES permit program a more stringent approach than cost-benefit analysis. See 33 U.S.C. § 1370 (providing that a state may adopt or enforce through its SPDES permit program more stringent standards with respect to an effluent limitation "or other limitation, effluent standard, prohibition, pretreatment standard or standard of performance"). The federal Clean Water Act, however, establishes the statutory "floor" for New York State's SPDES program. See id.⁷

The lack of a Phase II rule does not prevent the Department from proceeding in this case. As here, in the absence of an applicable effluent limit guideline, best professional judgment ("BPJ") is exercised to develop appropriate effluent limitations. See, 33 U.S.C. § 1342(a)(1); 40 CFR § 125(3)(d). EPA's guidance manual for permit writers defines BPJ as "the highest quality technical opinion developed by a permit writer after consideration of all reasonably available and pertinent data or information that forms the basis for the terms and conditions of a NPDES permit." U.S. EPA NPDES Permit Writers' Manual, at 68 (1996). As indicated in the notice suspending the Phase II Rule, all permits for Phase II facilities should include conditions under section 316(b) of the Clean Water Act developed on a best professional judgment basis. See 72 Fed Reg 37107-37109.

Based upon my review of the Second Circuit's construction of section 316(b) and in furtherance of the State's responsibility and authority over its aquatic resources, I am modifying the language in the final step of the State's four-step BTA analysis to clarify that it is not intended to include a cost-benefit

⁷ Although this proceeding is governed by the Second Circuit's construction of the federal Clean Water Act, the Phase II rule itself was not applicable in this matter. The ALJ properly determined that the regulation did not apply because the SPDES permit application for the Stations was in process, and the draft SPDES permit had been issued, prior to the effective date of the Phase II Rule. See Issues Ruling, at 24-25.

analysis. Incorporating language from the Second Circuit decision, the fourth step of the analysis shall be reworded as follows: "whether the cost of the technology can reasonably be borne by the industry and, upon making the determination that it can, whether considerations of cost-effectiveness allow for selection of a less expensive but equally effective technology."

The Second Circuit's decision did not explicitly define the phrase "reasonably borne by the industry," and it is significant that the decision was addressing a generic rule that applied to this regulated sector. The court did, however, say that the determination should be based not on the "average" facility, but on the "optimally best performing" facilities. Riverkeeper II, at 99-100.

Applying this to New York's BTA determinations, the analysis of whether a proposed technology, such as closed cycle cooling, can be "reasonably borne by the industry" shall first consider whether the cost of the technology can reasonably be borne by the facility in question. If it can reasonably be borne by the facility, that would end the inquiry with respect to the "reasonably borne" prong and the inquiry would proceed to evaluate whether considerations of cost-effectiveness would allow for the selection of a less expensive but equally effective technology. If, however, the proposed technology cannot reasonably be borne by the facility, the "reasonably borne" analysis would then consider whether the cost of the technology could reasonably be borne by an "optimally best performing" facility. If the cost of the proposed technology can reasonably be borne by such a facility, the "reasonably borne" inquiry would be satisfied and the proposed technology would continue to be evaluated as BTA for the facility. If neither the specific facility nor an "optimally best performing" facility can reasonably bear the cost of the proposed technology, then the technology would not be further considered for implementation as BTA for the facility in question. See Riverkeeper II, at 99 (technology that is not reasonably borne "is not 'available' in any meaningful sense").

For purposes of this proceeding, in order to determine whether closed cycle cooling is BTA for Indian Point Stations 2 and 3, it would need to be initially determined whether the cost of closed cycle cooling can reasonably be borne by the Stations. If it can reasonably be borne, the "reasonably borne" inquiry would be satisfied and closed cycle cooling would continue to be evaluated as BTA for the Stations. If the cost of closed cycle cooling could not be reasonably borne by the Stations, the analysis would proceed to consider whether the cost of closed

cycle cooling could reasonably be borne by an "optimally best performing" facility. If the cost of closed cycle cooling could be borne by an "optimally best performing" facility, closed cycle cooling would continue to be evaluated as BTA for the Stations.

To this end, the parties in this proceeding should be prepared to discuss the cost data utilized, including but not limited to the revenue stream developed for the Stations.⁸ The applicant would, in part, be expected to produce any material and relevant financial information relating to its facility in the consideration of BTA. In the event that the cost of closed cycle cooling cannot reasonably be borne by the Stations, and the analysis proceeds to whether the cost can reasonably be borne by an "optimally best performing" facility, additional general industry-related information may need to be considered.

ADJUDICABLE ISSUES

Issues Raised by Entergy

Entergy Issue 1⁹

The Issues Ruling determined the following issue to be adjudicable:

"Whether, as a threshold matter, the Department has demonstrated that the Station[s'] cooling water intake structures have caused an 'adverse environmental impact,' triggering the best technology available assessment under Section 316(b) and Section 704.5." Issues Ruling, at 26.

This issue concerns the first step of the Department's BTA analysis, that is: whether the facility's cooling water intake structure may result in adverse environmental impact. See Matter of Dyneqy, Decision of the Deputy Commissioner, May 24, 2006, at

⁸ In this review, "cost" relative to the Stations would include the construction, operation and maintenance of the proposed BTA, any lost revenues arising from outages, and other related inefficiencies. Revenue data for the facility may be developed from industry sources (for example, data developed by the New York Independent System Operator), together with any facility-related data that has been obtained.

⁹ For ease of reference, the numbering of Entergy's issues in this decision corresponds to the numbering in the Issues Ruling.

20; Matter of Athens, Interim Decision of the Commissioner, June 2, 2000, at 4. Consistent with Department administrative precedent, and as acknowledged by the parties, the threshold for determining that adverse environmental impacts exist under this analysis is "very low." See Matter of Dynegy, Decision of the Deputy Commissioner, at 21; see also id., Hearing Report, at 80 ("[t]he threshold for determining whether any facility's cooling water intake structure would result in any adverse environmental impacts is very low"); see also Entergy Reply, at 10; Staff Appeal, at 3.

Department staff argues that "the requisite 'adverse environmental impact' specified in 6 NYCRR [704.5] . . . has been thoroughly demonstrated in the record of this proceeding" and, therefore, no reason exists to adjudicate this proposed issue. Staff Appeal, at 2. Staff notes that the Final Environmental Impact Statement for Indian Point Units 2 and 3, dated June 25, 2003 ("FEIS"), contains information regarding entrainment rates for five fish species and estimates that more than one billion individuals of these species will be entrained annually. Id. at 3 (citing FEIS, Table 1, at 2).

Furthermore, staff notes, the Department has determined that other facilities along the Hudson River cause adverse environmental impacts even though they withdraw less cooling water and entrain significantly lower numbers of fish than the Stations. Staff also cites prior State and federal determinations where the loss of aquatic organisms by impingement or entrainment was deemed to constitute an adverse environmental impact. Id. at 4-8.

Riverkeeper concurs with Department staff's assertion that there is no reason to adjudicate Entergy Issue 1 and argues that "it has already been established in this proceeding that the Stations cause adverse environmental impact." Riverkeeper Reply, at 3. Among other things, Riverkeeper cites to fish mortality information "measured by the permittees' own consultant" and argues that "the applicant has admitted . . . adverse environmental impact exists." Id. (citation omitted).

Assemblyman Brodsky notes that the Issues Ruling describes the threshold for finding adverse environmental impacts under the BTA analysis as "a low one." Brodsky Reply, at 15 (citing Issues Ruling, at 26). As such, he argues, "the uncontroverted fact of mortality of more than 1 billion fish per year [at the Indian Point Stations] exceeds that low threshold." Brodsky Reply, at 15. Assemblyman Brodsky contends that "there is no factual basis and no legal basis for re-opening the issue of whether or not

Indian Point's [cooling water intakes] cause adverse environmental impacts to the Hudson River." Id. at 3.

Entergy argues that Department staff's assertion that the operation of the Indian Point cooling water intake structures "results in a per se adverse environmental impact is in conflict with prior Department determinations." Entergy Reply, at 10. Although acknowledging that "the hurdle is a low one," Entergy maintains that staff may not presume adverse impacts exist, but rather must "affirmatively establish" the existence of such impacts. Id.

Entergy maintains that, at this stage of the proceeding, Department staff may not rely upon the record to establish the existence of adverse environmental impacts. Entergy also argues that the State and federal determinations that staff cites in support of its position are inapposite because those determinations concerned new facilities rather than existing ones. Id. at 13 n 11.

Contrary to Entergy's assertion, Department staff has not argued that operation of the cooling water intakes results in adverse environmental impacts per se. Rather, staff argues that the entrainment of more than 1.2 billion fish per year by the cooling water intakes at the Stations leaves "no question" that adverse environmental impacts result from operation of the Stations. Staff Appeal, at 8.¹⁰

Moreover, the FEIS data cited by staff is drawn directly from the DEIS that was prepared by the owners/operators of the Indian Point stations and two other power generating facilities along the Hudson River. The DEIS estimates an annual mortality rate of nearly 900,000 of the entrained fish. The FEIS concludes that "the generators' estimates [in the DEIS] represent the lower boundary of the actual mortality range" with the actual mortality rate falling somewhere between the generators' estimate and the "upper end" of fish entrained. FEIS, at 4.

The Second Circuit, in its decisions in both Riverkeeper I and Riverkeeper II, recognized that it is reasonable and appropriate to deem fish mortality to be an adverse environmental impact of intake structures on aquatic organisms at both existing

¹⁰ Department staff also demonstrates the adverse environmental impact of Indian Point in light of findings of adverse environmental impacts of other power plants along the Hudson River. See Staff Appeal, at 3-7.

and new facilities. See Riverkeeper I, at 196; Riverkeeper II, at 125.

As noted previously, at the issues conference stage of an adjudicatory proceeding under 6 NYCRR part 624, legal issues that are not dependent upon the resolution of facts in substantial dispute may be decided as a matter of law. See 6 NYCRR 624.4(b)(2)(iv). In this case, it is not necessary to resolve the factual issue concerning the actual fish mortality rate to determine that an adverse impact exists as a matter of law. Even accepting the "lower boundary" estimate of fish mortality in the DEIS, a mortality rate in the range of 900,000 fish per year far exceeds any de minimis level, represents excessive fish kills and is sufficient to establish that the operation of the Indian Point cooling water intakes results in an adverse environmental impact, thereby triggering further BTA analysis.¹¹

This conclusion is consistent with EPA's position regarding what constitutes adverse environmental impact under CWA § 316(b). EPA has expressly stated that the loss of aquatic organisms, by itself, constitutes an adverse environmental impact. See, e.g., 69 Fed Reg 41586 (with respect to the promulgation of the Phase II Rule, EPA determined that there are multiple types of undesirable and unacceptable environmental impacts that may be associated with Phase II existing facilities, including entrainment and impingement); see also Staff Appeal, at 8.¹²

I am satisfied that, in the context of this BTA

¹¹ Because the magnitude of the mortality rate at the Stations demonstrates that an adverse environmental impact exists as a matter of law, it is not necessary to reach the question whether any entrainment and impingement constitutes an adverse environmental impact.

¹² As noted, effective July 9, 2007, EPA suspended nearly the entire Phase II rule in response to the Second Circuit's decision in Riverkeeper II, which remanded several aspects of the Phase II rule to EPA for further consideration. Although the Second Circuit took issue with significant portions of the Phase II rule and its promulgation, it nevertheless "specifically rejected the view that 'the EPA should only have sought to regulate impingement and entrainment where they have deleterious effects on the overall fish and shellfish populations in the ecosystem, which can only be determined through a case-by-case, site-specific regulatory regime'" [and] emphasized that "'the EPA's focus on the number of organisms killed or injured by cooling water intake structures is eminently reasonable.'" Riverkeeper II, at 125 (quoting Riverkeeper I, at 196).

determination, it has been established that Indian Point's cooling water intake structures cause an adverse environmental impact. Accordingly, this issue is not adjudicable.

Entergy Issue 2

The Issues Ruling determined the following issue to be adjudicable:

"Whether the Department's site-specific determination that closed-cycle cooling is the best technology available for Indian Point 2 and Indian Point 3, provided both Stations are relicensed, fails to satisfy the applicable legal standard, or is otherwise arbitrary and capricious." Issues Ruling, at 27.

Here, Department staff does not oppose adjudication of the issue in its entirety. Rather, staff states that it is concerned that Entergy Issue 2 may be read to expand the scope of the inquiry into the Department's BTA determination "beyond aquatic species and the water quality of the water body in question." Staff Appeal, at 11. Staff cites the statement in the Issues Ruling that "Entergy asserted that the Department had not accounted for the adverse effects of the proposed BTA to the electric system, air quality, and aesthetics" (Issues Ruling, at 27) and argues that such adverse effects are not properly considered under the Department's BTA determination.

According to Department staff, to consider issues beyond aquatic biota and water quality as part of the BTA determination would be at variance with Department precedent. See Matter of Athens, Interim Decision of the Commissioner, June 2, 2000, at 12 n 8. Staff also cites to a 2004 issues ruling wherein the ALJ ruled that the applicant's "proposed issue with respect to the effect of additional fish protection outages on electric system reliability in New York is not relevant to the BTA determination." Matter of Dyneqy, Issues Ruling, March 25, 2004, at 16.

Riverkeeper argues that "it would be improper and unproductive to allow the adjudication of these issues (the electric system, air quality, and aesthetics) with an open invitation to litigate matters having no direct connection with the SPDES permit conditions subject to this proceeding." Riverkeeper Appeal, at 16 (parenthetical in original). Riverkeeper "concur[s] with Staff's request that - consistent with DEC's administrative precedent - [Entergy Issue 2] 'be limited and/or clarified'" to avoid extending the BTA analysis

beyond impacts on aquatic resources. Riverkeeper Reply, at 11 (quoting Staff Appeal, at 9). Riverkeeper adds, however, that "all applicable Federal, State and local requirements (e.g., visual impacts) will need to be complied with prior to installation and operation of any new facilities at the Stations." Id.

Assemblyman Brodsky argues that the Issues Ruling could broaden the BTA determination "far beyond its appropriate scope, and graft a SEQRA determination onto this SPDES proceeding's BTA assessment." Brodsky Reply, at 7. Assemblyman Brodsky cites EPA and Department precedent which he argues demonstrate that BTA determinations are to consider only aquatic impacts and that "potential impacts to air quality, aesthetics or the electrical grid, where valid, could be addressed in a SEQRA proceeding." Id. at 8.

Entergy argues that this issue was properly identified for adjudication. Entergy asserts that the Issues Ruling correctly held that a dispute exists between Entergy and Department staff regarding what constitutes BTA for the Indian Point stations. Moreover, because this dispute relates to a substantial term of the draft permit, adjudication is appropriate. Entergy Reply, at 22-23. Entergy maintains that "existing technologies at the Stations, along with the flow restrictions set forth in the Consent Order,¹³ satisfy any and all concerns the Department may have regarding perceived aquatic impacts reasonably attributable to the Stations' cooling water intake structures in accordance with [CWA] §316(b) and/or [6 NYCRR] §704.5." Entergy Reply, at 22 (internal citation and quotation marks omitted).

Entergy directly challenges Department staff's assertion that the adverse environmental impacts to be considered under a BTA analysis are limited solely to aquatic organisms. Like Department staff, Entergy cites to the issues ruling in Matter of Dynegy in support of its position. Entergy states that in Dynegy

¹³ The flow restrictions referenced by Entergy were initially established under the Hudson River Settlement Agreement ("HRSA"), signed by, among others, the Department, Consolidated Edison Company of New York, Inc. ("Con Ed") (Entergy's predecessor at Indian Point Unit 2), the Power Authority of the State of New York (now the New York Power Authority ["NYPA"]) (Entergy's predecessor at Indian Point Unit 3) and other Hudson River power generators on December 19, 1980 (and which became effective in 1981). The HRSA expired in 1991 but the flow restrictions and other aspects of the agreement remained in effect through a series of consent orders and, after the last of the consent orders expired in 1998, by agreement of the generators.

"the ALJ expressly stated that effects on electric generating capacity, air emissions, visual impacts of cooling towers, and visual impacts of cooling plumes - clearly non-aquatic potential adverse environmental impacts of the proposed technology - must be taken into consideration." Entergy Reply, at 49.

Entergy Issue 2 raises the issue of the "applicable legal standard" for making a BTA determination. As noted, the Department uses a four-step analysis in making a BTA determination. For purposes of this proceeding and in the context of current policy, the BTA analysis shall be undertaken in conformance with that four-step process, as modified with regard to the last (fourth) factor. See BTA Analysis, supra.

The parties' disagreement regarding this issue implicates the relationship between the BTA determination process and the SEQRA review process. It appears that Entergy is arguing that the BTA determination process and the SEQRA review process should be merged or otherwise considered as one, but I view the processes to be sequential. In drafting a SPDES permit for this type of facility, Department staff should first apply the four-step BTA analysis to determine the appropriate BTA technology. This four-step BTA analysis focuses upon the adverse impact on aquatic resources, that is entrainment and impingement.¹⁴

Once the BTA determination is made, the proposed BTA technology must then be reviewed in accordance with SEQRA. This review may lead to modifications in the design, construction or operation of the identified technology. To the extent that the SEQRA review identifies mitigation or other modification to the location, construction or operation of the technology to address environmental impact(s), such mitigation or modification can be reflected in permit conditions, or revisions to the technology's design, location or operation.

Conceivably, an environmental impact may be identified in the SEQRA review that is of such magnitude that it could preclude the construction and operation of the proposed BTA technology (for example, if it were determined that construction of the BTA technology would impact an endangered species or a freshwater or tidal wetland, and no appropriate mitigation were available). In those circumstances, it may be determined that the proposed BTA technology would not satisfy the requirements of SEQRA, and

¹⁴ See, e.g., Matter of Dyneqy, ALJ Ruling on Proposed Issues, March 25, 2004, at 16 (effect of additional fish protection outages on electric system reliability not relevant to the BTA determination).

Department staff may then be obligated to revisit the BTA determination.

The Issues Ruling, in discussing Entergy Issue 2, references Entergy's assertion that the Department had not accounted for adverse effects of the proposed BTA with respect to the electric system, air quality and aesthetics. See Issues Ruling, at 27. Testimony on these issues will be evaluated as part of the SEQRA analysis of the proposed technology after the BTA analysis has been completed.¹⁵

As previously discussed, the first step in the BTA analysis, that is whether the Stations' cooling water intake structure results in an adverse environmental impact (entrainment and impingement), has been answered in the affirmative. See Entergy Issue 1, supra. Therefore, the scope of Entergy Issue 2 will be limited to addressing the remaining three steps of the BTA analysis with respect to Department staff's determination that closed cycle cooling is BTA for the Stations.

Entergy Issue 3

The Issues Ruling determined that the following issue was adjudicable:

"Whether the Department has appropriately assessed the costs and benefits of its proposal in the Draft Permit." Issues Ruling, at 27.

Here, as with Entergy Issue 2, Department staff does not oppose adjudication of this issue in its entirety but rather seeks to narrow the inquiry. Staff states that it "would not raise this concern but for the way the Issues Ruling uses the phrase 'compared to other available alternative technologies[.]'" Staff Appeal, at 14 (quoting Issues Ruling, at 29) (brackets added by Department staff). Staff argues that the appropriate analysis is solely whether the cost of the BTA proposed by staff is "wholly disproportionate" to the environmental benefit achieved. Such analysis, Department staff argues, does not entail an assessment of the relative costs of other available technologies, nor does it require a formal cost-benefit analysis where environmental benefits must be "monetized." Id. at 13. Accordingly, staff seeks clarification to avoid irrelevant argument and testimony at hearing regarding matters outside the "wholly disproportionate" analysis.

¹⁵ See Entergy Issue 12, infra.

Riverkeeper seeks to ensure that the "economic factors and the supporting evidence in the instant matter [are] limited to: environmental benefits to be gained by protecting aquatic resources; costs of a closed cycle cooling retrofit, including annual capital cost of the retrofit and annual operation and maintenance; and expected revenues for the sale of electricity." Riverkeeper Appeal, at 11. For reasons similar to those advanced by Department staff, Riverkeeper seeks clarification of the "wholly disproportionate" standard. As with Department staff, Riverkeeper argues that neither formal cost-benefit analysis nor cost comparisons between technologies intended to reduce fish mortality are appropriate. Riverkeeper Reply, at 12.

Assemblyman Brodsky requests "that the Commissioner clarify that the 'wholly disproportionate' test is not a cost-benefit analysis, and exclude such evidence and argument from this proceeding." Brodsky Reply, at 6. Moreover, the Assemblyman states that the proper cost analysis in this proceeding is "whether the costs of constructing closed-cycle cooling at Indian Point are wholly disproportionate to the practical elimination of the adverse impacts of entrainment and impingement of aquatic organisms." Id.

Entergy states that, under the BTA analysis, the applicable cost-benefit analysis is "whether the costs of practicable technologies are wholly disproportionate to the environmental benefits conferred by such measures." Entergy Reply, at 23 (internal citations and quotation marks omitted). Entergy argues that "both EPA and New York officially have concluded that monetization of environmental benefits should occur where feasible." Id. at 58.

As previously discussed, the inquiry in the fourth step of the Department's BTA analysis, which contains the "wholly disproportionate" standard, is modified in light of the Second Circuit's construction of Clean Water Act § 316(b) in Riverkeeper II. As modified and for purposes of this proceeding, the fourth step of the analysis shall address whether the cost of the proposed BTA technology (closed cycle cooling) can reasonably be borne by the industry (see, supra, at 12) and, upon making the determination that it can, whether considerations of cost-effectiveness allow for selection of a less expensive but equally effective technology. Cost-benefit analysis is not part of the Department's BTA determination process.

Entergy's assertion that environmental benefits should be monetized is in error, and the citations it references are not relevant here. Cost-effectiveness considerations go to

evaluation of whether alternate technologies would achieve the same environmental benefit with respect to aquatic organisms. Monetizing environmental benefits is not required or appropriate.

On the other hand, I deny Department staff's request to preclude cost-effectiveness comparisons between technologies. Provided that the proposed technologies achieve essentially the same environmental benefit, neither federal nor State law precludes implementation of the less costly alternative.¹⁶ For the purposes of such comparisons, costs associated with retrofitting the facility, including but not limited to modification or relocation of existing structures, would need to be considered.

Accordingly, Entergy Issue 3 is modified to read as follows:

"Whether the Department has adequately (i) assessed whether the costs of its proposal in the draft permit can be reasonably borne by the industry, and (ii) considered the cost-effectiveness of equally effective alternative technologies."

As this issue is encompassed by the fourth step of the BTA determination, it will be adjudicated as part of Entergy Issue 2.¹⁷

Entergy Issue 4

The ALJ, in the Issues Ruling, modified the issue proposed by Entergy. As modified by the ALJ, Entergy Issue 4 now reads:

¹⁶ With respect to the term "cost-effectiveness" as used in the fourth step, a comparative example is set forth in the Riverkeeper II decision. According to the court, where power plants can reasonably bear the price of a technology that costs \$100 to save 99-101 fish and a technology that costs \$150 to save 100-103 fish, the less expensive technology could be chosen based on cost-effectiveness considerations Riverkeeper II, at 100. We do not decide here whether additional fish impact that is properly considered de minimis would disqualify an alternative technology from consideration.

¹⁷ Various SEQRA-related issues are also discussed in the Issues Ruling under Entergy Issue 3 (that is, impacts to the electric system, aesthetics, and evaporative losses). Because the only environmental impact considered in the four-step BTA analysis relates to entrainment and impingement, such other environmental impacts shall be considered as part of the SEQRA review (see Entergy Issue 12, infra) and not part of the four-step BTA analysis.

"[W]hether cooling towers can be sited at the Stations, assuming that Entergy's design is adopted, in light of the expense associated with moving the Algonquin pipeline." Issues Ruling, at 30.

The ALJ noted that the issue would be considered in the context of the "wholly disproportionate" analysis. See id. at 29-30.

Riverkeeper has requested that Entergy submit the specific retrofit configuration that Entergy is proposing for consideration prior to the adjudicatory hearing (at a time to be determined by the ALJ). Riverkeeper Reply, at 8. Presently, the draft SPDES permit requires that Entergy, within one year of the effective date of the permit, submit a pre-design engineering report addressing regulatory and engineering issues, including but not limited to:

- (i) the potential relocation of a segment of the Algonquin pipeline;
- (ii) the potential need for blasting to construct closed cycle cooling and its potential impacts;
- (iii) particulate emissions from cooling towers;
- (iv) sequential construction outages at the Stations as opposed to simultaneous construction outages;
- (v) the potential impacts to energy reliability and capacity associated with anticipated construction outages as well as the 42 day annual operating outages; and
- (vi) additional measures to reduce potential impacts to energy reliability or capacity. See IC Exh 11C, Special Condition 28(b).

Based upon my review of the record and the issues to be adjudicated, consideration of Riverkeeper's request, and the interests of ensuring efficiency in the administrative process, I conclude that the information to be contained in the pre-design engineering report should be considered in this pending proceeding. The information is relevant to the issues that have been identified for adjudication and whether Department staff's selection of closed cycle cooling as BTA for this facility is appropriate. In particular, some of the information is relevant to steps 3 and 4 of the BTA analysis.

For example, it would not be useful to adjudicate Entergy Issue 4 regarding the Algonquin pipeline without having the information on the potential relocation of a segment of the Algonquin pipeline contemplated by Special Permit Condition 28(b)(i). In addition to cost considerations relating to moving

the pipeline, adjudication of this issue should also address whether the Algonquin pipeline would preclude the siting of cooling towers or otherwise make them unavailable for this site, given the impact on facility operations of moving the pipeline. If the movement of the pipeline (or movement of any other physical impediment) is so disruptive of facility operations that it would result in the permanent closure of the facility, a technology that requires movement of the pipeline would not be "available" for this site. See, e.g., Matter of Dyneqy, Decision of the Deputy Commissioner, May 24, 2006, at 13-14.

To the extent that Entergy believes that other site constraints exist with respect to closed cycle cooling, such constraints should be raised in this proceeding. Consequently, Entergy Issue 4 is modified as follows:

"Whether cooling towers can be sited at the Stations, in light of existing physical features and the expense of removing or relocating such impediments including but not limited to the Algonquin pipeline."

In addition, the draft SPDES permit (see IC Exh 11C) also provides that, within one year of the effective date of the permit, Entergy may submit a pre-design engineering report for an alternative technology(s) that will "minimize adverse environmental impact to a level equivalent to that which can be achieved by closed-cycle cooling." Id. at Special Condition 28(c). Department staff would then evaluate the capability of the proposed alternative. If it determines that the proposed alternative may be substituted for closed cycle cooling, Department staff would, if appropriate, commence a proceeding to modify the permit accordingly. Id. at Special Condition 28(d).

These permit provisions would allow for subsequent submission of alternate proposals, and the potential revisitation of the closed cycle cooling determination at some later date. The result could be further delay in addressing the ongoing adverse environmental impact on aquatic organisms at this facility. Any viable alternative to closed cycle cooling that is equally effective should be considered now, and not reserved for some future proceeding. This proceeding is the appropriate forum for a final BTA determination that would be incorporated into the SPDES permit, enabling the necessary construction and installation to commence as promptly as possible.

Accordingly, for purposes of administrative efficiency and to ensure a complete record in making a final BTA determination, I direct that information on any alternative BTA proposals must

be submitted and considered in this proceeding. If Entergy seeks to have an alternative to closed cycle cooling considered, including but not limited to any retrofit configurations, it should submit that alternative to Department staff and the other parties prior to the commencement of the adjudicatory hearing in accordance with a schedule to be established by the ALJ. Such submissions should include but not be limited to aquatic impact information, relevant cost information (for example, cost of construction, installation and operation), and the proposed location of the technology at the site.¹⁸

In light of the foregoing, Special Condition 28(c) and (d) would be rendered moot and, depending upon the adjudication, other provisions of the draft permit may similarly be rendered moot or otherwise require modification. If after consideration of any alternative proposed by Entergy, Department staff and the other parties do not agree that such alternatives represent BTA for the Stations, Entergy shall present those alternatives that it seeks to have considered as part of its direct case at the adjudicatory hearing.

Finally, several aspects of the pre-design engineering report involve SEQRA-related impacts rather than issues relevant to the four-step BTA determination: blasting (Special Condition 28[b][ii]); particulate emissions (Special Condition 28[b][iii]); construction outages (Special Condition 28[b][iv]); and impacts to electric reliability and capacity (Special Condition 28[b][v] & [vi]). This information should be considered in this proceeding, as part of Entergy Issue 12 (see infra) addressing SEQRA concerns.

Entergy Issue 5

The Issues Ruling determined the following issue to be adjudicable:

"Whether closed-cycle cooling is an available technology for an existing nuclear station comparable in size and configuration to the Stations." Issues Ruling, at 30.

¹⁸ As discussed in the review of Entergy Issue 1, it has been demonstrated that the Stations' cooling water intake structures have caused, and are continuing to cause, an adverse environmental impact. For purposes of review of any alternative technologies, however, further information may be received with respect to the numbers of fish that are entrained and impinged at the Stations as part of the evaluation of alternative technologies.

Department staff argues that this issue "should not be adjudicated because it is clear that closed cycle cooling is an available BTA technology." Staff Appeal, at 19. Staff asserts that, by "recounting negative statements made by Entergy at the Issues Conference" and by a "misplace[d] . . . reliance on EPA's Preamble to the Phase II Rule," the Issues Ruling appears to question whether there is sufficient historical data to justify retrofitting existing facilities with closed cycle cooling systems. Id. at 15. Staff argues that the BTA determination is "facility-specific, and one may not categorically rule out an available technology for an existing [cooling water intake structure]." Id. at 16. Accordingly, staff seeks reversal of Entergy Issue 5 or, alternatively, that the issue be limited to whether closed cycle cooling is BTA under the facts and circumstances specific to the Stations.

Entergy counters that the preamble to EPA's final Phase II rule "confirms that EPA concluded that [retrofitting existing facilities with closed cycle cooling systems] is not available on a national scale." Entergy Reply, at 19. Entergy cites to sections of the preamble to the final Phase II rule that indicate such retrofitting may be "'not economically practicable.'" Id. (quoting the preamble to the Phase II rule, 69 Fed Reg 41601 and 41606).

Entergy also argues that Department staff has acknowledged that closed cycle cooling may not be feasible at the Stations. In support of this contention, Entergy points to the draft permit requirement for a pre-design engineering report. This requirement, Entergy argues, demonstrates that the Department recognizes that closed cycle cooling could be unavailable because of site-specific conditions at the Indian Point stations. See Entergy Reply, at 20-21.

Riverkeeper writes in support of Department staff's opposition to Entergy Issue 5, stating that "adjudicating the 'availability' of the closed-cycle cooling technology for the Stations . . . is unnecessary and improper." Riverkeeper Reply, at 5-6. Riverkeeper asserts that "[t]he very fact that EPA and the Department have considered closed-cycle cooling viable for [several existing power stations along the Hudson River] . . . refutes Entergy's argument . . . that there is a need to adjudicate the 'availability' of closed-cycle cooling for the [Indian Point] Stations." Id. at 8. Moreover, Riverkeeper notes that there have been a series of reports that considered retrofitting the Stations and that "[b]ased on these reports, although retrofitting closed-cycle technology to Indian Point presents a number of economic and engineering issues, none of

these issues relate to the general 'availability' and 'practicability' of a closed-cycle cooling system for the Stations." Id. at 10.

As previously noted, EPA suspended the Phase II rule in response to the Second Circuit's decision in Riverkeeper II. Of particular note is the court's discussion of EPA's decision not to designate closed cycle cooling as BTA. The court cites EPA's use of the phrase "not economically practicable," the very phrase from the Phase II rule cited by Entergy, as part of the court's "deepen[ing]" concern that EPA impermissibly undertook cost-benefit analysis in determining BTA. Riverkeeper II, at 102. Moreover, the Phase II rule indicated that flow reduction "commensurate with a closed-cycle" system was a compliance alternative. Phase II rule, 40 CFR 125.94(a)(1)(i). Furthermore, Riverkeeper appropriately notes that the record is replete with demonstrations that closed cycle cooling is an available technology for power generating facilities.

BTA determinations are site-specific. In making this determination, the Department applies the four-step BTA analysis, using its best professional judgment. The issue of whether closed cycle cooling is an available technology for the Stations will be adjudicated in the context of Entergy Issues 2 and 4, and this Entergy Issue 5 shall not be adjudicated separately.¹⁹

Entergy Issue 6

ALJ Villa, in the Issues Ruling, modified Entergy's Issue 6 for purposes of adjudication to read as follows:

"[W]hether the costs associated with retrofitting the Stations with a closed cycle cooling system are wholly disproportionate to the environmental benefits to be gained, compared to other available alternative technologies." Issues Ruling, at 31.

Department staff argues that this issue is similar to Entergy Issue 3 and, therefore, these two issues should be consolidated. Staff restates its concern, noted in its challenge to Entergy Issue 3, that the Issues Ruling invites an inappropriate comparison of the proposed technology with other alternatives. Riverkeeper also considers this issue to be interrelated with Entergy Issue 3 and advances the same arguments

¹⁹As noted, Entergy Issue 3 will be adjudicated as part of Entergy Issue 2.

for clarification in relation to both issues. See Riverkeeper Appeal, at 2-11.

Entergy notes that its comments on the draft permit "include extensive discussion of its position that the costs of retrofiting the Stations with closed-cycle cooling are wholly disproportionate to any purported environmental benefit." Entergy Reply, at 23. Entergy argues that staff's arguments demonstrate the existence of a factual dispute over a substantial condition of the draft permit and, therefore, the ALJ properly held the issue is adjudicable.

The Department's BTA determinations are not based on a cost-benefit analysis. However, as discussed, comparisons of the cost-effectiveness of technologies that achieve essentially the same environmental benefit are appropriate. Because the fourth step of the BTA analysis will be adjudicated as part of Entergy Issue 2 (as modified by this decision), adjudication of Entergy Issue 6 will be subsumed within the adjudication of Entergy Issue 2. Accordingly, Entergy Issue 6 shall not be separately adjudicated.

Entergy Issue 7

The ALJ modified Entergy's proposed Issue 7 regarding outages, and rephrased it as follows:

"[W]hether planned fish protection outages, which would limit the amount of water withdrawn with corresponding effects on the Stations' capacity, are an appropriate interim measure during the design and construction phases of closed cycle cooling implementation at the Stations." Issues Ruling, at 34.

Department staff argues that this ruling should be overturned for several reasons. First, staff asserts that the 42-day forced outage requirement contained in the draft permit is "derived directly from the two SPDES permits previously issued for Indian Point Units 2 and 3." Staff Appeal, at 21. Staff cites to permits issued in 1982 and 1987, both of which "expressly incorporated" requirements, including the 42-day forced outage provision, contained in the Hudson River Settlement Agreement ("HRSA"). Id. Moreover, staff argues, as the transferee of the 1987 permit, "Entergy's failure to challenge the outage condition for Indian Point in a timely manner constitutes a waiver of its right to challenge those special conditions now." Id. at 23 (citations omitted).

Staff states that the applicable statute of limitation for challenging a condition of a SPDES permit is that established for an Article 78 proceeding. According to staff, this provides for a sixty day period (or in other circumstances four months) for a transferee to challenge a condition set forth in the permit being transferred. In the instant matter, Entergy's request to have the SPDES permit for the Stations transferred from Consolidated Edison and the New York Power Authority to Entergy was approved by the Department in 2001 and 2000, respectively. Thus, staff argues, the statute of limitation for challenging the outage provision has long since expired. See Staff Appeal, at 23-24.

Entergy responds that the provision is not a mere continuation of an existing permit condition. Rather, Entergy argues, the outage provision represents a substantial modification to the permit and, "[t]hus, Entergy may challenge this and any other modifications proposed by Department staff." Entergy Reply, at 29 (citations omitted). According to Entergy, the HRSA has expired, as have the series of consent orders that extended certain HRSA provisions. Thus, "[t]he instant Proceeding represents Entergy's first - and only - opportunity to challenge these conditions." Id. at 31.

Department staff's various arguments relating to the timeliness of Entergy's challenge to the forced outage provision are unpersuasive. As the ALJ ruled, Entergy Issue 7 concerns a dispute between Department staff and the applicant that "relates to a substantial condition of the draft SPDES permit, and is therefore adjudicable pursuant to Section [624.4](c)(1)(i) of 6 NYCRR." Issues Ruling, at 34.

Regardless whether the forced outage provision is a carryover provision that was contained in prior permits, it is plainly a provision of the draft permit under consideration here. As such, this proceeding provides an appropriate forum for the permittee to challenge the forced outage provision. See 6 NYCRR 624.2(m) (defining a "draft permit" as "a document prepared by department staff which contains terms and conditions staff find are adequate to meet all legal requirements associated with such a permit, but is subject to modification as a result of public comments or an adjudicatory hearing") (emphasis supplied).²⁰

²⁰ Department staff cites no provision of law or regulation that precludes an issue from adjudication solely because it relates to a permit condition that is being renewed. In the absence of such an express preclusion, an issue that relates to a dispute between Department staff and the applicant over a substantial term of a draft

Proceeding to the merits of this permit condition, Entergy argues that the forced outage requirement is "unjustifiable, contrary to the legal standard, arbitrary and capricious, and a temporary taking." Entergy Reply, at 25. Entergy asserts it will "establish that operation of the Stations has not resulted in an adverse environmental impact" and, therefore, it "disputes whether there is a factual basis for the imposition of any forced outage." Id. at 26 (emphasis in original). Entergy also argues that the forced outages will temporarily deprive Entergy "of all economically beneficial use of [the power stations], resulting in a taking subject to compensation under . . . the Constitution of the United States," (id. [citations omitted]), and that it is entitled to compensation for forced outage periods. See Issues Ruling, at 32.

In response to Entergy's takings claim, Department staff argues that the regulatory scheme serves a legitimate public interest and that the forced outage provision furthers that purpose. In addition, staff asserts that the 42-day outage only results in approximately 15 additional days of outage because refueling the units requires approximately 28 days and water intake will be minimal during that time. Thus, any loss in energy production will be limited and short-lived. Staff further argues that Entergy has made no offer of proof to establish that "it would experience any economic loss or deprivation that could be recognized as a taking." Staff Appeal, at 27 (citations omitted).

The question whether the forced outage provision constitutes a taking under the U.S. Constitution is not an appropriate matter for adjudication in this administrative proceeding. In Matter of Haines v Flacke, 104 AD2d 26 (2d Dept 1984), the Appellate Division denied petitioner's request for an order directing the Department to "hold an evidentiary hearing on the taking issue." Id. at 33. The court held that "[t]he proper practice is to assert such a claim in the proceeding seeking judicial review and to buttress that claim with a supporting affidavit outlining the basis for the confiscation claim. . . . Therefore, the evidence on the confiscation issue must be presented to Special Term."

permit, regardless whether that term is pre-existing or new, is an appropriate issue for adjudication. See 6 NYCRR 624.4(c)(1). Furthermore, in this matter, disagreement exists as to whether the forced outage provision is simply a "carryover" provision. See, e.g., Entergy Reply, at 29 (Stations have not been subject to forced outages for years); Issues Conference Transcript, at 128 (Riverkeeper position that outage requirements in draft permit are more lax than prior requirements).

Id.; see also Matter of Brotherton v Department of Env'tl. Conservation, 189 AD2d 814, 816 (2d Dept 1993). Moreover, the issue whether the imposition of an environmental control constitutes a temporary taking is not relevant to the determination whether such an environmental control satisfies statutory and regulatory standards under the federal CWA, the ECL, and the applicable regulations and, thus, is not relevant in a permit hearing proceeding under Part 624. Accordingly, the taking issue proposed by Entergy will not be considered in this administrative proceeding.

Pursuant to ECL 17-0815(7), it is within the Department's discretion to include in a permit "such other terms, provisions, requirements or conditions as may be necessary to meet the requirements of the [Clean Water] Act."²¹ Here, Department staff has determined that the fish protection outages are a necessary interim measure. To conform the phrasing of this issue with the standard set forth under ECL 17-0815(7) and to reflect that alternative technologies to closed cycle cooling may be considered in this proceeding, Entergy Issue 7 is revised to read:

"Whether the planned fish protection outages, which would limit the amount of water withdrawn with corresponding effects on the Stations' capacity, are a necessary interim measure prior to the implementation of BTA at the Stations."

Entergy Issue 7 identifies a substantial term of the draft permit that Entergy seeks to modify over the objections of Department staff. Accordingly, this issue shall be adjudicated.

Entergy Issue 8

ALJ Villa modified Entergy's proposed Issue 8 relating to flow reductions as follows:

"[W]hether flow reductions, which would limit the amount of water withdrawn with corresponding effects on the Stations' capacity, are an appropriate interim measure during the design and construction phases of

²¹ The Clean Water Act contains a similar provision. See 33 U.S.C. § 1342(a)(1) (providing that "the Administrator may . . . issue a permit for the discharge of any pollutant . . . [with] such conditions as the Administrator determines are necessary to carry out the provisions of this chapter").

closed cycle cooling implementation at the Stations." Issues Ruling, at 34-35.

Department staff states that the flow reduction provisions, like the permit condition addressed in Entergy Issue 7, are long-standing conditions carried over from earlier versions of the permit, and incorporate flow restrictions established under the HRSA. Staff argues that Entergy's proposed issue is time-barred. Staff also asserts that the condition is necessary to fulfill State and federal statutory requirements for maintaining water quality standards. See Staff Appeal, at 29-30.

Entergy again argues that the HRSA has expired and is no longer germane to this process. Entergy asserts that the HRSA has been supplanted by orders on consent that "authorize the Stations to utilize efficient flows, rather than the more restrictive flows in the Draft Permit." Entergy Reply, at 36 (citation omitted).

For the reasons discussed under Entergy Issue 7 (see supra), I hold that the ALJ properly determined that Entergy Issue 8 is adjudicable. As with Entergy Issue 7, I am revising Entergy Issue 8 to incorporate the standard for permit conditions established by ECL 17-0815(7) and to reflect that alternative technologies to closed cycle cooling may be considered in this proceeding. The issue for adjudication shall read as follows:

"Whether flow reductions, which would limit the amount of water withdrawn with corresponding effects on the Stations' capacity, are a necessary interim measure prior to the implementation of BTA at the Stations."

Entergy Issue 9

The ALJ modified Entergy Issue 9, limiting the inquiry to the following:

"[What] methodology [is] to be employed to establish the Stations' compliance with the requirements of [6 NYCRR 704.2]." Issues Ruling, at 36.

No appeals were filed with respect to this issue, and it shall, as modified by the ALJ, advance to adjudication.

Entergy Issue 10

The Issues Ruling determined the following issue to be adjudicable:

"Whether the Department appropriately should require Entergy to conduct River-wide biological monitoring, and if so, whether the Department appropriately should require Entergy alone to bear the cost of such monitoring, which historically has been financed by a consortium of station owners." Issues Ruling, at 36.

Department staff argues for reversal of the Issues Ruling determination to adjudicate this issue. Staff argues that "[a]s with the subjects of proposed issues 7 and 8 . . . [the requirement for river-wide monitoring] is a longstanding express condition of the Indian Point SPDES permits and review of this condition . . . is time barred as well." Staff Appeal, at 31. Staff also states that this requirement is necessary to fulfill requirements pertaining to maintenance of water quality standards.

Entergy briefly reiterates its position that it is not time-barred from raising this issue in this proceeding. Entergy also argues that Department staff's assertions that this requirement is a mere continuation of an existing permit provision and is temporary are both misleading. Entergy asserts its participation in the river-wide monitoring program was voluntary under both the HRSA and the subsequent consent orders.

Entergy challenges any assertion that this provision is temporary because the draft permit requires Entergy to fund the program "during the entire permit term." Entergy Reply, at 39 (citation omitted) (emphasis supplied by Entergy). Entergy also notes that Department staff has not cited, and Entergy is unaware of, any instance where the Department required a station to undertake biological monitoring "outside the sphere of influence of a station." Id.

Entergy, which previously was one of several entities funding the program, would under the draft permit be the sole funding source. For the reasons discussed under Entergy Issue 7 (see supra), I hold that the ALJ properly determined that Entergy Issue 10 is adjudicable. As with Entergy Issues 7 and 8, I am revising Entergy Issue 10 to incorporate the standard for permit conditions established by ECL 17-0815(7). The issue for adjudication shall read as follows:

"Whether the requirement for Entergy to conduct River-wide biological monitoring is necessary to meet the requirements of the Act, when the cost of such monitoring historically has been financed by a consortium of station owners."

Entergy Issue 11

The Issues Ruling determined the following issue to be adjudicable:

"Whether the Department inappropriately omitted from the Draft Permit provisions recognizing the emergency use of equipment and operation of the Stations." Issues Ruling, at 37.

Department staff argues that the fact "[t]hat the draft SPDES permit does not contain a condition with requirements or protocols dictating behavior for operating a nuclear power plant under emergency conditions in the State-wide electric system is not adjudicable in this forum." Staff Appeal, at 32. Staff states that it is not qualified to anticipate every emergency that may arise at the Stations nor is it qualified to determine the appropriate response thereto. Staff asserts that these concerns are better left to other regulators, such as the Nuclear Regulatory Commission. Id. at 32-33. Department staff further notes that the Department retains prosecutorial discretion in the event of noncompliance with a SPDES permit. Id. at 36.

Entergy argues that the SPDES permits should include provisions regarding operation of the Stations in emergency situations. Entergy states that it is "settled law" that safety concerns under the aegis of NRC take precedence over SPDES issues. Entergy Reply, at 41 (citation string omitted). Moreover, Entergy also states that the HRSA and the consent orders contain language similar to that sought by Entergy here, allowing the forced outage requirement to be excused "to the extent necessary, as certified by the chairman of the New York State Public Service Commission . . . to avoid an imminent and undue risk of an inadequate supply of electricity." Id. at 42-43.

What Entergy seeks here, however, is far broader than the narrow exception to the forced outage provision set forth in the HRSA. Entergy's request is for a provision that would

"allow[] the Stations to respond promptly to safety or reliability concerns without risk of

subsequent Department enforcement action, and to provide clear and reasonable guidelines for both the Stations and the Department in any subsequent enforcement proceeding for evaluating whether any particular action by the Stations falls within the emergency provisions." Entergy Reply, at 44.

There is no factual dispute that unforeseen emergency or reliability concerns may potentially arise at the Stations and that such emergencies may require the Stations to operate outside the parameters of the SPDES permit. The question presented by Entergy Issue 11 is whether a Department SPDES permit must include a provision precluding or limiting the risk of subsequent Department enforcement action in the wake of an emergency. No requirement exists for such a provision to be incorporated into Department permits and, based on the issues conference record, no sufficient offer has been made for the inclusion of such language here. Accordingly, Entergy Issue 11 shall not be adjudicated.²²

Entergy Issue 12

The Issues Ruling determined the following issue to be adjudicable:

"Whether the Department has appropriately implemented SEQRA initially and in its efforts to unilaterally modify the Existing Permit." Issues Ruling, at 37.

Entergy argues that the Department failed to appropriately implement SEQRA in the Department's consideration of the SPDES

²² Entergy's reliance on the Phase II rule in support of its position is misplaced. As Entergy notes, the preamble to the final rule states that EPA added language to the rule to ensure that "in cases of conflict between an EPA requirement under this rule and an NRC safety requirement, the NRC safety requirement take[s] precedence." See Entergy Reply, at 41; Preamble to the Phase II Rule, 69 Fed Reg 41585. The Phase II rule, however, contained an express provision that, in the event of a conflict between an EPA BTA determination and an NRC safety requirement, "the [EPA] Director must make a site-specific determination of [BTA] . . . that would not result in a conflict." 40 CFR 125.94(f). Here, Entergy has not argued that any condition of the draft permit conflicts with an NRC safety requirement. Accordingly, even if the Phase II Rule were controlling, it would not require a permit provision "recognizing the emergency use of equipment and operation."

permit renewal application. Entergy asserts that the Department had not accounted for the adverse effects of the proposed BTA on the electric system, air quality and aesthetics. According to Entergy, the potential visual impacts associated with cooling tower components and plumes, the frequency and duration of visible plumes and their anticipated size, and the potential effects of plumes on vegetation and highway safety would have to be considered as part of the review pursuant to SEQRA and would have to be taken into account in any final BTA determination. Such impacts might lead, for example, to changes in the height and size of cooling towers or their location. Entergy also argues that air quality issues attributable to emissions from the installation and operation of a proposed BTA would need to be addressed, as appropriate.

In evaluating Entergy's SEQRA argument, the ALJ concluded that the impacts of the installation of cooling towers at the Stations on aesthetics, air quality and the electric system must be considered at the adjudicatory hearing. According to the ALJ, Entergy's comments would be considered in the adjudication of the BTA determination (Entergy Issue 2) and the Department's assessment of costs and benefits (Entergy Issue 3).

Department staff seeks to have this issue clarified and narrowed. Staff argues that "[a]ny inquiry as to the purported impact of the draft SPDES permit on aesthetics, air quality, and the electric system must necessarily be an inquiry into the SEQRA process for this SPDES permit renewal and Department-initiated modification" and "is per se not an element of the inquiry made by Department Staff to make a BTA determination." Staff Appeal, at 37. Staff further argues that "[t]o the extent there is any inquiry, it may pertain to a SEQRA review and the Issues Ruling should limit it accordingly." Id.

While acknowledging the need to develop a complete record and to finalize the SEQRA process, Riverkeeper argues that it would be improper and unproductive to allow the adjudication of these issues (electric system, air quality, and aesthetics)." Riverkeeper Appeal, at 16 (parenthetical in original). Riverkeeper "concur[s] with Staff's request that . . . '[Entergy Issue 12] be clarified or narrowed'" to avoid extending the environmental impact assessment associated with the BTA analysis beyond the protection of water quality and aquatic resources. Riverkeeper Reply, at 11 (quoting Staff Appeal, at 37). As with Entergy Issue 2, Riverkeeper adds that "all applicable Federal, State and local requirements (e.g., visual impacts) will need to be complied with prior to installation and operation of any new facilities at the Stations." Id.

Entergy asserts that Department staff's challenge to Entergy Issue 12 "simply re-iterates [staff's] unfounded objection to the consideration of these factors [i.e., electric system reliability, air quality and aesthetics] in the BTA analysis, but raises no objection to their consideration in the context of SEQRA." Entergy Reply, at 55 (emphasis in original).

As discussed previously, the four-step BTA analysis does not consider the environmental impacts of a control technology, other than entrainment and impingement. However, the completion of that four-step analysis does not end the inquiry. Once BTA is proposed for a facility, the environmental impacts of the technology will be subject to SEQRA review.

The June 2003 "Final Environmental Impact Statement for State Pollutant Discharge Elimination System Permits for Bowline Point 1 and 2, Indian Point 2 and 3, and Roseton Steam Electric Generating Stations," expressly contemplated further scrutiny of the environmental impacts associated with the site-specific BTA chosen for the Stations. See, e.g., FEIS, at 4, 28. Although the FEIS examined some of the environmental impacts associated with closed cycle cooling at the Stations (see, e.g., FEIS, Appendix F-IV, ESSA Technologies Ltd., "Review of the Draft Environmental Impact Statement for SPDES Permits" [2000], at 26-27), the FEIS did not examine all site-specific environmental impacts associated with the actual construction and operation of closed cycle cooling at the Stations. The need for further SEQRA review was recognized during litigation over the FEIS. See, e.g., Matter of Entergy Nuclear Indian Point 2, LLC v New York State Dept. of Env'tl. Conservation, 3 Misc 3d 1070, 1073 (Sup Ct, Albany County 2004) ("[t]he FEIS on its face indicates that considerably more environmental review is necessary and is specifically contemplated").

Moreover, the Department, as lead agency, must make SEQRA findings prior to imposing any particular BTA through the SPDES permit for the Stations. See 6 NYCRR 624.4(c)(6)(i)(b); see also FEIS, at 28.

In recognition of these circumstances, the ALJ authorized supplementation of the SEQRA record to address the aesthetic, air quality and electric system impacts associated with closed cycle cooling at the Stations. See Issues Ruling, at 38-39.

Under the circumstances presented in this case, I conclude that the appropriate vehicle to address this environmental information is by a supplemental EIS ("SEIS"), applying the standards set forth in 6 NYCRR part 617. Pursuant to 6 NYCRR

617.9(a)(7), an SEIS may be required where specific significant adverse environmental impacts have not been adequately addressed in the environmental impact statement, where such impacts arise from changes to a proposed project, newly discovered information, or a change in circumstances related to the project.

Here, Department staff has proposed closed cycle cooling as BTA. However, the specific impacts of closed cycle cooling at the Stations, as well as such interim measures as flow reductions and fish protection outages proposed in the draft permit, were not fully examined in the FEIS. Likewise, the FEIS did not examine the impacts associated with any of the as-yet undeveloped alternatives to closed cycle cooling that Entergy may propose. Accordingly and in light of the unique circumstances of this case, an SEIS should be prepared to examine the significant adverse environmental impacts that are not already addressed in the FEIS for closed cycle cooling, the proposed interim measures, and any alternative technologies that Entergy may propose as BTA for the Stations. This examination should include an evaluation of potential impacts of closed cycle cooling at the Stations upon aesthetics, air quality, and electric system reliability, as identified by the ALJ. For purposes of this review:

- air quality impacts shall include impacts on air quality arising from particulate and other emissions from the operation of cooling towers;
- aesthetic impacts shall include the visual impacts of the cooling towers and any associated plumes (including the frequency and duration of any visible plumes and their anticipated size); and
- impacts on electric system reliability shall include the impacts of the construction and operation of the closed cycle cooling system, and any permit-required outages, on the provision of energy by the Stations. Sequential and simultaneous construction outages may be considered. Impacts on the use and conservation of energy shall also be considered. See 6 NYCRR 617.9(b)(5)(iii)(e).

In addition, the SEIS should address any other significant adverse environmental impacts that may be associated with closed cycle cooling relating to the above-referenced matters or other impacts, including but not limited to noise, icing and fogging, deposition on vegetation, blasting during the construction of closed cycle cooling, and other environmental impacts arising from construction activities. The SEIS should also consider any significant adverse environmental impacts associated with

proposed interim measures. Similarly, significant adverse environmental impacts associated with any alternative technology that may be proposed shall also be developed to ensure that the appropriate "hard look" is taken.²³

Because the final determination of whether closed cycling cooling is BTA for the Stations has not yet been made, nor have any alternatives to closed cycle cooling been developed, I conclude that it would be inefficient to remand the development of the draft SEIS to Department staff. Cf. Matter of Peckham Materials Corp., Interim Decision, January 27, 1992, at 5. Instead, administrative efficiency warrants using the adjudicatory proceeding to develop the draft SEIS and to address environmental impacts as discussed herein.

Accordingly, by this Interim Decision, Entergy Issue 12, as phrased in the Issues Ruling, is reframed to expand the scope of SEQRA review and to set forth a procedure for developing an SEIS. As the various technologies proposed by the parties as BTA for the Stations are presented at hearing, the proponents of each technology should present an analysis of the environmental impacts associated with such technologies pursuant to SEQRA. Other parties may also offer evidence concerning the impacts they assert will be associated with a proposed technology. Applying the standards established at 6 NYCRR 617.9(a)(7), the ALJ will be responsible for assuring that the impacts that the parties seek to develop are relevant and significant, and not otherwise adequately addressed in the FEIS.

At the conclusion of the hearing, the ALJ's hearing report will constitute the draft SEIS, and the SEQRA process shall be completed in accordance with the procedures established by 6 NYCRR 617. Accordingly, the ALJ at that time may remand the draft SEIS to Department staff to publish notice of completion of the draft SEIS and to receive public comments. See 6 NYCRR 617.9(a)(3). The determination whether to conduct further public comment hearings on the draft SEIS will be made consistent with the requirements of 6 NYCRR 617.9(a)(4). If a determination is made that a public comment hearing should be held pursuant to section 617.9(a)(4), the ALJ shall conduct the hearing.

After the period for written comments has passed, and after any hearing held pursuant to section 617.9(a)(4), Department staff shall prepare a response to comments. Staff shall then

²³ Pursuant to the SEQRA review, additional SPDES permit conditions may be imposed.

forward all comments and the response to comments to the ALJ for her review and consideration. The ALJ, as she may deem appropriate, shall have the discretion to modify the procedural steps set forth herein with respect to the consideration of the SEIS, as long as such modifications satisfy the applicable SEQRA requirements in 6 NYCRR part 617.

After conducting any further proceedings the ALJ deems appropriate, the ALJ shall prepare a supplemental hearing report. The supplemental hearing report, together with the draft SEIS, the comments, and the response to comments, shall constitute the final SEIS, and shall be forwarded to the Commissioner. The final Commissioner's decision will include the required SEQRA findings for the technology that is determined as BTA for the Stations, and will be based upon the 2003 FEIS and the SEIS developed through this hearing process.

Condition 29 of the Draft SPDES Permit

As noted in the Issues Ruling, Entergy also requested that Condition 29 of the draft SPDES permit, which requires Entergy to pay \$24 million into an escrow account established for the benefit of the Hudson River Estuary Restoration Fund, be deleted. The ALJ advanced this matter to adjudication. See Issues Ruling, at 40-41.

Department staff requests a "narrowing or clarification" of the inquiry into how the dollar amount for the Hudson River Estuary restoration, enhancement and protection programs was derived. Staff Appeal, at 38. Staff argues that "to the extent this matter is adjudicated at all, participants [should] be directed to address this as an interim SEQRA measure, effective only until commencement of construction of the Department's BTA condition (closed cycle cooling)." Id. (parenthetical in original).

Entergy argues that this provision should be deleted from the permit and that, if it is not deleted, Department staff should clarify how the \$24 million figure was derived. Entergy Reply, at 36. Entergy states that "the ALJ properly ruled that this issue should be adjudicated as it involves a substantial condition of the permit," but Entergy also states that it "reserves all of its rights to challenge both the factual and legal bases" for imposing the \$24 million restoration fund. Id. at 37.

I reject Entergy's request to strike the provision from the permit at this juncture. Entergy, however, may challenge the

legal, as well as the factual, basis for this permit condition during the adjudicatory hearing. Similarly, Department staff (as well as intervenors) may assert whatever legal or factual bases it deems appropriate in support of the condition. I do not see a reason, based on the arguments presented on the appeals, to limit adjudication of this issue, as requested by Department staff.

With respect to this issue, I direct Department staff to provide information regarding how the \$24 million figure in Condition 29 was derived to Entergy and intervenors prior to the commencement of the adjudicatory hearing in accordance with a schedule established by the ALJ.

Issues Raised by Riverkeeper

As previously noted, four of Riverkeeper's five issues were advanced to adjudication. These include the following:

1. Whether closed cycle cooling, augmented by design protections such as wedgewire and Ristroph screens, is the best technology available to minimize Indian Point's adverse environmental impacts;
2. Whether closed cycle cooling is available technology at Indian Point within the five year SPDES permit period or shortly thereafter;
3. Whether the "technologies" required by the permit will not equal or even approach the protection offered by closed cycle cooling; and
- 5.²⁴ Whether DEC would unnecessarily delay implementation of BTA requirements years after the expiration of the permit.

Department staff requests that the four Riverkeeper issues that were accepted by the ALJ for adjudication be consolidated into a single issue as follows: "[w]hether closed cycle cooling can be implemented within the first five-year SPDES permit term." Staff Appeal, at 38. According to Department staff, Riverkeeper's first issue "can be subsumed within Entergy's second and fifth questions" which, "in combination, ask whether closed cycle cooling is BTA and whether closed cycle cooling is

²⁴ As a result of discussions between Department staff and Riverkeeper, Riverkeeper advised the ALJ that it was withdrawing its issue denominated as "4." See Issues Ruling, at 43-44.

an available technology for making a BTA determination." Staff Appeal, at 39 (underscoring omitted). Staff further states that Riverkeeper's second and fifth issues are "fairly included in" staff's restatement of Riverkeeper's first issue. Finally, staff argues that Riverkeeper's third issue is "superfluous" because it inappropriately "attempts to equate the Department's interim measures with Staff's BTA determination." Id.

Riverkeeper argues that, because Department staff did not raise an objection to the issues Riverkeeper proposed for adjudication during the issues conference or in subsequent written arguments authorized by the ALJ, Department staff's request is "improper and unnecessary." Riverkeeper Reply, at 13. Notwithstanding the foregoing, Riverkeeper offers to consolidate its issues, but in a manner that "preserv[es] the integral nature of the issues and the corresponding offers of proofs." Id. at 14. Specifically, Riverkeeper proposes to adjudicate Riverkeeper Issues 1 and 5. Riverkeeper states that Riverkeeper Issues 2 and 3 may be subsumed into Riverkeeper Issue 1, again provided that "the offers of proof related to th[ese] issue[s] are preserved." Id. at 17.

Riverkeeper's position that the objections of Department staff to the Riverkeeper issues are untimely is correct. The appropriate time for staff to raise argument in opposition to a proposed issue for adjudication is at the issues conference, not initially on appeal (see, e.g., 6 NYCRR 624.4(b)(2)(iii) [stating that a purpose of the issues conference is "to hear argument on whether disputed issues of fact that are not resolved meet the standards for adjudicable issues"]). No arguments have been advanced that warrant consideration of Department staff's objections at this time.

None of the participants in the issues conference objected to the adjudication of Riverkeeper's proposed issues. See Issues Ruling, at 42. Neither the ALJ, Riverkeeper nor the other participants had the opportunity to address or consider staff's request (first raised on appeal) to combine Riverkeeper's issues at the issues conference. To allow such matters to be raised by a party at a stage subsequent to the issues conference would result in serious inefficiencies in the permit hearing process. It is essential to the administrative process that matters be raised in a timely fashion so that they may be considered fully and in a manner that will not result in prejudice to the other parties. See, e.g., Matter of Saratoga County Landfill, Second Interim Decision of the Commissioner, October 3, 1995, at 2; Matter of the Town of Brookhaven, Interim Decision of the Commissioner, July 27, 1995, at 5.

In accordance with Riverkeeper's proposal to consolidate its issues, Riverkeeper's Issues 2 and 3 shall be subsumed within, and adjudicated as part of, Riverkeeper Issue 1. Riverkeeper's offers of proof related to Issues 2 and 3 shall be considered as part of the adjudication of Riverkeeper Issue 1. Riverkeeper Issue 5, as set forth above, shall also be adjudicated.

Riverkeeper further offered to subsume its Issue 1 into Entergy Issue 2 if the latter were clarified or narrowed in a manner consistent with Riverkeeper's appeal. Riverkeeper's Issue 1, as consolidated with Riverkeeper Issues 2 and 3, overlaps with Entergy Issue 2, as set forth in this Interim Decision. I will, however, defer to the ALJ whether it would be more administratively efficient to adjudicate Riverkeeper Issue 1 (as consolidated) and Entergy Issue 2 jointly or separately.

PARTY STATUS

African American Environmentalist Association ("AAEA")

AAEA filed a timely petition for party status in this proceeding. See IC Exh 4. AAEA's petition stated that it was seeking party status to bring its "unique perspective to the Indian Point . . . permitting process and to raise the issue of environmental justice." Id. at 3.²⁵

AAEA argued that in order to reduce impingement and entrainment of fish in the Hudson River, the draft SPDES permit "substantially limits" the Stations' ability to generate electricity and might lead to reduced energy production or possibly even their closure. See id. at 1. According to AAEA, other nearby fossil fuel burning electric generation plants would then be called upon to supply electric power to the region, with a corresponding increase in air pollution and decrease in air quality in low-income and minority communities, where most such plants are located. Thus, AAEA argues, the permits would cause adverse air quality impacts and these impacts would be

²⁵ To the extent that AAEA is relying on Commissioner's Policy 29 (Environmental Justice and Permitting) ("CP-29"), that reliance is misplaced. CP-29 applies to permit applications received after its effective date, and in this instance, the SPDES permit application was received years prior to the effective date of CP-29. Notwithstanding the foregoing, an environmental justice issue that is raised by a party that is entitled to party status and meets the standard for an adjudicable issue (see 6 NYCRR 624.4[c] & 624.5[d]) may be considered.

disproportionately borne by low-income and minority communities.

At the issues conference, both Department staff and Riverkeeper raised objections to AAEA's petition and the issues that it raised. See Issues Ruling, at 47-48. Entergy indicated that it had no objection to the environmental interest advanced by AAEA, nor did it object to any of the issues AAEA proposed for adjudication. Id. at 47.

The ALJ granted AAEA's petition for full party status and consolidated AAEA's three issues into one: "whether the draft SPDES permit has considered adequately the impacts on air quality if a closed-cycle cooling system is installed at the Stations." Id. at 49.

Department staff, in its appeal, contends that AAEA's concerns arise from its "erroneous assumption" that the Stations will be offline for such an extended amount of time that significant adverse air quality impacts will result. Id. at 43. Staff asserts that only a limited number of additional days of shutdown will be necessary to implement the 42 day outage provision in the draft permit. Department staff also maintains that, in the event that generation is reduced at the Stations, any replacement generation sources must comply with their permit conditions, which establish limitations protective of human health. Id. at 44.

AAEA, in its reply, argues that it has demonstrated an "environmental interest" in the proceeding and has raised a substantive and significant issue that supports its request for full party status in this proceeding. Entergy, in its reply, maintains that the ALJ correctly granted party status to AAEA and that AAEA has proposed a substantive and significant issue for adjudication. See Entergy Reply, at 61-62.

By regulation, an ALJ's ruling of entitlement to full party status is based on the following:

"(i) a finding that the petitioner has filed an acceptable petition pursuant to paragraphs (b) (1) and (b) (2) of [6 NYCRR 624.5];

"(ii) a finding that the petitioner has raised a substantive and significant issue or that the petitioner can make a meaningful contribution to the record regarding a substantive and significant issue raised by another party; and

"(iii) a demonstration of adequate environmental interest."
6 NYCRR 624.5(d)(1)(i)-(iii).

For purposes of party status, a potential party's assertions cannot be simply conclusory or speculative but must have a factual or scientific foundation. See Matter of Bonded Concrete, Interim Decision of the Commissioner, June 4, 1990, at 2; see also Matter of Ramapo Energy Limited Partnership, Interim Decision of the Commissioner, July 13, 2001, at 5. Conducting an adjudicatory hearing "where 'offers of proof, at best, raise [potential] uncertainties' or where such a hearing 'would dissolve into an academic debate' is not the intent of the Department's hearing process." Matter of Adirondack Fish Culture Station, Interim Decision of the Deputy Commissioner, August 19, 1999, at 8.

AAEA's petition for party status and the contentions that it has raised meet, albeit narrowly, the regulatory standard. AAEA has raised an issue with respect to potential negative impacts on air quality in environmental justice communities that is adjudicable in the SEQRA portion of the hearing. These impacts relate to circumstances when, pursuant to the conditions in the draft SPDES permit, the Stations will be offline or will be required to reduce their generating capacity. Accordingly, AAEA shall have full party status in this proceeding.

In addressing this issue in the adjudicatory proceeding, generalized and nonspecific arguments will not be sufficient. AAEA should present evidence regarding air quality impacts on specific environmental justice communities, and should address the extent to which such impacts on those communities are disproportionate. In support of its contentions, AAEA should identify those power plants that would be expected to provide replacement energy during offline or reduced generation periods and that would be the sources of negative impacts on air quality. AAEA should also identify the specific air pollutants of concern.²⁶

²⁶ I note, however, that other general matters upon which AAEA proposes to offer testimony, including the negative health effects of fossil fuel plants, and the number of power plants in minority communities in the Hudson Valley/New York metropolitan area (see IC Exh 4, at 15-16), of themselves, lack sufficient specificity and do not raise any substantive and significant issues. Such testimony would be only relevant to the extent that it is directly tied to the potential negative impacts on air quality in environmental justice communities when, pursuant to the conditions in the draft SPDES permit, the Stations will be offline or will be required to reduce

New York State Department of Public Service ("DPS")

Entergy moved to join DPS as a party in this proceeding. In denying the motion, ALJ Villa noted that the Department's hearing regulations do not provide for mandatory joinder, and that DPS had not sought to intervene in this proceeding. See Issues Ruling, at 20-21. She also noted that counsel for DPS indicated that it would "act in an advisory capacity [to DEC staff], provide testimony, and participate in any adjudicatory hearing." Id. at 21.

Entergy appeals the denial of its motion, contending that a fair adjudication and complete record require DPS's participation as a full party in this proceeding. In support of its position, Entergy argues that an ALJ had compelled DPS to participate as a full party in another proceeding (see Matter of Besicorp-Empire Development Co. ["Matter of Besicorp"], Hearing Report and Recommended Decision of the ALJ, January 9, 2004), and that the circumstances of this matter warrant the same action.

Entergy further maintains that the anticipated "consulting relationship" between DPS and DEC violates Entergy's due process rights. As a result of this relationship, Entergy states that it would be unable to subpoena and cross-examine DPS's experts and to conduct full discovery. In addition, Entergy contends that DPS's unique legislative mandate, expertise and history compel DPS's independent involvement in this proceeding on public policy grounds.

Department staff, after addressing misstatements it alleges were made in Entergy's appeal, contends that the pending SPDES permit application does not trigger any jurisdictional authority of DPS, the Public Service Commission or the New York State Board on Electric Generation Siting and the Environment ("Siting Board"). Department staff also disputes Entergy's claim that Entergy would be denied due process if DPS were not joined as a party. Department staff notes that, in the event that DPS were to file testimony in this proceeding, Entergy would have the opportunity to cross-examine the DPS staff witnesses. Department staff also rejects the argument that Matter of Besicorp provides precedent to compel DPS to be made a party. Finally, Department staff contends that DPS is not a necessary party to this proceeding.

Riverkeeper and Assemblyman Brodsky also oppose Entergy's

their generating capacity.

appeal seeking to include DPS as a party. Riverkeeper maintains that a full and complete record and fair adjudication would be achieved without imposing full party status on DPS. Riverkeeper also maintains that the current role of DPS in the proceeding does not deny Entergy due process. See Riverkeeper Reply, at 18-22. Assemblyman Brodsky argues that no legal precedent exists for joining DPS to this DEC administrative proceeding as an indispensable party and that such joinder would be against public policy. See Brodsky Reply, at 9-15. He similarly contends that Matter of Besicorp affords no precedent in support of Entergy's motion. See id. at 12-13.

I affirm ALJ Villa's denial of Entergy's motion. The pending SPDES permit application does not implicate the jurisdictional authority of DPS, the Public Service Commission or the Siting Board. Nor do the provisions of DPS's general statutory authority mandate party status for DPS. DPS has not requested or otherwise filed for party status in this proceeding, nor is it a mandatory party for purposes of a Part 624 proceeding. See 6 NYCRR 624.5(a). DPS clearly has the discretion to determine the manner of its participation.²⁷

Entergy has not cited any statute or regulation that would require compulsory joinder of a state agency in this proceeding. Entergy's reliance on Matter of Besicorp as support for its motion is misplaced. The two proceedings are distinguishable. The Besicorp proceeding involved an application subject to review pursuant to article X of the Public Service Law and the Environmental Conservation Law, where a single record was being made for both proceedings. See Matter of Besicorp, Hearing Report and Recommended Decision of the ALJ, January 9, 2004, at 5, 9. In contrast to Matter of Besicorp where the application was subject to the jurisdiction of both DEC and the Siting Board, the instant proceeding is solely before a Department ALJ to determine whether a DEC SPDES permit should be issued pursuant to the Environmental Conservation Law and the authority delegated to the Department pursuant to the federal Clean Water Act. Full party status for DPS is not required to develop the record on this SPDES application for which DEC has sole jurisdiction.

²⁷ Counsel for DPS advised that the question of DPS's participation in this proceeding "was raised with [DPS] senior management, with the chairman, and the decision was made that DPS would participate by continuing to assist DEC staff." IC Tr, at 18. DPS Counsel further noted that he thought DPS staff "would present testimony on the areas of [its] expertise with respect to issues that [are determined] to be adjudicable." Id. at 19.

Entergy's reliance on other authorities is also misplaced. For example, Entergy cites Matter of Stissing Valley Farms, Inc. in support of its position. In that proceeding on a mining permit application, the ALJ noted that certain traffic issues were under the jurisdiction of the Dutchess County Department of Public Works (the "DPW"), which had not sought party status in the proceeding. The ALJ indicated that the applicant was not relieved from obtaining whatever local approvals were necessary, and directed that copies of submissions on traffic issues be forwarded to the DPW. See Matter of Stissing Valley Farms, Inc., Issues Ruling of the Administrative Law Judge, November 4, 1996, at 23. The ALJ did not, however, direct that the DPW participate in DEC's proceeding.

Furthermore, Entergy's due process arguments are rejected. To the extent that DPS staff testifies in this proceeding, such staff will be subject to cross-examination by Entergy, and any related discovery will be available in accordance with the discovery provisions of 6 NYCRR part 624. See 6 NYCRR part 624.7(b) & (c). Entergy may also, consistent with the New York Civil Practice Law and Rules, issue subpoenas in this proceeding. See 6 NYCRR 624.7(f).

I have further considered the case law that Entergy has referenced, and based upon my review of the record, the legal authorities and the arguments in the respective briefs, I find Entergy's arguments to be unavailing. For example, Entergy equates DPS's role in this proceeding to the role of witnesses that it argues was rejected by the Appellate Division in Matter of Alvarado v State, 110 AD2d 583 (1st Dept 1985). See Entergy Appeal, at 17-18. In Alvarado, witness reports were introduced without the witnesses' testifying and no opportunity was provided for cross-examination. See Alvarado, at 584-85; see also Borchers & Markell, New York State Administrative Procedure and Practice, § 3.8, at 48-49 (noting "general agreement" that the right of cross-examination extends only to those witnesses that appear, and to the extent that Alvarado suggests otherwise is "clearly dictum"). In this proceeding, DPS staff who submit testimony will be subject to discovery in accordance with 6 NYCRR part 624 and will be available for cross-examination by the other parties.

Entergy also cites to Matter of Doe v Axelrod, 123 AD2d 21 (1st Dept 1986), revd, 71 NY2d 484 (1988), for the proposition that it is "entitled to have access to DPS in an unfettered manner." Entergy Appeal, at 14. That decision, which addressed whether individuals who have filed complaints regarding medical misconduct should be produced as witnesses in the face of

countervailing considerations for their confidentiality, is inapposite here. Discovery and the right to cross-examination will be available in the instant proceeding. Furthermore, Entergy's arguments that the State Administrative Procedure Act is violated because of an inability to conduct cross-examination are similarly lacking in merit.

Entergy also cites to the requirement in SAPA § 302(2) that an agency make a complete record of all adjudicatory proceedings conducted before it in support of its argument that DPS is required to be a full party to this proceeding. Again, however, DPS has no jurisdictional authority over DEC's consideration of this SPDES application, and its participation as a party is not required for a complete record. Furthermore, DPS will have the same opportunity as the public and other agencies to provide comments on the SEIS in accordance with the requirements of SEQRA. See Entergy Issue 12, supra.

I note also that Entergy has the right, pursuant to the State's Freedom of Information Law, to request access to publicly available records directly from DPS for Entergy's use in this proceeding.

The ALJ's denial of Entergy's motion is affirmed.

OTHER MATTERS

I have reviewed the remaining appeals to the ALJ's Rulings not specifically addressed here and find no reason to overturn the ALJ on these other matters.

BURDENS OF PROOF

In its appeal of Entergy Issue 5, Department staff argues that it will be Entergy's burden to show that the Department's selection of BTA technology does not meet regulatory requirements. See Staff Appeal, at 17. Department staff cites to Matter of Athens for the proposition that the burden is on a permit applicant to demonstrate that the relative costs are unreasonable. See Matter of Athens, Interim Decision, June 2, 2000, at 15. Entergy, in its reply, argues that the burden of proof is on Department staff to demonstrate that closed cycle cooling "is feasible, practicable, and without wholly disproportionate cost to the Stations." Entergy Reply, at 16 n 12.

The parties' characterization of the burdens of proof at the evidentiary portion of the adjudicatory proceeding is incomplete and incorrect. As the party applying for permit renewal, Entergy has the burden of proof. See, e.g., State Administrative Procedure Act ("SAPA") § 306(1); 6 NYCRR 624.9(b)(3). Accordingly, Entergy has both the initial burden to produce evidence and the ultimate burden of persuasion to demonstrate that the permitted activity is in compliance with all applicable laws and regulations administered by the Department. See id.

To the extent Entergy proposes to modify the permit sought to be renewed, or proposes new conditions not approved by Department staff and agreed to by intervenors, Entergy must produce evidence demonstrating that its proposed modifications and conditions will be in compliance with all applicable laws and regulations administered by the Department. See id.

Department staff and intervenors (that is, Riverkeeper, AAEA and Assemblyman Brodsky) also bear burdens at the evidentiary stage of the proceeding. Each bears a burden to produce evidence either in rebuttal to Entergy's evidence or in support of contrary factual assertions, or both. See Matter of Karta Corp., Decision of the Executive Deputy Commissioner, April 20, 2006, at 4-5; Matter of St. Lawrence Cement Co., LLC, Second Interim Decision of the Commissioner, Sept. 8, 2004, at 126-127. Where, as here, applicant objects to permit conditions proposed by Department staff on the renewal that were not included in the original permit, staff bears a burden of production on those additional permit conditions. See Response to Comment, Part 624 Public Comment Responsive Document, 624.9 Evidence, Burden of Proof and Standard of Proof. Thus, Department staff will be required to produce evidence establishing the factual or legal basis of the conditions it proposes to which Entergy objects. See id.

Similarly, to the extent that an intervenor seeks the imposition of permit conditions that are not proposed by Department staff and not agreed to by Entergy or the other intervenors, it will bear a burden of production to establish the factual and legal basis of its proposed conditions.

At the close of the evidentiary hearing, Entergy bears the ultimate burden of persuasion that it is entitled to permit renewal subject to the modifications it proposes. Where factual matters are at issue, the standard of proof Entergy must satisfy is by the preponderance of the evidence. See 6 NYCRR 624.9(c).

At this stage of the proceeding, the parties have the

opportunity to present evidence in support of their positions on the identified issues. A party that fails to do so risks the possibility that an opposing party's position will prevail if the preponderance of the evidence supports that position.

CONCLUSION

I hereby remand this matter to Administrative Law Judge Maria E. Villa for further proceedings consistent with this Interim Decision.

For the New York State Department
of Environmental Conservation

By: _____/s/_____
J. Jared Snyder
Assistant Commissioner

Dated: August 13, 2008
Albany, New York

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***Department Staff Offer of Proof on
Permanent Forced Outages/Seasonal Protective Outages***

Introduction:

Pursuant to the Memorandum Ruling of DEC Administrative Law Judge Maria E. Villa dated October 18, 2013 (“Ruling”), this submission represents Department staff’s “offer of proof with respect to permanent forced outages as a BTA alternative” at Indian Point Units 2 and 3 to meet the requirements of 6 NYCRR §704.5 (*see*, Ruling at p. 8). This offer of proof is hereby provided in accordance with the Ruling and with a full reservation of rights by Department staff to further amend, supplement or otherwise augment such proof in the future, as appropriate, including at the time of hearings on permanent forced outages.

As provided in the Ruling, this offer of proof sets forth the potential efficacy and costs of seasonal protective outages (*i.e.*, “permanent forced outages”) as a BTA alternative that could be implemented at Indian Point in the event that Department staff’s preferred BTA alternative, closed-cycle cooling, is eliminated from consideration, either in part or in whole, after application of the Department’s 4-step BTA analysis and SEQRA review on closed-cycle cooling are completed. Pursuant to the Ruling, this offer of proof also provides clarification of and an explanation for the forced outage period (*i.e.*, 32-weeks) which was previously considered by Department staff in the November 12, 2003 fact sheet which accompanied the 2003 Draft SPDES permit (*see* Ruling at p. 8).¹

¹ DEC staff did not interpret the Oct. 18th Ruling to require this offer of proof to provide any input about potential reliability impacts (including, but not limited to, MAPS modeling) which could result from permanent forced outages. DEC staff understands that such information and analyses would be part of the forthcoming SEQRA-related aspects associated with the issue of outages, which will be undertaken at a time consistent with the schedule noted in the Ruling “with other subjects for inquiry related to this BTA alternative” (*see* Ruling, p. 8, at ¶2).

Background:

The 2003 fact sheet that was released with the Department's 2003 Draft SPDES permit for Indian Point pursuant to State Supreme Court Order [Albany County Index No. 7136-02, 2003] contained a discussion on a potential BTA alternative – referred to as “Generation Outages” – requiring a 32-week outage period (224 consecutive days) to be taken at both operating Units 2 and 3 from February 15 through September 15th each year. As stated in the fact sheet, this 32-week annual outage period was analyzed and rejected by Department staff as BTA for Indian Point (or “IPEC”) because the potential costs of this option would be approximately 62 percent of the gross annual revenue generated by Indian Point. Though this operational measure would essentially eliminate entrainment and reduce impingement mortality considerably when used in conjunction with the existing modified Ristroph traveling screens at the facilities, Department staff determined, after applying its established 4-step BTA analysis, that the resulting cost would be wholly disproportionate to the environmental benefits that would be gained.

Based on this finding, the Department rejected 32-week annual outages as BTA for Indian Point. *See Attachment B – Page 4 of 8, to the 2003 fact sheet.* The rejection of annual forced outages of 32-weeks in the fact sheet should not be interpreted to mean that the Department has rejected protective outages of any lesser duration. In fact, as an interim measure, the 2003 Draft SPDES permit included a condition for Entergy to take 42 fish protective outage days annually until such time as the Department's selected BTA alternative, closed-cycle cooling, is operational in recognition of the fact that outages of some duration would afford some reduction in the ongoing, unmitigated entrainment caused by the facilities' intakes.

Forced outages of 42-days, or more specifically, Fish Protective Outage Days (“FPOD” or “protective outages”) have historically been required of Indian Point (as well as at the Roseton and Bowline facilities on the Hudson River) when the Hudson River Settlement Agreement (“HRSA”) went into effect in 1981. Under the HRSA, Indian Point was required to take 42 FPODs annually between May 15 and August 15 of each calendar year. Those required protective outages were ultimately incorporated by reference into the 1987 SPDES permit for Indian Point, the permit currently in effect as a result of SAPA. *See* 1987 SPDES Permit No. NY0004472, Additional Requirement No. 7, at p. 11.

By way of comparison, the protective outages discussed in this offer of proof are clearly not identical to the 32-week outage discussed in the 2003 SPDES Factsheet. Specifically, the FPOD options discussed in this offer of proof only span a minimum of 42 to a maximum of 92 days at one or both Units with outages being taken between May 10th and August 10th each calendar year for the 20-year NRC relicensing period. In the event that a closed-cycle cooling alternative is found by the decision-maker to not be available, after DEC’s 4-step BTA analysis and SEQRA review for closed-cycle cooling is complete, protective outages provide an alternative to the Department’s preferred alternative of closed-cycle cooling to reduce, and in some instances minimize, the adverse environmental impact that has been determined to be caused by Indian Point’s cooling water intake structures. *See* Interim Decision of the Assistant Commissioner, Aug. 13, 2008, at pp. 16-18, including fns. 10, 11, and 12.

Accordingly, this offer of proof provides both an estimated efficacy and wholly disproportionate cost analysis for the following alternatives:

1. Fish Protective Outage Days (of 42, 62, or 92 day durations) taken annually at both units between May 10 and August 10 for the 20-year NRC license renewal period; and

2. A closed-cycle cooling system installed at Unit 2 with protective outages (of 42, 62, or 92 day durations) taken annually at Unit 3 between May 10 and August 10 for the 20-year NRC license renewal period.

Rationale for the Efficacy of Protective Outages

Protective outages are an effective method for reducing and, in some instances, even minimizing the impingement mortality and entrainment of fish of all life stages. Protective outages were historically used by three power plants that were party to the 1981 HRSA and, until recently the Danskammer Generating Station, a power plant also located on the Hudson River, was also required to take annual protective outages as part of the final BTA selected for that facility. See Matter of Dynegy Northeast Generation, Inc., on behalf of Dynegy Danskammer, LLC, Decision of the Deputy Commissioner, May 24, 2006; see also Riverkeeper, Inc. v Johnson, 52 AD3d 1072 (3d Dept. 2008), appeal denied 11 NY3d 716 (2009). As noted above, Indian Point's 1987 SPDES permit incorporated the HRSA-required 42 fish protective outage days by specifically incorporating the 1981 HRSA as a permit condition. See 1987 SPDES Permit, Additional Condition No. 7, at p. 11.

From a technical stand point, protective outages have some advantages over a full closed-cycle cooling retrofit. Protective outages can be implemented immediately thereby providing immediate reductions in the ongoing, established adverse environmental impact caused by Indian Point's CWISs (see Interim Decision of the Assistant Commissioner, Aug. 13, 2008, at pp. 16-18, including fns. 10, 11 and 12). Implemented on their own, protective outages would not cause any on-site physical disturbances or construction impacts, or off-site visual, noise, or traffic impacts associated with retrofitting IPEC with a closed-cycle cooling system. A partial retrofit (*i.e.*, retrofitting only IPEC Unit 2 with closed-cycle cooling) used in conjunction with protective

outages at IPEC Unit 3 would significantly reduce any short or long-term impact identified in conjunction with a full closed-cycle cooling retrofit of both Units.

The reason protective outages are effective for reducing entrainment is due to the fact that the time of year a particular fish species will occur or spawn in the Hudson River is highly predictable. In fact, the majority of entrainment that occurs at Indian Point has historically taken place between May 10 and August 10 of each year (*see*, Figure 1 below). This discrete biological window was recognized by the parties to the 1981 HRSA which targeted 42 fish protective outage days at IPEC to occur between these dates on an annual basis. Figure 1 presents the combined average density and estimated baseline entrainment of six species commonly entrained at Indian Point between May 1 and August 10 for the years 1984 through 1987 (*i.e.*, striped bass, bay anchovy, white perch, river herring, American shad, and Atlantic tomcod).

Though the *peak* entrainment may vary somewhat from year to year depending on a variety of factors, the relative timing of entrainment abundance, as reflected in Figure 1, is highly predictable. In fact, if Entergy were to take protective outages for the entire 92 day period from May 10 through August 10 at both Units 2 and 3 (*i.e.*, 184 unit outage days annually), the reduction in entrainment could potentially exceed that achievable with a closed-cycle cooling retrofit at both IPEC Units.

Figure 1 highlights two periods within the total 92-day entrainment window where peak entrainment occurs. These are from May 20 through June 20 (denoted as "A" in Fig. 1) and July 10 through August 10 (denoted as "B" in Fig. 1). While the 1981 HRSA allowed for the 42 fish protective outage days to be applied anywhere within the total 92-day window, what is clear from Figure 1 is that if these 42 fish protective outage days were targeted to take place so as to

incorporate the two peak density windows, the effectiveness of the 42 fish protective outage days would be maximized. For instance, outages taken at Indian Point during period “A” would target entrainment of striped bass, white perch, American shad and river herring (in addition to other species of lower densities). Outages taken at Indian Point during period “B” would primarily target entrainment of bay anchovy (though the entrainment of other, less dense ichthyoplankton would also be reduced).

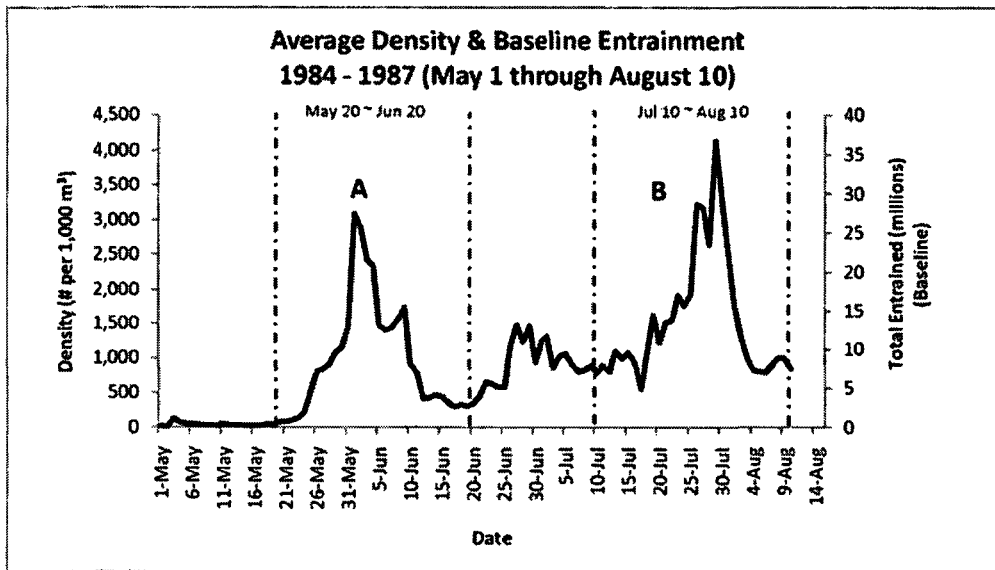


Figure 1: The combined average density (#/1,000 m³) and estimated baseline entrainment (millions) of striped bass, bay anchovy, white perch, river herring, American shad, and Atlantic tomcod entrained at IPEC from May 1 through August 10 for the years 1984 through 1987. Data for this Figure was taken from the 1984 -1987 Indian Point Generating Station Entrainment Abundance Program Annual Reports (EA 1985, NAI 1987a&b, NAI 1988).

Impingement also demonstrates a seasonal component (*see* EA 1989, at p. 3-15). Figures 2 and 3 (below) present the average density and estimated baseline number of fish impinged at IPEC for each month from 1979 to 1990. From these graphs it is evident that impingement at Indian Point is typically highest from December through March each year, accounting for nearly 57 percent of the annual impingement on average. This seasonality of impingement at IPEC has

been known for some time and was previously reported by Consolidated Edison Company of New York (see Con Ed 1982, at p. 3-7; and Con Ed 1984, at p. 3-13). The period from May through August, which corresponds to the annual period when fish protective outage days were required under the 1981 HRSA, on average accounted for only about 25 percent of the total potential annual impingement. This is why protective outages alone were insufficient to reduce impingement mortality at Indian Point, and why modified Ristroph traveling screens and a dedicated fish return system were installed as necessary in order to reduce impingement mortality under the 1981 HRSA.

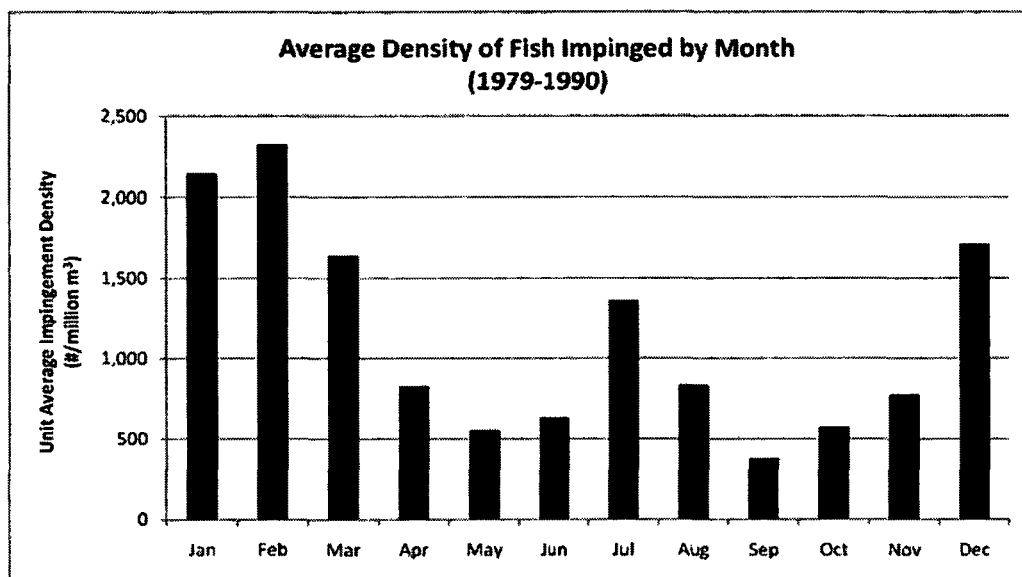


Figure 2: Annual distribution of the unit average density of fish impinged at IPEC from 1979 to 1990. Data presented were averaged from interpolations made from figures presented in the "Hudson River Ecological Study in the Area of Indian Point" reports covering calendar years 1979 through 1990 (see Literature Cited).

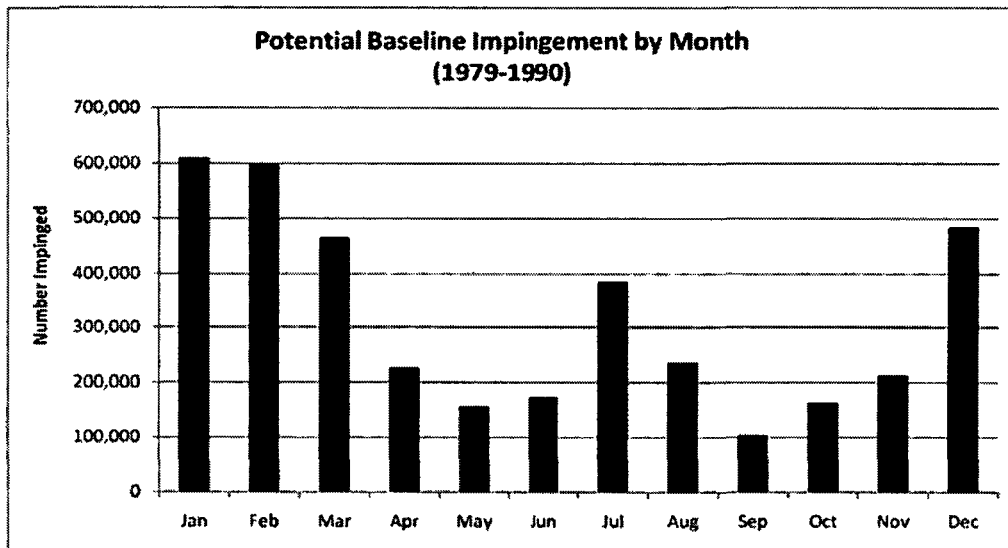


Figure 3: Annual distribution of the average baseline impingement at IPEC from 1979 through 1990. Data presented were calculated by multiplying the average impingement density for each month and each generating unit by the maximum cooling water capacity [i.e., 4,579.2 (1,000 m³) per day per generating unit].

The Wholly Disproportionate Test

The Department does not conduct a formal cost-benefit analysis as part of its BTA determination that would cause the resource, in this case aquatic organisms, to be monetized. The only consideration of cost in the selection of BTA is a “wholly disproportionate” cost test that is applied during the fourth step of the Department’s BTA Analysis. *See* Ruling of the Regional Director, Nov. 28, 2012. The “wholly disproportionate test” has been used by the Department for several years in SPDES permit/BTA matters (*see, e.g.,* Matter of Athens, *Interim Decision of the Commissioner*, June 2, 2000; Matter of Mirant Bowline LLC, *Decision of the Commissioner*, March 19, 2002; and Matter of Dynegy Northeast Generation, Inc. *Decision of the Deputy Commissioner*, May 24, 2006). This wholly disproportionate test is not a traditional cost-benefit analysis and such an analysis is not required by CWA §316(b) (*see Entergy Corp. v Riverkeeper, Inc., et al.*, 556 U.S. 208, 129 S.Ct. 1498 [2009]).

In the November 2012 Ruling of the Regional Director, the fourth step of the BTA analysis was defined as follows: “whether the costs of feasible technologies are wholly disproportionate to the environmental benefits to be gained from such technologies” (at p. 8). The Ruling goes on to state that “CP-52 and administrative precedent shall be used as guidance in the application of the fourth step.” Department Policy CP-52 further defines the wholly disproportionate test as “neither a traditional cost-benefit analysis nor an economic analysis but simply a comparison of the proportional reduction in impact (benefit) as compared to the proportional reduction in revenue (cost) of installing and operating BTA technology to mitigate adverse environmental impact. This comparison does not monetize the resource and gives presumptive weight to the value of the environmental benefits to be gained” (*see*, CP-52, at p. 4).

In order to determine the revenue available for implementing BTA at Indian Point, Department staff estimated annual revenue based on the average monthly price of the day ahead electricity market rates for wholesale energy for New York Zone H (Millwood) for August 2012 through July 2013 and multiplied this average rate by Indian Point’s average generating capacity over a 5-year period. For purposes of this offer of proof, Department staff used the annual generating capacity reported for the 2008 through 2012 5-year period.

Methods

Calculation of Proportional Costs:

Pursuant to the Department’s 4-part BTA analysis, there are two primary financial estimates necessary to undertake the wholly disproportionate test. These are: (1) the annual gross revenue of the facility; and (2) the annual cost of implementing the feasible technology over the remaining life of the facility. For Indian Point, the annual gross revenue was estimated by using two variables: (1) the average of the actual annual generating capacity use for the

previous 5 years reported in the NYISO Annual Load and Capacity Reports from 2008 through 2012 (*a.k.a.* “Gold Book”); and (2) the average monthly Load Based Marginal Pricing (“LBMP”) price reported in the NYISO Monthly Reports for Zone H (Millwood) for the most recent 12 months prior to calculation of the fourth step BTA analysis. In addition, for alternatives which include a partial closed-cycle cooling retrofit (one Unit only), parasitic costs and efficiency losses are subtracted from the annual gross revenue.

The costs for implementing a feasible technology are the capital, operational, and maintenance costs of implementing a feasible technology or operational measure at Indian Point Unit 2 and Unit 3. For purposes of this offer of proof, costs for the construction, operation, and maintenance of a partial closed-cycle cooling retrofit (*i.e.*, one Unit only) were calculated by applying essentially one-half of the construction, operation, and maintenance costs presented in the 2013 Tetra Tech Report entitled “Indian Point Closed Cycle Cooling System Retrofit Evaluation” dated June 2013 for a full closed-cycle cooling retrofit.²

I. Total 20 year cost of protective outages:

$$[(\text{Annual Protective Outage cost} \times 20 \text{ years}) - (\text{refueling outage costs})]$$

Where:

$$\text{Protective Outage costs} = \# \text{outage days} \times \text{average daily generation per unit} \times \text{average day ahead market price} \times \# \text{units} \times 20 \text{ years} .$$

$$\text{Average daily generation} = \text{average annual capacity use (2008 – 2012)} / 365 \text{ days}$$

$$\text{Average day ahead market price} = \text{monthly average price (July 2012 – June 2013)}$$

² DEC staff recognizes that applying a “one-half” calculation is only an approximation for purposes of this offer and proof on permanent forced outages, and that additional, refined details concerning outages at one Unit and closed-cycle cooling at another Unit at Indian Point will be “further evaluated, along with other subjects for inquiry related to this BTA alternative” when hearings on permanent forced outages take place. See Ruling, p. 8, at ¶2.

Refueling outage costs = 30 days × average daily MWhr production/unit × average day ahead market price x 10 refueling periods for each unit over 20 year period.

II. Total 20 year cost of single unit conversion plus protective outages:

[(Capital costs + Construction costs + contingency + indirect /2] + [(Annual Protective Outage cost × 20 years)-(refueling outage costs)]

Where:

Construction costs = (capital costs + construction outage + contingency + indirect)/2

Protective outage costs = #outage days × average daily generation per unit × average day ahead market price × 20 years.

Average daily generation = average annual capacity use (2008 – 2012) / 365 days

Average day ahead market price = monthly average price (July 2012 – June 2013)

Refueling outage costs for each unit = 30 days × average daily MWhr production/unit × average day ahead market price x 10 refueling periods.

III. Annual Gross Revenue:

[(5-year average electric generating capacity × 12-month average day ahead market price) - (annual parasitic loss + annual efficiency loss)³]

Calculation of Proportional Costs:

The following formula was used to determine the proportional cost of a mitigative technology or operational measure:

³ For purposes of this offer of proof, parasitic and efficiency loss reductions are only applied to options which include closed-cycle cooling.

$$\text{Proportional cost} = \frac{\text{Annual cost of mitigative technology}}{\text{Annual gross revenue}^4}$$

Calculation of Proportional Environmental Benefit:

The proportional benefit gained by a mitigative technology or operational measure is best expressed by the following formula:

$$\text{Proportional Benefit} = \frac{\text{Number of organisms protected with mitigative technologies}}{\text{Number of organisms at risk of impingement or entrainment mortality}}$$

The proportional benefits are evidenced by the expected efficacies of the feasible technology or operational measure in reducing entrainment and impingement mortality. The efficacies of technologies and operational measures can either be directly estimated from site specific entrainment, impingement, and operation data, or these efficacies can be based on the results of published studies. For purposes of this offer of proof, some efficacies were taken from previously provided reports and data (*i.e.*, Enercon 2010) with some efficacies calculated based on past entrainment and current operational data for the facilities.

For BTA, the potential environmental benefits obtainable from a feasible mitigative technology or operational measure are the reductions in the number of aquatic organisms impinged and entrained. For the calculations contained in this offer of proof, the following estimates of the aquatic organisms annually at risk at Indian Point Units 2 and 3 were used: 1.224 billion fish entrained; and 669,465 fish impinged. *See Enercon 2010 Alternatives Report,*

⁴ For purposes of this offer of proof, annual gross revenue is the *potential* annual gross revenue of IPEC before any construction costs or operational measures associated with a feasible BTA alternative (*i.e.*, protective outages) are applied.

Attachment 6, Table 3, at p. 20 (Entergy Ex. 8). These estimates represent the most current DEC-accepted calculation baseline for purposes of determining BTA under 6 NYCRR §704.5.

To estimate the reduction in entrainment and impingement that would result from protective outages, historic entrainment data reported in the annual entrainment abundance reports for sampling years 1984 through 1987, and historic impingement data reported in the annual Hudson River ecology reports from sample years 1979 through 1990, were analyzed to determine relative abundances and seasonal trends in impingement and entrainment. *See* Literature Cited section of this offer of proof.

Results and Discussion

Gross Annual Revenue and Potential Costs of Taking Protective Outages

The data used for estimating the gross annual revenue for Indian Point were taken from the NYISO 2009 through 2013 Load and Capacity Reports (“Gold Book”): (http://www.nyiso.com/public/markets_operations/services/planning/documents/index.jsp) (*see* Table 1 below), and from the NYISO Monthly Reports (July 2012 through June 2013): (http://www.nyiso.com/public/markets_operations/documents/studies_reports/index.jsp) (*see* Table 2 below).

Tables 1 and 2 (below) present the electric generating data and monthly average day ahead market rate for wholesale electricity used in the calculation of costs and revenues in this offer of proof.

Table 1: Average generating capacity of Indian Point Units 2 and 3 from 2008 to 2012.

Year	Generating Capacity (MWhr)
2008	17,381,849
2009	16,542,300
2010	16,320,600
2011	17,016,900
2012	16,937,900
<i>5-year Average</i>	<i>16,839,910</i>

Table 2: The average monthly day ahead market price for wholesale electricity from July 2012 through June 2013 for Zone H (Millwood).⁵

Year	Price per MWhr
July 2012	\$48.07
August 2012	\$39.86
September 2012	\$35.84
October 2012	\$36.61
November 2012	\$49.45
December 2012	\$44.92
January 2013	\$74.70
February 2013	\$85.73
March 2013	\$48.19
April 2013	\$42.84
May 2013	\$43.29
June 2013	\$41.68
<i>12-month Average</i>	<i>\$49.27</i>

Estimated Efficacy and Costs of Protective Outages

Table 3 (below) presents the proportional environmental benefits and proportional increase in costs of six different feasible BTA options that include protective outages (*i.e.*, Options *A – F*) and the rejected alternative of a 32-week forced outage. Options *A, B, and C* in Table 3 present the costs and reductions in adverse environmental impact associated with taking

⁵ The one-year period reflected in this Table is for illustration purposes in this offer of proof only. DEC staff recognizes that other or additional months/years of average monthly day ahead market price for wholesale electricity may be utilized in the future “when hearings on permanent forced outages take place.” See Ruling, p. 8, at ¶2.

42 to 92 day protective outages at both generating units annually during the period from May 10 through August 10. Options *D*, *E*, and *F* in Table 3 present the costs and reductions in adverse environmental impacts associated with retrofitting only Unit 2 with closed-cycle cooling and taking either 42, 62, or 92 fish protective outage days annually at Unit 3 during the period from May 10 through August 10. For the partial retrofit options (*i.e.*, *D*, *E*, & *F*), Unit 2 was selected for closed-cycle cooling since this would eliminate the need (and, therefore, the estimated associated costs of \$14.8 million) of moving the Algonquin natural gas pipeline (*see* Tetra Tech June 2013 Report, at p. 26).

Table 3: Proportional reductions in entrainment (E), impingement mortality (IM), and costs estimated for six mitigative options to reduce adverse environmental impacts caused by Indian Point Units 2 and 3. Annual costs include all construction costs amortized over the 20-year relicensing period, any outage costs, and any necessary annual maintenance cost. Note that the costs and benefits estimated for options *A*, *B*, and *C* presume that Fish Protective Outage Days (FPOD) are taken at *both* units (*i.e.*, Option *A* would require a total of 84 unit outage days).

Mitigative Option:	32-Week Forced Outage ⁶	A	B	C	D	E	F
		42 FPOD Units 2&3	62 FPOD Units 2&3	92 FPOD Units 2&3	42 FPOD Unit 3 Closed-cycle Unit 2	62 FPOD Unit 3 Closed-cycle Unit 2	92 FPOD Unit 3 Closed-cycle Unit 2
Annual cost (million)	\$475.1	\$61.4	\$106.8	\$175.0	\$70.3	\$93.0	\$127.1
20 Year Cost (million)	\$9,502	\$1,227.5	\$2,136.8	\$3,500.7	\$1,388.8	\$1,843.1	\$2,525.0
Annual Revenue (million)	\$829.7	\$829.7	\$829.7	\$829.7	\$814.1	\$814.1	\$814.1
Proportional E Benefit	~100 %	66.3 %	76.2 %	99.5 %	81.1 %	86.1 %	97.7 %
Proportional IM Benefit	92.2 %	81.1 %	82.4 %	84.9 %	90.0 %	90.6 %	91.9 %
Proportional Cost	57.3 %	7.4 %	12.9 %	21.1 %	8.6 %	11.4 %	15.6 %

⁶ The 32-week forced outage column represents the 32-week outage considered and discussed in the fact sheet accompanying the 2003 Draft SPDES permit. The protective outages in columns A – F are not synonymous with the 32-week outage considered or discussed in the fact sheet accompanying the 2003 Draft SPDES permit. If the 32-week outage discussed in the fact sheet was taken from February 15th through September 15th at both units annually, it would cost Entergy more than \$9,500,000,000 over the 20-year relicensing period for Indian Point. Using current revenue figures, Department staff estimate that this would amount to more than 57 % of Indian Point's gross annual revenue. Though the Department also found that an annual 32-week outage would reduce fish mortality at levels commensurate with closed-cycle cooling, Department staff rejected this option as BTA since the added annual costs were determined to be wholly disproportionate to the added benefits gained over the Department's preferred BTA alternative (*i.e.*, a closed-cycle cooling retrofit of both Units 2 and 3).

The most protective alternative for minimizing entrainment presented in Table 3 would be for Indian Point to take 92 day Fish Protective Outage Days (or "FPOD") at both Units from May 10 through August 10 each year (*see* Option C) producing an estimated proportional entrainment benefit exceeding 99 percent. This option, along with the presumed efficacy of the modified Ristroph traveling screens, is estimated to also reduce impingement mortality by nearly 85 percent. However, taking 92 fish protective outage days at both Units would also be the most costly of the protective outage options and would raise annual costs at Indian Point by 21.1 percent (by reducing revenue).

Two options (options *E* and *F*) are estimated to provide reductions in impact commensurate with a full closed-cycle cooling retrofit. Option *F* (92 FPOD and closed-cycle cooling at Unit 2) is estimated to reduce entrainment by nearly 98 percent and impingement mortality by nearly 92 percent. This alternative would cost 5.5 percent less on an annual basis than taking 92 FPOD at both units. Option *E* reduces costs further and is still estimated to reduce impingement and entrainment to levels commensurate with closed-cycle cooling.

The least expensive fish protective outage alternative presented in this offer of proof is for Indian Point to take 42 FPOD annually at both Units (Option *A*). This alternative would result in annual proportional increases in costs to Entergy of 7.4 percent. However, this alternative is estimated to only reduce entrainment by approximately 66 percent, thereby not meeting the efficacy goal required by the 2008 Interim Decision or the entrainment performance goal of Department Policy CP-52. Impingement mortality reductions resulting from Option *A* would essentially remain unchanged from current mortality levels.

Conclusion

The Department is not proposing the protective outage options presented in this offer of proof as a substitute for the Department's determination that a full closed-cycle cooling retrofit is BTA for Indian Point. As noted, a number of the protective outage options presented in this offer of proof would likely be less protective than the performance goals identified in the Aug. 13, 2008 Interim Decision and Department Policy CP-52 for entrainment reductions. In fact, several fall short of the reductions in impingement mortality achievable with a full closed-cycle retrofit. However, in the event that a closed-cycle cooling retrofit of both Units 2 and 3 is determined to be unavailable based on application of the 4-part BTA analysis and associated SEQRA review, annual protective outages offer a viable and less complex option to significantly reduce the adverse environmental impact caused by the existing cooling water intake structures at Indian Point. This is especially true if annual outages are used in conjunction with a closed-cycle cooling retrofit of one of the generating units.

Finally, Department staff has reaffirmed that the cost of the 32-week forced outage previously rejected by Department staff as BTA and discussed in the fact sheet accompanying the 2003 Draft SPDES permit would be wholly disproportionate to the environmental benefits that would be gained by implementing this alternative. Therefore, Department staff continues to reject the 32-week outage option for the purposes of meeting the BTA requirements of 6 NYCRR §704.5.

Witnesses

Potential witnesses likely to be called to testify on behalf of Department staff in furtherance of the topic of permanent forced outages include, but are not limited to, the following individuals:

William Charles Nieder – DEC biologist: benefits, efficacy and cost considerations;

Roy Jacobson – DEC biologist: benefits, efficacy and cost considerations;

Sharon Brooks – DEC economist: cost considerations;

Leon Sedefian – DEC air resources: air quality impacts;

Margaret Valis – DEC air resources: air quality impacts;

David Wheat – DPS regulatory economics: transmission/reliability impacts;

Thomas Paynter – DPS regulatory economics: transmission/reliability impacts;

Leka Gjonaj – DPS electric, gas and water: transmission/reliability impacts.

Department staff reserves the right to amend or further supplement the names of witnesses identified in this offer of proof at such time and under such circumstances which, as appropriate, may arise.

Dated: November 12, 2013
Albany, New York

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EDMS#487367v1

**Comments of Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC
and Entergy Nuclear Operations, Inc. on the DEC Staff Proposal on Scheduled BTA
Outages/Seasonal Protective Outages**

Consistent with the direction of the Administrative Law Judges (“ALJs” or the “Tribunal”), Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC and Entergy Nuclear Operations, Inc. (collectively, “Entergy”), respectfully submit the following comments (“Comments”) relating to the New York State Department of Environmental Conservation (“DEC”) Staff’s “permanent outages” proposal, as described in the document entitled, “DEC Staff Fact Sheet on Scheduled BTA Outages/Seasonal Protective Outages,” dated May 9, 2014 (the “Outage Proposal”). *See* New York State Department of Environmental Conservation Notice of Public Comment Hearing and Issues Conference, dated May 21, 2014 (directing comments on or before July 11, 2014).

Introduction

We respectfully request that the ALJs determine whether to conduct an adjudicatory hearing on the Outage Proposal and, if so, on what issues, based upon comments being provided by the parties and the public and matters to be discussed at the Issues Conference. *See, e.g.*, Transcript of June 12, 2014 Status Conference at 11-13 (ALJ Villa discussing Tribunal’s procedural expectations); New York Environmental Conservation Law (“ECL”) § 70-119 (requiring an adjudicatory hearing where DEC Staff seek to impose significant permit conditions); 6 NYCRR § 624.4(c)(1)(i) (in the absence of dispositive legal resolutions, disputes between Entergy and DEC Staff over a substantial term of the draft SPDES Permit¹ are set for adjudication).

These Comments are provided primarily to advise the ALJs of: (1) the illegality of DEC Staff’s Outage Proposal, including under applicable federal and state substantive and procedural law; (2) the suggested scope of the issues to be adjudicated, to the extent that the ALJs advance DEC Staff’s Outage Proposal to adjudication; and (3) corrections to the record necessitated by errors in DEC Staff’s Outage Proposal. Specifically, these Comments are arranged into three sections, as follows:

Section I addresses dispositive questions of law, on the basis of which Entergy respectfully requests this Tribunal conclude that DEC Staff’s Outage Proposal should not move forward to adjudication. Entergy respectfully requests prompt resolution of the legal issues for two reasons. First, controlling state and federal law indicate that outages, *as a matter of law*, are not an available technology that even can be considered for purposes of a SPDES permit, because outages are not a “technology” related to the cooling water intake structure within the meaning of 6 NYCRR § 704.5 (“Section 704.5”). Even if outages were a technology, DEC is precluded from mandating outages under the federal Atomic Energy Act (“AEA”), which grants exclusive authority over nuclear operations to the federal Nuclear Regulatory Commission (“NRC”). If the

¹ Despite requests to do so, *see infra* at 4-5 (citing correspondence from Entergy), Department Staff neither has prepared draft permit conditions that would serve to implement the Outage Proposal, nor has identified any credible basis for concluding that its Outage Proposal satisfies 6 NYCRR § 704.5 or SEQRA. Thus, Entergy must dispute the terms of a skeletal Outage Proposal, the foundation for which is not established.

Tribunal elects to move forward with adjudicating outages notwithstanding these fundamental roadblocks to its doing so, Entergy reserves the right to seek judicial relief. Second, DEC Staff has no credible basis to advance a new “best technology available” (“BTA”) alternative more than a decade after DEC Staff was directed to issue its draft SPDES permit to resolve a judicial determination of excessive Departmental delay. *See Brodsky v. NYSDEC*, 766 N.Y.S.2d 277, 281 (N.Y. Sup. 2003). This untenable dynamic is exacerbated by the fact that DEC Staff have performed no analysis to establish that its Outages Proposal can satisfy BTA standards or the holistic review of environmental, economic, and social impacts required by the State Environmental Quality Review Act (“SEQRA”). For these reasons, delaying consideration of threshold and dispositive legal issues would consign the Tribunal and parties to adjudicatory hearings concerning proposals that are no more likely to result in a viable BTA selection than were DEC Staff’s closed cycle cooling proposals. Of course, Entergy acknowledges that the Tribunal may opt to allow full briefing to facilitate its decisionmaking prior to the commencement of adjudicatory hearings on the Outage Proposal, and stands ready to assist in development of that schedule.

Section II addresses mixed questions of law and fact relating to whether the Outage Proposal satisfies the four-part test for determining BTA under Section 704.5 and federal law, as well as the requirements of SEQRA. For the reasons given herein, and as will be established at any adjudicatory hearing, the Outage Proposal satisfies neither inquiry. Again, DEC Staff has provided no credible evidence that it has performed the requisite analysis of the feasibility (availability) of its Outage Proposal or of the Proposal’s compliance with SEQRA. This absence of evidence is particularly problematic, since the Outages Proposal implicates nuclear operations and DEC Staff has never advanced a witness with any nuclear qualifications. Previous DEC Staff witnesses – during the radiological phase of trial – specifically disavowed any nuclear operations expertise. *See, e.g.*, Transcript of Adjudicatory Hearing dated November 15, 2011 at 2756 (Mr. Kolakowski: “I’m not an expert on how the facilities operate.”). DEC Staff’s retention of outside experts to advance closed-cycle cooling did nothing to remedy its lack of nuclear expertise. *See, e.g.*, Transcript of Adjudicatory Hearing dated April 8, 2014 at 7415-18 (Mr. Ortiz and Mr. Havey admitting their lack of experience with nuclear facility construction and operation). For its Outage Proposal, which requires fundamental alterations in Entergy’s nuclear operations and nuclear fuel management, DEC Staff did not identify *any* nuclear experts in a list of witnesses it was required by the ALJs to provide in November 2013. As a consequence, Entergy is again facing a lengthy trial on a proposal that DEC Staff has not even initially established, nor can establish at trial, is credible.

Section III addresses factual errors in, or clarifications necessary to, the Outage Proposal, which in some circumstances does not accurately reflect the historical consideration of outages at Indian Point.

Background

In the Fact Sheet accompanying the 2003 Draft SPDES Permit, DEC Staff evaluated and rejected a permanent outage scenario as an alternative for compliance with the BTA requirements of Section 704.5. Specifically, DEC Staff stated as follows:

Generation outages are another way to reduce cooling water flow that could result in substantial decreases in fish mortality. Annual outages lasting 32 weeks would result in reductions in fish mortality similar to closed-cycle cooling. Since these generation outages would be necessary each year, the economic costs to the operator over a possible 30 year life of the plant (assuming twenty year license extensions after the 2013 and 2015 license expirations for Units 2 and 3, respectively) would represent approximately 62% of Indian Point's annual gross revenue. The Department considers these costs to be wholly disproportionate to the environmental benefits derived.

See 2003 Fact Sheet, Attachment B, Section 3(D). No party to the SPDES Proceeding, including Riverkeeper, appealed this determination by DEC Staff, nor did any party propose the adoption of permanent outages or advance outages as an issue for adjudication. Indeed, at the SPDES permit Issues Conference, Riverkeeper's counsel expressly disavowed outages as a viable BTA alternative. *Matter of Entergy Nuclear Indian Point 2 and 3*, DEC # 3-5522-00011/00004, Issues Conference Transcript, 127:19-128:1, 226:23-227:5 (Gordon) (Mar. 3, 2004).

Thereafter, ten years passed during which DEC Staff pursued closed-cycle cooling – and only closed-cycle cooling – as its proposed BTA for Indian Point. During this time, ALJ Villa directed the parties (by order dated February 25, 2010) “to advise the parties and the ALJs of any alternative BTA proposals that a party intends to advance in [the SPDES Proceeding].” *See* Memorandum and Sequence of Events, February 25, 2010. More specifically, ALJ Villa ordered that, “[b]y May 21, 2010, Department Staff is to advise the parties and the ALJs of any changes in its position with respect to BTA.” *Id.* In response to this order, DEC Staff submitted a letter to the ALJs and the parties on May 21, 2010, “to provide Your Honors and the parties with Department staff's position with respect to BTA for Indian Point Units 2 and 3.” Correspondence from Mark Sanza, May 21, 2010. In that letter, DEC Staff identified “plume-abated cooling towers such as the Marley SPX ClearSky wet-dry hybrid system” – another closed-cycle cooling variant – as an alternative BTA. The letter never mentioned annual outages. In addition, Department Staff purported in the letter to:

specifically reserve the right to modify or otherwise amend this alternative BTA proposal in the future once it has secured SEQRA analysis funding from Entergy ... and *until such time as the contractor selected to conduct and/or assist staff with the alternative BTA analysis determines, in conjunction with DEC staff and based upon identified environmental impacts, that another or different BTA alternative should be advanced in this proceeding.*

Id. at 2 (emphasis added).

Three years later, in June 2013, DEC Staff circulated to the parties the “Tetra Tech Report,” which contained its contractor's BTA analysis (Staff Ex. 214). The Tetra Tech Report, like Staff's May 21, 2010 letter, proposes the use of Marley SPX ClearSky wet-dry hybrid cooling towers only. It nowhere discusses, and explicitly states that it does not determine, that “another

or different BTA alternative should be advanced in [the SPDES Proceeding].” And Tetra Tech did not recommend or even discuss annual plant outages as an alternative BTA. Thus, while in May 2010 Department Staff purported to reserve the right to propose some other BTA “until such time” as the Tetra Tech Report was issued, the Tetra Tech report contained only a ClearSky proposal, not an outages proposal.

Nonetheless, on September 12, 2013, DEC Staff submitted a letter to the ALJs and the parties, informing them that “Staff intends to present additional evidence on permanent periods of outages for fish protection as an additional BTA alternative for the Indian Point facilities in this proceeding.” Correspondence from Mark Sanza, September 12, 2013. On October 4, 2013, Entergy filed a motion to strike the undisclosed outage proposal on procedural grounds, arguing that: (i) DEC Staff’s undisclosed proposal was untimely because it was proposed more than three years after the May 21, 2010 deadline established by ALJ Villa to identify all BTA alternatives; (ii) the undisclosed proposal violated state and federal law because it directly contradicted DEC Staff’s position rejecting permanent outages as BTA in the 2003 Draft SPDES Permit, did not propose draft SPDES permit conditions for public review and comment, and was not accompanied by a fact sheet explaining DEC Staff’s position; and (iii) the undisclosed proposal contradicted DEC Staff’s position in its April 2010 draft water quality certification (“WQC”) denial that closed-cycle cooling is “the only available and technically feasible technology” to satisfy the BTA requirement of Section 704.5, and could not be used retroactively as a basis to deny the WQC application. *See* April 2, 2010 Notice of Denial, p. 13.

On October 18, 2013, the Tribunal denied Entergy’s motion, stating in full that “the need for a complete record for the decisionmaker’s review outweighs Entergy’s argument that consideration at this point would be untimely.” The Tribunal, however, also required DEC Staff to publicly notice the Outage Proposal and to prepare and circulate to the ALJs and the parties, by November 8, 2013, an “offer of proof with respect to permanent outages as a BTA alternative.” October 18, 2013 Memorandum and Order (ALJ Villa). After the deadline for submittal was extended to November 12, 2013, DEC Staff submitted its offer of proof. Thereafter, on May 9, 2014, the offer of proof was re-issued, with only slight changes, as the Outage Proposal.

The Outage Proposal provides information “with respect to DEC staff’s proposal for permanent annual outages at Indian Point Energy Center Unit’s 2 and 3 (‘IPEC’) . . . as a best technology available (‘BTA’) alternative.” Outage Proposal, p. 1. The Outage Proposal sets forth six potential outage scenarios for IPEC:

- (1) 42 days of outages between May 10 and August 10 at each unit (that is, 84 unit-days total);
- (2) 62 days of outages between May 10 and August 10 at each unit (124 unit-days total);
- (3) 92 days of outages between May 10 and August 10 at each unit (184 unit-days total), which is in fact every day in that period;

- (4) installation of closed-cycle cooling at Unit 2, and 42 days of outages between May 10 and August 10 at Unit 3;
- (5) installation of closed-cycle cooling at Unit 2, and 62 days of outages between May 10 and August 10 at Unit 3; and finally
- (6) installation of closed-cycle cooling at Unit 2 and 92 days of outages between May 10 and August 10 at Unit 3.

The Outage Proposal does not specify the type, location or dimensions of the cooling towers proposed for Unit 2, or provide any statement that feasibility of the Unit 2 retrofit has been determined (nor could it, given the evidentiary record on closed-cycle cooling). The Outage Proposal also provides no evidence that the outages proposed, particularly the simultaneous outages, are feasible (available) at Indian Point. It finally provides no SEQRA analysis at all, despite the substantial evidence already in the existing record that outages at Indian Point come with significant, negative impacts to electric-system reliability, electricity affordability and air quality. Moreover, Staff was required by the Tribunal's October 18, 2013 order to identify, in the November 12, 2013 offer of proof, its witnesses supporting the outages proposal; Staff identified no witnesses with nuclear expertise.

Entergy challenged the procedure by which DEC Staff's Outage Proposal was advanced. *See, e.g.,* Letter from Elise N. Zoli to Tribunal dated November 25, 2013; Letter from Kevin P. Martin to Tribunal dated May 9, 2014; email from Kevin P. Martin to Tribunal dated May 13, 2014 (2:25 p.m.); Letter from Kevin P. Martin to Tribunal dated June 17, 2014. The grounds included (among other arguments not repeated here) DEC Staff's failure to provide a revised SPDES permit and the insufficiency of the Outage Proposal to serve as a fact sheet for purposes of 6 NYCRR § 621.7(b)(7), 6 NYCRR § 750-1.9, and 40 C.F.R. § 124.8(b). Entergy further noted that the Outage Proposal is: (i) unclear concerning the outages scenarios that DEC Staff actually is proposing rather than considering and rejecting, since the Outage Proposal actually criticizes certain of the six outages scenarios; (ii) in violation of state and federal law because it is not accompanied by specific draft permit conditions for consideration by the public; (iii) improper and misleading with respect to the three scenarios involving closed-cycle cooling at Unit 2, because it fails to inform the public of the overwhelming evidence adduced at previous adjudicatory hearings concerning the infeasibility of closed-cycle cooling at IPEC; (iv) materially deficient because it fails to advise the public of key relevant considerations, including the significant detrimental impacts of annual outages to electric system reliability, electricity prices, and air quality, which Staff of the New York Department of Public Service ("DPS") previously acknowledged in sworn testimony; (v) misleading, because it fails to acknowledge Entergy's cylindrical wedgewire screen proposal, and the absence of electricity price, electric system reliability and air quality impacts associated with that proposal, thus leaving the public with the misimpression that closed-cycle cooling and permanent outages are the only alternatives under consideration; (vi) misleading insofar as it incorporates an incorrect formulation of the fourth step of the BTA test to determine whether the costs of the Outage Proposal are wholly disproportionate to the environmental benefits it may provide (if any).

Notwithstanding Entergy's comments on the flawed procedures employed in connection with the Outage Proposal, it was publicly noticed.

I. Threshold Legal Issues

This section presents dispositive issues of law that should be resolved, on full briefing, prior to the commencement of further adjudicatory hearings. The purpose of an issues conference is, among other things, to appropriately establish and narrow the issues for adjudication, including by resolving antecedent legal issues. *See, e.g.*, 6 NYCRR § 624.4(b)(2)(iv); 6 NYCRR § 624.4(b)(5)(iii). Narrowing issues in a proceeding that has been ongoing for more than a decade has particular value. Moreover, resolution of some or all of these issues may significantly curtail, and perhaps completely obviate, the need for adjudicatory hearings on the Outage Proposal, and therefore they are properly addressed at this time.

Three dispositive legal issues are summarized below in sufficient detail to allow the Tribunal to reach a determination at the Issues Conference, or alternatively to set a schedule for full briefing. The first argument is that outages – requiring Entergy to shut down the two Indian Point Units for some period each summer – are not a “technology” for Indian Point’s *cooling water intake structure*. The second argument is that DEC Staff’s Outage Proposal is preempted by the AEA, rendering adjudication of the issue by this Tribunal *ultra vires* and otherwise illegal. The third argument is that DEC Staff’s action, in developing a new BTA proposal more than a decade after issuance of its draft SPDES permit, cannot be reconciled with DEC Staff’s 2003 commitment to the New York trial court to imminently issue a draft SPDES permit; is in violation of numerous tenets of applicable procedure governing the issuance of SPDES permits and the reasonable conduct of administrative hearings; and should be estopped because it cannot be reconciled with legal norms regarding reasonable agency action. At the very least, Entergy requests that the Tribunal exercise its authority under 6 NYCRR § 624.8(b)(1)(xv) to order Staff to select one outages proposal for adjudication, instead of advancing all six proposals to adjudication.

1. Annual Outages Are Not a “Technology” Within the Meaning of 6 NYCRR § 704.5, Judicial Precedent, and DEC Precedent and Policy.

As an initial matter, the six outages scenarios set forth in the Outage Proposal all are *ultra vires*, because shutting down a nuclear power plant is not a “technology” within the meaning of: (i) Section 704.5 and its federal antecedent, 33 U.S.C. § 1326(b) (“Section 316(b)”); (ii) judicial precedent authoritatively interpreting Section 316(b); (iii) applicable definitions of cooling water intake structures; (iv) the Interim Decision in the SPDES proceeding; and (v) DEC Commissioner’s Policy 52 (“CP-52”).

Section 704.5 requires that “[t]he location, design, construction and capacity of *cooling water intake structures*, in connection with point source thermal discharges, shall reflect the best *technology* available for minimizing adverse environmental impact” (emphasis added). The “cooling water intake structure” is a discrete part of a facility, defined by New York law to be “the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of New York State. The cooling water intake structure extends from the point at which water is withdrawn from the waters of the State *up to, and including the intake pumps.*” 6 NYCRR § 700.1(a)(12) (emphasis added); CP-52, p. 3 (same).

There is nothing in the single-sentence of Section 704.5, nor in the legislative history of its federal law equivalent (Section 316(b)), to support the notion that turning off a nuclear power

plant – with all that doing so entails with respect to the nuclear reactor and fuel and spent-fuel management – is a “technology” pertaining to the “[t]he location, design, construction and capacity of cooling water intake structures,” as defined to end at “the intake pumps.” It is implausible that Congress would have intended to give EPA, and delegated state agencies like DEC, authority to decide whether and when a facility operates *at all*, in a provision that narrowly targets specified attributes of the cooling water intake structure and was only “something of an afterthought.” *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 186 & n. 12 (2d. Cir. 2004) (“*Riverkeeper I*”). If Congress had intended to allow plenary authority over facility operations in order to reduce adverse impacts from intakes of cooling water, it could and would have phrased Section 316(b) far more generally, rather than specifically targeting “[t]he location, design, construction and capacity of cooling water intake structures.”

This conclusion is underscored by the Second Circuit’s decisions in *Riverkeeper I* and *Riverkeeper II* that two operational measures – restoration of aquatic habitats and restocking – are not intake structure technologies within the meaning of Section 316(b) “*because they are unrelated to the structures themselves*,” and so “have nothing to do with the location, the design, the construction, or the capacity of cooling water intake structures.” *Riverkeeper, Inc. v. EPA*, 475 F.3d 83, 109 (2d Cir. 2007) (“*Riverkeeper II*”) (quoting *Riverkeeper I*). Decisions from other courts are to similar effect. They consistently read Section 316(b) as allowing regulation only of the cooling water intake structure itself. *See, e.g., Surfrider Found. v. Cal. Reg’l Water Quality Control Bd.*, 211 Cal. App. 4th 557, 579-80 (4th Dist. 2012) (“[B]y referring solely to the ‘location, design, construction and capacity of cooling water intake structures,’ section 316(b) specifically focuses *only* on the nature of the intake structures themselves, *to the exclusion of other measures for limiting environmental harm*.” (emphasis added)); *ConocoPhillips Co v. EPA*, 612 F.3d 822, 839 (5th Cir. 2010) (reasoning that the word “location” in Section 316(b) refers to the location of the intake structure specifically, not the facility generally, logic that applies equally to “design,” “construction,” and “capacity”); *cf. Robertson County v. Tex. Comm’n on Env’tl. Quality*, 2014 WL 2568495 (Tex. App. June 6, 2014) (reasoning, on the basis of EPA’s definition of CWIS at 40 C.F.R. § 125.83, that a particular water-transfer pump station is not part of the cooling water intake structure because it is not located between the intake and the intake pumps; neither are Indian Point’s nuclear reactors).

Riverkeeper II is particularly instructive. In that case, the Second Circuit emphasized that the federal Clean Water Act is a technology-forcing mandate in rejecting an argument that a non-technological approach to compliance could satisfy BTA requirements, explaining:

Restoration measures are not part of the location, design, construction, or capacity of cooling water intake structures, *Riverkeeper I*, 358 F.3d at 189, and a rule permitting compliance with the statute through restoration measures allows facilities to avoid adopting *any* cooling water intake structure technology at all, in contravention of the Act’s clear language as well as its technology-forcing principle.

475 F.3d at 110 (emphasis added; internal citations omitted); *see also id.* at 109 (“We began *Riverkeeper I* by noting that we were remanding the Phase I restoration provision because it

'contradicts Congress's clearly expressed intent.' We went on to state that '*however beneficial to the environment, [restoration measures] have nothing to do with the location, the design, the construction, or the capacity of cooling water intake structures, because they are unrelated to the structures themselves.*'") (internal citations omitted) (emphasis added).² In short, Section 704.5, and its antecedent Section 316(b), require the implementation of *technology* at or related to the cooling water intake structure. Shutting off nuclear power plants is not a technology and has "nothing to do with the location, the design, the construction, or the capacity of cooling water intake structures," 475 F.3d at 109, and therefore cannot be mandated under Section 704.5. Indeed, under DEC Staff's proposal the "location, the design, the construction, and capacity" of Indian Point's two cooling water intake structures will remain exactly the same.

Unsurprisingly, and consistent with this judicial precedent, the Interim Decision also acknowledges that the intent of Section 704.5 is to implement available technologies at the cooling water intake structure that allow a facility to "operate efficiently":

The third step of the BTA analysis addresses whether practicable alternate technologies are available to minimize impingement and entrainment. Availability of a technology is analyzed in the context of its suitability for the particular application, including its ability *to be installed and operated at the site*. In this regard, for example, the impacts of a technology on a facility's operation (that is, can it be engineered *such that the facility will operate efficiently*) are part of the BTA analysis.

Interim Decision at 10 (emphasis added; citations omitted). Any BTA proposal that forces a *facility not to operate* is obviously antithetical to a requirement that the BTA selected must allow "the facility [to] operate efficiently," and certainly an outage is not something that is "installed and operated at [a] site." To mandate an operational measure that ensures that the facility does not operate at all – let alone operate efficiently – is expressly beyond the scope of and contradicts the clear purpose of the Interim Decision. Likewise, CP-52 defines the word "feasible," in the context of BTA determinations related to cooling water intake structures, as "capable of being done; *able to be installed and function efficiently within the operating constraints of the facility.*" (emphasis added). Again, an "outage" is not something that is "able to be installed and function efficiently" – it is the polar opposite of "function[ing]." Allowing outages to be a candidate for BTA therefore would render nonsensical the very DEC policy on which DEC Staff routinely has relied during the course of this proceeding.

² Elsewhere, the *Riverkeeper II* court reiterated that the statutory scheme for cooling water intake structures is intended to be technology-forcing. See, e.g., 475 F.3d at 122 (finding that "the Phase II requirements are 'requirements' under sections 301 and 306"); *id.* at 91 ("Section 301 sets forth a framework under which limitations on the discharge of pollutants from existing sources would become more stringent over time. Section 301(b)(1)(A) required the EPA, beginning in 1977, to set effluent limitations for existing sources based on "the best practicable *control technology* currently available," or "BPT." By 1989, existing source effluent limitations were to be based on the more stringent "best available *technology* economically achievable," or "BAT." Additionally, section 306 requires the EPA to establish "standards of performance" for the control of the discharge of pollutants from new sources based on "the best available demonstrated *control technology*," a standard that "reflects the greatest degree of effluent reduction.") (emphasis added, internal citations omitted).

Respectfully, this is not a close question. Federal law (as interpreted by the Second Circuit and other federal courts), New York law (as interpreted by the Department itself with respect to Indian Point), and DEC policy all acknowledge that BTA, whatever it may be, must concern the cooling water intake structure itself and must allow a facility to continue to operate efficiently. Outages pass neither test. Unless DEC Staff can demonstrate some credible authority under Section 704.5 or federal law to order outages as BTA – and it cannot – the Tribunal and the parties should not be put to the time and expense of litigating the Outage Proposal.

Further and importantly, this issue of statutory construction is precisely the type of pure legal issue that should be decided prior to the adjudicatory hearings. *See, e.g.*, 6 NYCRR § 624.4(b)(5)(iii) (at or following issues conference, ALJ will “rule on the merits of any legal issue where ruling does not depend on the resolution of disputed issues of fact”). For this reason alone, the Tribunal should decide not to advance outages to adjudication. At a minimum, Entergy respectfully requests that this Tribunal establish a briefing schedule and issue a decision on this issue prior to the commencement of hearings on the Outage Proposal.

2. The Outages Proposal Is Preempted by Federal Law

Congress intended, in the Atomic Energy Act, to give the NRC exclusive jurisdiction over the field encompassing (at a minimum) the “nuclear” aspects of power generation at nuclear power plants. This includes, necessarily, operation of the nuclear reactor and other nuclear or radiological considerations, such as nuclear fuel management. NRC’s exclusive jurisdiction over nuclear operations previously was recognized by the U.S. Supreme Court in *Pacific Gas & Electric Co. v. State Energy Resources Conservation & Development Commission*, 461 U.S. 190 (1983) (“*PG&E*”). As the Court explained in that case:

At the outset, we emphasize that the statute does not seek to regulate the construction or *operation* of a nuclear power plant. It would clearly be impermissible for California to attempt to do so, for such regulation, even if enacted out of non-safety concerns, would nevertheless directly conflict with NRC’s exclusive authority over plant construction and *operation*.

Id. at 212 (emphases added); *see also Entergy Nuclear Vermont Yankee v. Shumlin*, 733 F.3d 393, 411 (2d Cir. 2013) (observing that *PG&E* “emphasiz[ed]” that a “state statute that seeks to regulate the construction or *operation* of a nuclear powerplant” would “directly conflict with the NRC’s exclusive authority over plant construction or *operation*” (emphases added)); *County of Suffolk v. Long Island Lighting Co.*, 728 F.2d 52, 56 (2d Cir. 1984) (“[T]he NRC retains responsibility to regulate “the construction *and operation* of any production or utilization facility.”) (emphasis added); *Conn. Coalition Against Millstone v. Conn. Siting Council*, 286 Conn. 57, 80-81 (2008) (state regulations of an operational plant are limited to “areas unconnected with radiological, *operational*, construction or safety issues”) (emphasis added); *Missouri v. Westinghouse Elec., LLC*, 487 F. Supp. 2d 1076, 1084 (E.D. Mo. 2007) (reciting that in *PG&E* the Supreme Court “noted two general areas in which state regulation is pre-empted: the construction and *operation* of nuclear power plants”) (emphasis added). If there were any doubt, Congress specifically prohibited NRC from agreeing to cede to a state any authority

over the “the construction *and operation* of any production or utilization facility.” 42 U.S.C. § 2021(c)(1) (emphasis added).

The exclusive jurisdiction Congress granted NRC over the nuclear aspects of plant “operation” necessarily precludes a State from ordering a nuclear plant to cease operating for some period of months on an annual basis. There are many practical reasons why such an order would interfere with Congress’s intent that NRC be solely responsible for nuclear operations. For example, each unit presently operates for approximately 23 months between scheduled maintenance and refueling outages. Changing that 23-month cycle to 9 months (in the case of 92 day outages) or just under 11 months (in the case of 42 day outages) indisputably has implications for a variety of operational considerations that are within the sole ambit of NRC, including, *inter alia*, fuel enrichment levels and assembly characteristics; spent fuel storage and handling; peak power levels; maintenance and repair schedules; planned radioisotope discharges; and so on. These are all issues that are at the heart of plant nuclear operations and in many instances nuclear safety, and therefore are heavily regulated by NRC. *See, e.g.*, 10 C.F.R. §§ 50.30 (requirement for operating license applications to indicate expected power levels); 50.65 (monitoring of the effectiveness of maintenance at nuclear power plants); 50.68 (maintaining sub-criticality in spent fuel pools); 50.90-50.92 (setting forth the process for amending NRC licenses, including changes to a plant’s power level); Part 72 (licensing requirements for operation of ISFSIs); 73.62 (regulations concerning personnel access authorization requirements for nuclear power plants). Accordingly, state intrusion in this area is field preempted. *See, e.g., Maine Yankee Atomic Power Co. v. Bonsey*, 107 F. Supp. 2d 47, 55 (D. Me. 2000) (state could not regulate plant’s use of dry cask storage as “authorized under Maine Yankee’s operating license,” or the on-site transfer of spent fuel because that is “clearly an operational and nuclear safety issue”); *see also English v. Gen. Elec. Co.*, 496 U.S. 72, 84-85 (1990) (state regulation is field-preempted if it has “some direct and substantial effect on the decisions made by those who build or operate facilities concerning nuclear safety levels,” as opposed to, *e.g.*, “minimum wage and child labor laws” or whistleblower-retaliation claims). Indeed, this Tribunal has acknowledged the lack of state authority over planned nuclear plant operations. *See, e.g.*, December 13, 2010 Ruling on Proposed Issues for Adjudication and Petitions for Party Status, pp. 25-27 (asserting as an “open question” only whether the Tribunal retained authority to consider unintended “leaks” of radioisotopes, not *planned* radioisotope discharges).

Accordingly, the Outage Proposal improperly invades the field of nuclear operations that is the sole and exclusive province of the NRC and is preempted by the Atomic Energy Act. This Tribunal therefore should conclude, as it previously has, that it lacks authority to mandate outages as a SPDES permit condition, and not advance outages to adjudication. At a minimum, Entergy respectfully requests that this Tribunal establish a briefing schedule and issue a decision on this issue prior to the commencement of hearings on the Outage Proposal.

3. DEC Staff’s Outages Proposal Is Substantively And Procedurally Flawed.

Even if outages were a cooling water intake structure “technology” – and they are not – and even if this Tribunal’s consideration of outages was not preempted by the Atomic Entergy Act – and it is – this Tribunal still should rule that the DEC Staff’s Outages Proposal cannot be advanced to adjudication due to the substantive and procedural flaws with the proposal. While we request full briefing of these issues (consistent with the above), the arguments may be summarized as

follows: (1) DEC Staff's Outages Proposal comes far beyond the reasonable time period for agency action under applicable law, including as construed by the New York courts, (2) DEC Staff's Outages Proposal is in flagrant disregard of this Tribunal's authority to set schedules, and (3) under the totality of the facts at issue here, DEC Staff should be estopped from advancing its Outages Proposal to avoid prejudice to Entergy and the other parties.

DEC Staff's action with respect to Indian Point's renewal SPDES permit was characterized as needlessly delayed by the New York Supreme Court *in 2003*, precipitating a DEC Staff commitment to issue a draft SPDES permit immediately. Specifically, in *Brodsky v. NYSDEC*, 766 N.Y.S.2d 277, 281 (N.Y. Sup. 2003), the Court concluded, in reviewing motions to dismiss Mr. Brodsky's causes of action, that DEC Staff's delays violated general legal norms and were prejudicial:

[T]here is still a general requirement that applications for permits or licenses be acted upon within a reasonable time (*Matter of Utica Cheese v Barber*, 49 N.Y.2d 1028 [1980]). As indicated above, the renewal application has been pending for more than 10 years, considerably longer than the delay of seven years characterized as extensive, unwarranted and prejudicial in *Matter of Kupersmith v Public Health Council of State of N.Y.* (101 A.D.2d 918 [1984], *aff'd* 63 N.Y.2d 904 [1984]).

With Entergy's support, the *Brodsky* suit was resolved (although the Court expressly held the case in abeyance) by DEC Staff's commitment to issue a draft SPDES permit in 2003, and DEC staff did so. At no time did DEC Staff indicate to the Court that the draft 2003 SPDES permit might be merely a placeholder for another decade, until such time as DEC Staff decided that it was unhappy with the BTA permit condition it proposed in 2003, and wanted the opportunity to propose an entirely different permit condition *that it had rejected in 2003*. Further, we are aware of no circumstances in which DEC Staff has attempted to hit the reset button a decade into a contested proceeding as it proposes to do here. To the contrary, we respectfully submit that DEC Staff's proposal of what amounts to a new draft SPDES permit in 2014 cannot be reconciled with the legal standard of prejudicial delay invoked by the *Brodsky* Court. *See, e.g.*, ECL § 70-0103 ("The legislature finds and declares that: 1. *It is the intent of the legislature to assure the fair, expeditious and thorough administrative review of regulatory permits. . . . 3. It is the intent of the legislature to establish reasonable time periods for administrative agency action on permits. 4. It is the intent of the legislature to encourage public participation in government review and decision-making processes and to promote public understanding of all government activities*") (emphasis added).

DEC Staff's failure to abide the Tribunal's orders underscores the unreasonable nature of its actions and the resulting prejudice to Entergy and the other parties. As described above, in February 2010 – seven years into the SPDES proceeding – the Tribunal specifically ordered Staff "to advise the parties and the ALJs of any changes in its position with respect to BTA." *Supra* at 3. In response, Staff identified only the possibility of identifying a variation on closed-cycle cooling. *Id.* While Staff purported to reserve the right to flout the Tribunal's May 2010 deadline and identify additional BTA alternatives "until such time as the contractor selected to conduct and/or assist staff with the alternative BTA analysis determines . . . that another or different BTA

alternative should be advanced in this proceeding,” id. (emphasis added), that purported reservation of rights was ultimately irrelevant: the Tetra Tech report came and went, and Tetra Tech did not “determine” that the Outages Proposal “should be advanced in this proceeding.” Accordingly, even if Staff had the right to ignore the May 2010 deadline pending the Tetra Tech report – which it did not – its outages proposal still came too late. If this Tribunal’s authority to “take any measures necessary for maintaining order and *the efficient conduct of the hearing*,” 6 NYCRR § 624.8(b)(1)(xv) (emphasis added), is to be meaningful, DEC Staff cannot be allowed to identify entirely new (and previously rejected) BTA concepts years after the deadline for doing so has passed.

Any attempt by DEC Staff to argue that the Outage Proposal has its origins in SEQRA and that Staff therefore should be allowed to ignore the Tribunal’s deadlines is likewise meritless. SEQRA does not provide grounds to ignore this Tribunal’s Section 624.8 authority to establish deadlines in this proceeding. Moreover, DEC Staff *already* considered outages for purposes of SEQRA back in 2003, and concluded that outages were *not* an appropriate alternative. SEQRA does not give Staff license to continue returning to the drawing board: If 42, 62, or 92 days are determined not to be BTA or to pass muster under SEQRA, should Staff be allowed to come back with 32-, 72-, and 82-day outage proposals? Such an approach would fly in the face of this Tribunal’s authority under the statutory mandates established by the New York Legislature in the Uniform Procedures Act. *See supra* at 11. DEC Staff’s advancement of entirely new outages proposals, coming 10 years after the draft SPDES permit rejected outages, more than three years after the Tribunal required parties to identify their BTA alternatives, more than three years after Staff recommended denial of Entergy’s WQC application stating that “only” closed-cycle cooling is BTA, and months after the Tetra Tech report advanced closed-cycle cooling and not outages, is no less baseless.

In addition, we respectfully submit that under the circumstances of this case it is appropriate to equitably estop DEC Staff from pursuing an outages mandate. *See, e.g., Landmark Colony at Oyster Bay v. Bd. of Supervisors of the County of Nassau*, 113 A.D.2d 741 (2d Dep’t 1985); *accord Agress v. Clarkstown Cent. Sch. Dist.*, 69 A.D.3d 769, 771 (2d Dep’t 2010) (denying summary judgment on estoppel claim against school district because triable issues of fact existed as to whether exceptional circumstances warranted estoppel based on “bureaucratic confusion and deficiencies”); *Allen v. Bd. of Educ. of Union Free Sch. Dist. No. 20*, 168 A.D.2d 403, 404 (2d Dep’t 1990) (same); *see also* 57 N.Y. Jur. 2d Estoppel, Ratification, and Waiver § 48 (“Estoppel may be imposed against a government agency, even if it is acting in its governmental capacity, if manifest injustice would result otherwise[.]”). In *Landmark Colony*, for example, the court affirmed an estoppel finding prohibiting municipal action (in awarding a penalty) on the basis of “bureaucratic confusion and deficiencies,” finding:

It is settled that a municipality or other governmental subdivision may be estopped where its wrongful or negligent conduct induces a party relying thereon to change his position to his detriment (*Bender v New York City Health & Hosps. Corp.*, 38 N.Y.2d 662, 668; *see also La Porto v Village of Philmont*, 39 N.Y.2d 7, 12). Although estoppel should not be invoked against governmental entities in the absence of exceptional circumstances (*Luka v New York City Tr. Auth.*, 100 A.D.2d 323, 325, *aff’d* 63 N.Y.2d 667),

we have not hesitated to do so where a municipality's misleading nonfeasance would otherwise result in a manifest injustice (*Matter of 1555 Boston Rd. Corp. v Finance Administrator of City of N. Y.*, 61 A.D.2d 187, 192). In this case, application of the penalty provision of Nassau County Ordinance No. 229-80, which was enacted after plaintiff had commenced the approval process for its condominium project, constituted such a manifest injustice that the penalty, plus interest, must be returned.

The *Landmark Colony* circumstances are analogous to those here, and underscore how the equitable estoppel standard is satisfied in these circumstances. DEC Staff, in 2003, evaluated and rejected permanent outages, expressly advising the public and Entergy of that plain fact. *Supra* at 2-3. DEC Staff then emphasized that position in its April 2, 2010 proposed notice to deny Entergy's WQC application; there, DEC Staff concluded that "conversion from a once-through cooling system to a closed-cycle cooling system, while expensive and involving a potentially lengthy construction process, is nevertheless the *only available and technically feasible technology for Units 2 and 3 to completely satisfy the BTA requirement of 6 NYCRR § 704.5 and, therefore, comply with State water quality standards.*" April 2, 2010 DEC Staff Notice of Denial, p. 15. DEC Staff's use of the word "only" is telling, and underscores the irrefutable point that – even seven years into this proceeding and contemporaneous with this Tribunal's orders to make a BTA selection – DEC Staff was still communicating to Entergy, this Tribunal and the public that it had no permanent outages proposal in mind. Finally, and as detailed above, DEC Staff never, in response to any scheduling order of this Tribunal, expressly or impliedly raised the prospect of permanent outages. To the contrary, virtually every document and statement by DEC Staff has been premised upon Staff's selection of closed-cycle cooling as BTA. Whether this conduct amounts to "wrongful" or "negligent" conduct within the meaning of *Landmark Colony*, it is surely one or the other.

Likewise, there can be no doubt that DEC Staff's actions represent a manifest injustice, prejudicing Entergy and the other parties to this proceeding, and also damaging the integrity of the hearing process. There can be no doubt that Entergy, like any reasonable party and the public, understood DEC Staff's proposed BTA to be closed-cycle cooling, not outages, and has proceeded for the past decade accordingly. This proceeding languished as Entergy and the parties awaited DEC Staff's efforts to retain, at Entergy's expense, experts to perform the actual technical analysis to support DEC Staff's closed-cycle cooling proposal. The closed-cycle cooling question has been tried, nearly in full, at great expense and with a tremendous commitment of time, with only limited testimony of select witnesses remaining. DEC Staff's Outage Proposal now requires all of the parties to this proceeding to commit material additional time and resources in order to address not one, but *six* more BTA proposals, even though Staff has conducted *no* analysis concerning the feasibility of these proposals – on either a technical or NRC-licensing basis – or their acceptability under SEQRA. Time and money, particularly the years and millions of dollars implicated here, satisfy the manifest injustice standard. *See, e.g., Landmark Colony*, 113 A.D.2d at 743-44 (\$15,000 penalty represented manifest injustice). Further, the absence of a resolution has had reputational consequences for Entergy and has inflicted a needless emotional toll upon Entergy personnel who have dedicated more than a decade to addressing in good faith a closed-cycle cooling option that now, apparently, DEC Staff regard as a "never mind." Finally, DEC Staff's actions cast the very administrative process into

disrepute, raising the specter of judicial review on the grounds that continuing the administrative process is futile. While equitable estoppel may be a rare remedy, it is an appropriate remedy here.

For these reasons, DEC Staff should be estopped from advancing its Outage Proposal, and this Tribunal should not advance DEC Staff's Outages Proposal to adjudication. At a minimum, Entergy respectfully requests that this Tribunal establish a briefing schedule and issue a decision on this issue prior to the commencement of hearings on the Outage Proposal.

4. The Tribunal Should Exercise Its Authority to Manage this Proceeding By Requiring DEC Staff to Withdraw All or Some of the Scenarios in the Outage Proposal.

This Tribunal has the authority to "take any measures necessary for maintaining order and the efficient conduct of the hearing." *See, e.g.*, 6 NYCRR § 624.8(b)(1)(xv). That includes the authority to require Staff to streamline its BTA case by eliminating the Outages Proposal or narrowing the number of outage scenarios submitted for adjudication. Indeed, the Tribunal already has exercised precisely that authority in this case, requiring Riverkeeper to reduce its number of proposed cooling tower configurations from dozens to one for each Unit for purposes of the hearings (configurations which Riverkeeper eventually abandoned). *See* Memorandum of ALJ Villa, November 13, 2013, p. 6 ("Nevertheless, in order to ensure that the hearing proceeds efficiently, Riverkeeper must limit its presentation at the hearing to two proposed configurations: one proposed configuration for Unit 2, and one proposed configuration for Unit 3.").

So, too, DEC Staff should be required to present a single permanent outage scenario for purposes of the hearing. DEC Staff is already proposing two separate and very different cooling tower configurations (circular hybrid and ClearSky). Now it seeks to advance six outages proposals, which again are very different: some involve a closed-cycle cooling retrofit of Unit 2 and some do not; some theoretically could be staggered during the May 10-August 10 period and others cannot; some are guaranteed to occur during the summer peak for electricity consumption and others possibly could avoid it; and all have different implications for air pollutant emissions, wholesale and capacity market electricity pricing, electric system reliability, the likelihood and likely cost of new generation capacity and transmission resources being constructed, and on and on and on.

Respectfully, the sheer volume of BTA proposals put forward by DEC Staff is not fair to Entergy, the other parties, the Tribunal or the public. This unfairness is compounded by the fact that DEC Staff does not appear even to support some of the outages proposals that it is advancing. In particular:

- on page 12 of the Outage Proposal, Staff calls out the option involving 42 days of outages at both units as "not meeting the efficacy goal required by the 2008 Interim Decision or the entrainment performance goal in Department Policy CP-52," and
- on page 13 of the Outage Proposal, Staff states ambiguously that "*a number* of the protective outage options presented in this fact sheet would likely be less protective than

the efficacy and performance goals identified in the Aug. 13, 2008 Interim Decision and Department Policy CP-52 for entrainment reductions” (emphasis added).³

And the unfairness of the requiring the Tribunal and parties to litigate all six outages proposals is compounded even further by the fact that DEC Staff appears to have given no advance thought to the feasibility of the outages proposals, nor their compliance with the AEA and NRC regulations.

If there are scenarios in its Outages Proposal that Staff does not support, this Tribunal should not require the parties to adjudicate them. Nor should it require the adjudication of six outages proposals on top of two closed-cycle cooling proposals. Again, enough is enough. Accordingly, at the July 22, 2014 public hearing or the issues conference (if not before), the Tribunal should require DEC Staff to identify which, if any, of the six scenarios in the Outages Proposal it actually supports. At a minimum, the Tribunal should advance only that set of scenarios to adjudication; more appropriately, and as it did with Riverkeeper’s many closed-cycle cooling proposals, the Tribunal should limit DEC Staff to one proposed outage scenario covering both units.

II. Proposed Issues For Adjudication

This section summarizes Entergy’s substantive disputes with DEC Staff’s Outages Proposal, and provides the ALJs with the wording for suggested issues for adjudication (provided as headings numbered 1 through 5), on the assumption that all dispositive legal issues are resolved against Entergy.

As an initial matter, the Tribunal’s Issues Ruling should be clear that, with respect to the three scenarios in the Outage Proposal that involve installation of cooling towers at IPEC Unit 2, DEC Staff should not be allowed to re-litigate issues relating to closed-cycle cooling, which were the subject of volumes of evidence at the April-May 2014 adjudicatory hearings establishing the infeasibility and detrimental SEQRA impacts of retrofitting Unit 2 with closed-cycle cooling. Rather, DEC Staff (and the other parties) only should be permitted to introduce evidence that is both specific to a single unit retrofit at IPEC Unit 2 and that could not have been raised in the April-May 2014 hearing. As a result, testimony should not be allowed as to, *e.g.*, the general or site-specific feasibility of closed-cycle cooling at Unit 2 or the SEQRA impacts, including the visual, noise or other impacts of Unit 2 towers, and so forth. Hearings with respect to the Outage Proposal should not be an opportunity for Staff to rehabilitate its closed-cycle cooling case, which was palpably insufficient to meet Staff’s burden of proof on BTA and SEQRA.

1. Whether the Six Scenarios in the Outages Proposal Are Feasible (Available) on a Site-Specific Basis at Indian Point.

Application of the third step of the four-part test for determining BTA under Section 704.5 requires DEC Staff to prove the “availability” of its BTA proposals, including the six proposals

³ Entergy disagrees with DEC Staff as to what the Interim Decision (which has been supplanted in relevant respects by the November 2012 reconsideration decision) and CP-52 (which has no force of law) actually require. However, the fact remains that DEC Staff plainly does not support the entire outages proposal that it asks the Tribunal to advance.

set forth in the Outage Proposal. *See* Interim Decision, p. 9. As previously noted, this includes the technical or engineering feasibility of each proposal:

Availability of a technology is analyzed in the context of its suitability for the particular application, including its ability *to be installed and operated at the site*. In this regard, for example, the impacts of a technology on a facility's operation (that is, can it be engineered *such that the facility will operate efficiently*) are part of the BTA analysis.

Interim Decision, p. 10 (emphasis added; citations omitted).

DEC Staff's bald assertion that "[p]rotective outages can be implemented immediately" and that such outages offer an "immediately viable and less complex option" to implement BTA, *see* Outage Proposal at 3 and 13, reveals its arbitrary and capricious approach to the development of the Outage Proposal, unmoored from any consideration of actual analysis or consultation with nuclear-qualified personnel and experts. The periodic shutdown of Indian Point Units 2 and 3 has direct consequences for nuclear operations for each Unit, each of which is presently designed and operated to run for 23 consecutive months between refueling outages. While it is possible (though unlikely) that a layperson might think that simply "turning off" a nuclear power plant is as straightforward as flipping a switch, it will come as no surprise that the process is substantially more complicated than that and will require substantial time to assess and, if feasible, implement.

Entergy expects to provide expert testimony and analysis demonstrating that outages do not meet the Interim Decision's standard for feasibility (availability) on a site-specific basis at Indian Point. Altering the Stations' generation profile by forced shutdowns for as much as 25% of the year, including during peak demand periods, cannot be reconciled with, and in fact is the antithesis of, ensuring "that the facility will operate efficiently." Interim Decision, p. 10 (citations omitted). Indeed, it suggests a veiled effort to shut down Indian Point, not a genuine technology-forcing mission focused on legitimate environmental policy.

Further feasibility barriers include, but are not limited to, the disruptive nature of annual, multi-month outages at baseload nuclear facilities that normally operate on a staggered 24-month refueling cycle with only a thirty-day maintenance and refueling outage; the uncertain availability of sufficient resources (internal or consulting) to successfully deliver simultaneous outages; the uncertainty of meeting industry standards and expectations around increased fuel handling, fuel quality and assembly management, as well as radioisotope dose and discharge expectations and goals; and the implications of stagnant water and protracted non-use in the steam generators, condensers, circulating water pumps and other balance of plant system components, particularly during periods of highest bio-fouling and the challenges this represents for restarting the Units. Importantly, Entergy expects to demonstrate that the site is too constrained, and skilled personnel in the country are too few, to provide the resources necessary to accomplish the simultaneous shutdown, and then simultaneous startup, of both Indian Point units every year.

With respect to those scenarios involving closed-cycle cooling at Unit 2, Entergy already has submitted voluminous testimony on the infeasibility of closed-cycle cooling at Indian Point and will expressly incorporate all of that testimony with respect to the scenarios involving the retrofit of Indian Point Unit 2 with closed-cycle cooling. Entergy will introduce further evidence that limiting the closed-cycle cooling retrofit to Unit 2 will not mitigate the infeasibility issues of closed-cycle cooling, which Entergy established at the April-May 2014 hearing, with the result that none of the three outage scenarios implicating retrofitting Unit 2 with closed-cycle cooling are available.

These issues have not been acknowledged, let alone addressed and satisfactorily resolved, by DEC Staff. While ultimately Staff has the legal burden in an adjudicatory proceeding of demonstrating the availability of its proffered BTA alternatives, Entergy expects to provide expert testimony on these issues. Specific Entergy witnesses are expected to include Yan Kishinevsky and Richard Clubb, among others.

2. Whether, Even if DEC Staff Is Not Field Preempted From Forcing Outages at Indian Point, DEC Staff's Outage Proposal Conflicts With NRC Regulations

As discussed above, annual outages have implications for reactor management. Annual outages also necessarily increase the frequency of fuel handling, and spent fuel and spent fuel pool management, which represent challenges to maintaining current dose limitations for on-site personnel and site boundary dose limits in a manner consistent with NRC-administered goals, including "ALARA" ("as low as is reasonably achievable") goals. *See, e.g.*, 10 CFR Part 20, Subpart C – Occupational Dose Limits, and Subpart D – Radiation Dose Limits for Individual Members of the Public; 10 CFR §§ 10.1301(d)(3) (exemplary ALARA condition) and 20.1003 (defining ALARA to mean "making every reasonable effort to maintain exposures to radiation as far below the dose limits as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to the benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest."). Also implicated are the management of dry cask storage of spent fuel and other significant radioisotope-management considerations.

Potential conflicts with NRC regulations have not been acknowledged, let alone addressed and satisfactorily resolved, by DEC Staff. While ultimately Staff has the legal burden in an adjudicatory proceeding of demonstrating the availability of its proffered BTA alternatives, Entergy expects to provide expert testimony on these issues, including as to whether ALARAs can be maintained. Specific Entergy witnesses are expected to include Matt Barvenik, Yan Kishinevsky and Richard Clubb, among others.

3. Whether DEC Staff's Outage Proposal Satisfies the Fourth Step for Determining BTA Under 6 NYCRR § 704.5.

The fourth step of the BTA analysis addresses whether the costs of practicable technologies are "wholly disproportionate" to the environmental benefits conferred by such measures. *See* Interim Decision at 9; Ruling of Regional Director, November 2012. Entergy expects to provide expert testimony demonstrating, *inter alia*, that (1) DEC Staff's application of the "wholly

disproportionate” test as described in the Outage Proposal is arbitrary and capricious and contrary to DEC precedent, (2) that Staff’s analysis of outage costs, which seemingly is limited to Entergy’s lost revenues, ignores entirely the costs of implementing outages, including, *e.g.*, the costs incurred in annual outages at each Unit, rather than biennial outages, and (3) that the incremental costs of the Outage Proposal, and of each scenario contained within the Outage Proposal, are wholly disproportionate to their incremental environmental benefits, whether applying DEC Staff’s formulation of that test or a more appropriate formulation.

Relatedly, Entergy expects to demonstrate through expert testimony that the efficacy of the Outage Proposal at reducing entrainment and impingement mortality at Indian Point is no better than the efficacy of Entergy’s cylindrical wedgewire screen (“CWWS”) alternative. In that regard, Entergy expects to demonstrate that the impingement and entrainment reductions set forth by DEC Staff in its Outage Proposal overstate the likely reductions, and that the reductions are highly uncertain and variable, depending upon the timing of the entrainment peaks in any given year. Specifically, there is no guaranty in a particular year that any outage will overlap entirely with either of the peak entrainment periods identified in the Outage Proposal; indeed, it is possible that the peak entrainment periods in some years could occur entirely outside the May 10-August 10 period. In comparison, DEC Staff acknowledges that Entergy’s proposed CWWS will have at least 54% efficacy, while Riverkeeper’s expert has estimated 60% efficacy, and Entergy’s experts have estimated CWWS efficacy as high as 90%, depending upon the treatment of factors such as entrainment survival and conversion to age-1 equivalents. Moreover, outages will provide no impingement reductions outside the outage period, whereas it is undisputed that CWWS will almost entirely eliminate impingement year-round (>99% reduction). The Outages Proposal itself confirms the smaller impingement benefits offered by outages in comparison to CWWS.

The complexity of determining the efficacy and cost of the outages proposals, and the incremental costs and benefits of outages in comparison to CWWS, have simply been ignored by DEC Staff. While ultimately Staff has the legal burden in an adjudicatory proceeding of demonstrating the availability of its proffered BTA alternatives, Entergy expects to introduce evidence demonstrating that the Outage Proposal does not survive step four of the BTA analysis, including in comparison to Entergy’s CWWS proposal. Specific Entergy witnesses are expected to include John Young, Doug Heimbuch and David Harrison, among others.

4. Whether DEC Staff’s Outage Proposal Complies with SEQRA.

The Interim Decision in the SPDES Proceeding instructs that “the proponents of each technology should present an analysis of the environmental impacts associated with such technologies pursuant to SEQRA.” Interim Decision at 40. DEC Staff’s Outage Proposal, however, is bereft of *any* mention of the adverse environmental impacts associated with the Outage Proposal. Nor does the Outage Proposal contain any discussion of the social, economic and other factors which must be identified, assessed and balanced, as SEQRA requires.

Entergy expects to demonstrate through expert testimony that each of the scenarios within the Outage Proposal results in significant adverse environmental, social and economic impacts, including without limitation:

- a. Adverse impacts to Station operations addressed above in Sections 1 and 2;
- b. Adverse air quality impacts associated with the deployment or new construction of fossil-fuel fired power sources to replace Indian Point's baseload, essentially emissions-free generation, during periods of outages at IPEC. Testimony already submitted by DPS Staff in the SPDES proceeding confirms that the outages scenarios will lead to increased emissions of pollutants with significant human health and environmental impacts such as NO_x (a ground-level ozone precursor) and SO_x. These witnesses also already have estimated that annual outages at Indian Point will cause substantial increases in greenhouse gas emissions with significant implications for global climate change and hence New York's environment and human health;
- c. Adverse impacts to electricity consumers associated with the Outage Proposal, and the corresponding increase in wholesale electricity and capacity prices. This is not a matter of debate: the DPS witnesses estimate that the scenarios set forth in the Outage Proposal could cost consumers hundreds of millions of dollars – or even upwards of \$1 billion – *every* year due to wholesale and capacity price increases caused by the removal of Indian Point's more than 2,000 MW of baseload capacity each summer;
- d. Adverse impacts to electric system reliability. DPS witnesses already have testified that an outage for any reason, especially during the summer peak demand period, would be a "big deal." Witnesses testifying at the April-May 2014 adjudicatory hearing with respect to construction outages for closed-cycle cooling installation demonstrated that an outage for any reason is likely to lead to violations of federally-mandated reliability criteria intended to guard against the risks of power outages, as demands on the electric system combined with mandated reliability margins exceed system capacity. This will result in the statistical probability of a power outage increasing above legal requirements. Moreover, an outage at Indian Point will rob the electric system of voltage support and reactive power at a crucial location in the Lower Hudson Valley. If new generation capacity or transmission lines must be built to cover capacity needs during annual outages, the cost to ratepayers or taxpayers of this infrastructure would likely be billions of dollars;
- e. Adverse impacts to air quality, visual resources, terrestrial ecology, archeological resources, noise, water quality, transportation and navigation, human health and environmental justice communities associated with the construction and operation of a cooling tower at Unit 2, as was the subject of testimony at the April-May 2014 adjudicatory hearing;
- f. Adverse impacts to Environmental Justice communities as a result of outages and resultant local and regional emissions increases; and

- g. The risk that Entergy would respond to an outages mandate by retiring the facility, which would lead to a magnification of all of the above impacts and directly and indirectly cost New York thousands of jobs.

While ultimately Staff has the legal burden in an adjudicatory proceeding of demonstrating the availability of its proffered BTA alternatives, Entergy expects to introduce evidence of the above and other adverse environmental, social and economic impacts of the Outage Proposal, and the failure of the Outage Proposal to appropriately weigh social and economic impacts particularly in comparison to the available CWS alternative. Specific Entergy witnesses are expected to include Marc Lawlor, Yan Kishinevsky, Richard Clubb, Ted Main, Matt Allen, John Young, Doug Heimbuch and David Harrison, among others.

5. Whether Any Outage Constitutes a Regulatory/Temporary Taking Requiring Compensation under the Fourteenth Amendment to the United States Constitution.

In its comments on the 2003 Draft SPDES Permit, Entergy raised an issue under the Takings Clause with respect to DEC Staff's proposed interim outages in the 2003 Draft SPDES Permit. Without waiving that issue, Entergy expands it here to include DEC Staff's Outage Proposal. Entergy expects to demonstrate through expert witness testimony that Entergy is deprived of the economically beneficial use of its property during the period of outage for the asserted public purpose of saving fish eggs and larvae. Accordingly, to the extent the Outage Proposal is included in a final SPDES Permit, Entergy is entitled to compensation for such outages consistent with the Fourteenth Amendment to the United States Constitution.⁴

III. Factual Errors and Clarifications with Regard to Outage History

The Outage Proposal contains certain factual errors regarding the history of outages at Indian Point. These must be corrected for the Tribunal and the public to have an accurate context for evaluation of the Outage Proposal, if advanced to trial.

First, DEC Staff asserts that annual outages of 42 days "were historically required at IPEC . . . when the Hudson River Settlement Agreement ('HRSA') took effect in 1981." Outage Proposal at 2. DEC Staff implies that *both* Unit 2 and Unit 3 were required to be out for 42 days each year under the HRSA. This is incorrect and potentially misleading. Under the HRSA,⁵ the IPEC facilities agreed to take 42 *unit-days* of outages annually between May 15 and August 15 of each calendar year. In other words, the *sum* total of outage days at *both* Unit 2 and Unit 3 amounted to 42 days, not 42 days at *each* unit (which is 84 unit-days) as currently proposed by DEC Staff. Thus, the HRSA provision allowed Indian Point to have only one Unit out each year, with the

⁴ Entergy acknowledges that the Interim Decision concluded that takings claims are a matter to be addressed in a judicial forum, rather than adjudicated in this administrative proceeding, but respectfully submits that development of relevant evidence before this Tribunal may assist in the development of a complete record for review by the ultimate decisionmaker. See Interim Decision at 31.

⁵ The HRSA was a consensus agreement reached among the prior owners of Indian Point, DEC, and Riverkeeper (among others) more than three decades ago in the infancy of Indian Point's operational history. The then-owners of Indian Point accepted the HRSA without the benefit of more than three decades of outage experience, but declined to accept the outage provisions beginning in 1991, as noted *infra* in text. Thus, the HRSA is not only different, it is also irrelevant today.

other Unit maintaining its then-existing schedule of refueling outages. The HRSA further authorized accumulation and trading of fish protection points associated with flow reductions among facilities, an inherently more flexible scheme than what DEC Staff now proposes and one that translated to the parties waiving Indian Point's outage requirements in the series of judicially-approved consent orders that supplanted the HRSA when it terminated in 1991.

The reason this clarification is necessary is that the Tribunal (and the public as well) should understand that the Outage Proposal would, at a minimum, double the number of unit-days of outages at Indian Point (under the three scenarios involving only outages and not closed-cycle cooling at Unit 2), as compared to the HRSA outage provisions, for a facility that has different expectations, and a different role in the electric system, than it did 30 years ago. Specifically, the three outages-only proposals in DEC Staff's new Proposal call for 84, 124, and 184 unit-days of outages, and the three outages-plus-cooling-towers proposals in its new Proposal call for 42, 62, and 92 unit-days of outages. Thus, the Outage Proposal represents a fundamental change in Indian Point's current outage management and a substantial increase in outages from even the long-terminated HRSA agreement. The Outages Proposal consequently introduces considerations, including electric system reliability and human health risks, to an extent not present in the HRSA for the then-new station. This is not a trivial change, yet its implications are nowhere considered or addressed in the Outage Proposal.

Second, DEC Staff states that the outage requirements of the HRSA "were incorporated by reference into the 1987 SPDES permit for IPEC, the permit currently in effect as a result of the State Administrative Procedure Act," implying that IPEC's current SPDES Permit requires 42 unit-days of outages at Indian Point each year. This is not accurate, as demonstrated by DEC Staff's own statements in multiple documents. *See, e.g.*, 2003 Fact Sheet, Attachment B, p. 21 (referencing multiple draft permit revisions based on the expiration of the HRSA – "*As HRSA has expired, this condition is no longer relevant.*") (emphasis supplied); FEIS, p. 8 ("The HRSA was effective for the ten year period from May 10, 1981 to May 10, 1991."); December 5, 2002 Affidavit of DEC counsel William G. Little, p. 4 ("The HRSA was effective for the 10-year period from May 10, 1981 to May 10, 1991") (submitted in the *Brodsky* matter); December 5, 2002 Affidavit of DEC Staffperson Ed Radle, p. 7 ("Although the HRSA and subsequent Consent Orders have expired ...") (submitted in the *Brodsky* matter). The plain fact is that there has been no outage requirement at Indian Point since the expiration of the HRSA in 1991. An accurate accounting of this history is necessary to provide the appropriate context for the Outage Proposal and its significant deviation from prior Department positions.

Entergy respectfully reserves its right to contest all factual issues raised in the Outage Proposal, to raise additional issues for pre-hearing briefing or adjudication following its review of public comments on the Outage Proposal, the submissions of other parties, public comments received at the Legislative Hearing, or the positions adopted by DEC Staff and other parties during the remainder of this proceeding.

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 7, 2014, 8:30 a.m.

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1 that. Criteria pollutants form ozone. I don't know
2 if ozone is actually a criteria.
3 Okay, yes, it is.
4 Q. Do you know if they include sulfur dioxide?
5 A. [STANNARD] Yes.
6 Q. And if I call that SO_x throughout the
7 afternoon, you'll know what I'm talking about?
8 A. [STANNARD] Yes.
9 Q. Oxides of nitrogen, or NO_x, are also a
10 criteria pollutant; is that correct?
11 A. [STANNARD] Yes, it is.
12 Q. At least parts of New York are presently in
13 nonattainment for some of the criteria pollutants;
14 correct?
15 A. [STANNARD] Yes.
16 Q. That would include particulate matter; is
17 that correct?
18 A. [STANNARD] Yes.
19 Q. And also ozone; right?
20 A. [STANNARD] Yes.
21 Q. Is it fair to say that you're familiar with
22 the environmental and human-health effects of these
23 pollutants?

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1 A. [STANNARD] Yeah, fairly.
2 Q. Familiar enough for your job; right?
3 A. [STANNARD] Yes.
4 Q. Are you also familiar with New York State's
5 efforts to address problems with those pollutants?
6 A. [STANNARD] Yes.
7 Q. And generally speaking, your goal in the
8 Division of Air Resources is to reduce emissions of
9 those pollutants; correct?
10 A. [STANNARD] In general, yes.
11 Q. But you would agree that, as a result of
12 installing closed-cycle cooling at Indian Point,
13 there would be some increase in emissions of certain
14 of those pollutants; correct?
15 A. [STANNARD] Yes, based upon the DPS report
16 that I reviewed, yes.
17 Q. For example, during the expected
18 construction outage to build closed-cycle cooling,
19 the almost 2,000 megawatts of power presently
20 provided by Indian Point would need to be replaced
21 by other electric generating facilities; right?
22 A. [STANNARD] Yes.
23 Q. And the expectation, as reflected in the

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1 DPS report you mentioned, is that much of that
2 electricity would be generated by fossil-fuel-
3 burning facilities; correct?
4 A. [STANNARD] Yeah, that would be the
5 reasonable expectation, yes.
6 Q. And in comparison to a nuclear energy
7 plant, like Indian Point, those fossil-fuel plants
8 emit more criteria pollutants; correct?
9 A. [STANNARD] I would say yes.
10 Q. And the purpose of your prefiled testimony
11 in this proceeding is to provide some amount of
12 commentary on the DPS report, which attempted to
13 quantify what the increase in emissions of
14 pollutants might be; right?
15 A. [STANNARD] That sounds accurate.
16 Q. And in particular, your prefiled testimony
17 addresses increases in SO_x, NO_x, and carbon dioxide;
18 is that right?
19 A. [STANNARD] Yes.
20 Q. First let's talk about carbon dioxide. You
21 would agree that carbon dioxide is emitted into the
22 air when fossil fuels -- among other ways, when
23 fossil fuels are burned to produce energy; correct?

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1 A. [STANNARD] Yes, that's one way, yes.
2 Q. Nuclear power plants, which don't burn
3 fossil fuels to create energy, don't release carbon
4 dioxide except perhaps incidentally; correct?
5 A. [STANNARD] Yeah, that's reasonable.
6 Q. So to the extent electricity is being
7 generated by nuclear plants, it results in lower
8 carbon dioxide emissions than you would have if that
9 same amount of electricity were being generated by
10 fossil-fuel plants; right?
11 A. [STANNARD] Yes. I mean, if we're just
12 talking about one pollutant, yes.
13 Q. One expected consequence of Indian Point
14 being out for a construction outage is that there
15 will be some increase in the amount of carbon
16 dioxide emissions in order to supply New York
17 State's electricity; right?
18 A. [STANNARD] Yes, that was one of the
19 conclusions of the DPS report.
20 MR. GIBBS: Your Honor, I'm going to
21 have to object at this point. I'm not sure where
22 these questions are leading to. He's given this
23 testimony in his direct testimony. It's all there.

1 I'm not sure where these questions are going. They
2 sound very general and very -- a lot of assumptions
3 happening on these questions.

4 JUDGE VILLA: Mr. Martin?

5 MR. MARTIN: Your Honor, this is in part
6 a SEQRA unit. This tribunal, and ultimately DEC,
7 need to weigh and balance what the environmental and
8 other impacts are of the different technologies
9 which are being proposed. As the DPS report that
10 Mr. Stannard comments on demonstrates, there will be
11 an increase in CO₂, NO_x, and SO_x emissions. So I
12 think it's perfectly fair with this witness to talk
13 about what the implications are of those increases
14 in pollutants, since this witness did comment on the
15 scope of those emissions.

16 JUDGE VILLA: Can you be a little bit
17 more specific? Because the questions are pretty
18 general. I'm wondering if we can move a little
19 faster.

20 MR. MARTIN: I could, Your Honor. But
21 just to give you a guide to where I was going to go,
22 I was going to start by talking a little bit about
23 what the implications are of those emissions and

1 MR. MARTIN: It's a participating state.

2 Q. New York State is participating -- it
3 signed a memorandum of understanding; correct?

4 A. [STANNARD] Yes.

5 Q. And individual signed it, but that
6 individual is not participating. He signed on
7 behalf of the State; right?

8 A. [STANNARD] I don't know the details of how
9 that works. So if you say so.

10 Q. Mr. Stannard, you're aware that RGGI -- you
11 discuss RGGI in your prefiled testimony; right?

12 A. [STANNARD] Yes.

13 Q. RGGI targets CO₂ emissions from power plants
14 in particular; correct?

15 A. [STANNARD] Yes.

16 Q. And it does so through a cap-and-trade
17 system for CO₂ allowances?

18 A. [STANNARD] Essentially, yes.

19 Q. Would you agree that the negotiation and
20 entry into RGGI was a significant accomplishment for
21 New York in the fight against greenhouse gas
22 emissions?

23 A. [STANNARD] I would say it's a step in the

1 then drill down into the scope of the emissions,
2 which is the subject of his testimony, and then ask
3 the witness at the end to tie together the effects
4 and the scope.

5 JUDGE VILLA: I'll overrule the
6 objection, but if you can just try to move it along
7 as much as you can. We do have testimony in
8 prefiled, and he's referenced -- he made reference
9 to the report. So if we can move it along as
10 quickly as we can.

11 Q. Mr. Stannard, you would agree that New York
12 State is attempting to reduce emissions of
13 greenhouse gases such as carbon dioxide; right?

14 A. [STANNARD] Yes.

15 Q. An in fact, New York State is one of the
16 signatories to the Regional Greenhouse Gas
17 Initiative, or RGGI?

18 MR. BINDER: I'm going to object to that
19 because it's an inaccurate characterization. The
20 State is not signatory to the program.

21 MR. MARTIN: New York State is a member
22 of the program; right?

23 MR. BINDER: A participating state.

1 right direction.

2 Q. Do you think more needs to be done?

3 A. [STANNARD] Yes.

4 Q. Let's take a look at what's been marked as
5 Entergy 425. Mr. Stannard, have you seen what's
6 been marked as Entergy 425 before?

7 A. [STANNARD] I have seen it. I haven't
8 studied it.

9 Q. Do you recognize this -- and it says it on
10 the front cover -- that this is the memorandum of
11 understanding for RGGI?

12 A. [STANNARD] Yes.

13 Q. And this is signed by New York State;
14 correct? Or by an individual representing New York
15 State?

16 A. [STANNARD] Yes.

17 Q. If you look back to Page 17 do you see the
18 signature of former Governor Pataki?

19 A. [STANNARD] Yes.

20 Q. What this states on the front page, and I
21 think we would probably all agree, is that climate
22 change poses serious potential risks to human health
23 and terrestrial and aquatic ecosystems globally and

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1 in the signatory states; correct?
 2 A. [STANNARD] I can't say whether we all
 3 agree about that, but it does say that.
 4 Q. DEC certainly agrees officially that
 5 climate change poses risks to human health and to
 6 the ecology in New York State; correct?
 7 A. [STANNARD] I would say that's the
 8 Department's position, yeah.
 9 Q. Let's take a look at what's been marked as
 10 Entergy Exhibit 417.
 11 A. [STANNARD] Yes.
 12 Q. Mr. Stannard, do you recognize what's been
 13 marked as Entergy 417?
 14 A. [STANNARD] Yes.
 15 Q. What is this?
 16 A. [STANNARD] It's the regulatory impact
 17 statement for the RGGI rule.
 18 Q. If you look in the right-hand side of the
 19 cover page here, there's a little box which has the
 20 contact for this page, and that's the Division of
 21 Air Resources?
 22 A. [STANNARD] Yes.
 23 Q. Did you have any role in putting together

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1 this regulatory impact statement?
 2 A. [STANNARD] No direct role in that. I may
 3 have contributed little bits to it, but no.
 4 Q. Have you seen this before?
 5 A. [STANNARD] Yes.
 6 Q. Let's just take a quick look at this and
 7 see what this regulatory impact statement says about
 8 the risks of greenhouse gas emissions to New York
 9 State's ecology and to human health.
 10 Mr. Stannard, would you turn to Page 5
 11 in this document.
 12 A. [STANNARD] Okay.
 13 Q. At the bottom of the page do you see where
 14 it states, "Needs and benefits, introduction"?
 15 A. [STANNARD] Yes, I do.
 16 Q. The first sentence here is, "Mitigating the
 17 impacts of a change in climate represents one of the
 18 most pressing environmental challenges for the
 19 state, the nation, and the world. Extensive
 20 scientific data demonstrates the need for immediate
 21 worldwide action to reduce emissions from burning
 22 fossil fuels." Do you see that?
 23 A. [STANNARD] Yes, I do.

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1 Q. And that is in fact DEC's official view;
 2 correct?
 3 A. [STANNARD] I can't really speak for the
 4 Department on that. But, I mean, this was filed on
 5 behalf of the Department, so I would say probably.
 6 Q. Do you have any reason to believe that this
 7 regulatory impact statement in any particular does
 8 not reflect the Department's official policies and
 9 views?
 10 A. [STANNARD] No, I believe the Commissioner
 11 signs off on these documents, so I'd say it's a fair
 12 characterization.
 13 Q. Could we turn to the next page, please,
 14 Page 6.
 15 MR. SANZA: We'll be happy to stipulate
 16 to what's in there so we can move this along so we
 17 don't have to play follow the reader.
 18 JUDGE VILLA: Is that possible,
 19 Mr. Martin? Are there questions other than -- as to
 20 the content?
 21 MR. MARTIN: I think we can stipulate,
 22 Your Honor. I guess one of the reasons to do it is
 23 just to emphasize certain points.

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1 JUDGE VILLA: I think you can do that in
 2 argument. If we could move along, that would be
 3 great.
 4 MR. MARTIN: Just to get a few more
 5 documents into the record, Your Honor.
 6 Q. Could we please turn to Exhibit 432.
 7 Mr. Stannard, are you familiar with the fact that
 8 back in 2009 then-Governor Patterson issued an
 9 executive order calling for the State to reduce
 10 greenhouse gas emissions 80 percent by the year
 11 2050?
 12 A. [STANNARD] Yes, I was aware of that.
 13 Q. If we could turn to what's been marked as
 14 Entergy Exhibit 431.
 15 A. [STANNARD] What number?
 16 Q. 431. Are you there, sir?
 17 A. [STANNARD] Yes.
 18 Q. Were you aware that DEC has an Office of
 19 Climate Change?
 20 A. [STANNARD] Yes, I am.
 21 Q. And the purpose of that office is to help
 22 facilitate efforts to reduce greenhouse emissions
 23 for New York State?

1 A. [STANNARD] No, actually, I do not.
 2 Q. Do you see that it's a printout from the
 3 Department of Environmental Conservation website?
 4 A. [STANNARD] Yes.
 5 Q. Do you know what the network plan is?
 6 A. [STANNARD] No.
 7 Q. Do you know who would? Does anybody else
 8 on the panel know what the network plan is for these
 9 pollutants?
 10 A. [VALIS] It's the air quality monitoring
 11 plan.
 12 Q. Okay, thank you. Mr. Stannard, can you
 13 turn with me to Page 21 in this document. Do you
 14 see in the top right-hand corner there are page
 15 numbers?
 16 A. [STANNARD] Yes, I do. I'm at Page 21.
 17 Q. Okay. Mr. Stannard, do you see the entry
 18 4.5 sulfur dioxide?
 19 A. [STANNARD] Yes.
 20 Q. Let's turn to the second paragraph on this
 21 number -- in this section. Do you see the paragraph
 22 beginning, "High concentrations of SO₂"?
 23 A. [STANNARD] Yes.

1 and children and the elderly, are especially
 2 susceptible to health problems as a result of SO₂
 3 exposure?
 4 A. [STANNARD] I think it exaggerated a little
 5 there by saying "especially susceptible." But I
 6 think they are an impacted group, yes.
 7 Q. What this says is that subgroups of the
 8 population that may be affected --
 9 A. [STANNARD] It doesn't say "especially
 10 susceptible," though.
 11 Q. It's calling out these groups. Presumably
 12 other groups aren't as susceptible; correct?
 13 MR. SANZA: We'll stipulate it says what
 14 it says so we don't have to do this bickering.
 15 JUDGE VILLA: I think it speaks for
 16 itself.
 17 Q. Mr. Stannard, you also agree that SO₂ can
 18 cause environmental impacts on top of human health
 19 impacts; correct?
 20 A. [STANNARD] Yes.
 21 Q. SO₂ is one of the pollutants which has
 22 contributed historically to acid rain; is that
 23 right?

1 Q. Mr. Stannard, you don't disagree that, as
 2 this document from DEC states, high concentrations
 3 of SO₂ can result in breathing impairment for
 4 asthmatic children and adults who are active
 5 outdoors?
 6 A. [STANNARD] No, I don't disagree.
 7 Q. Do you disagree that short-term exposures
 8 of asthmatic individuals to elevated SO₂ levels
 9 while at moderate exertion can result in reduced
 10 lung function?
 11 A. [STANNARD] I'm sorry, what was the
 12 question?
 13 Q. Do you agree that short-term exposures of
 14 asthmatic individuals to SO₂ can cause decreased
 15 lung function in such individuals?
 16 A. [STANNARD] To elevated SO₂? Yes.
 17 Q. And that's even short-term exposures;
 18 correct?
 19 A. [STANNARD] Yes, that's what the document
 20 says.
 21 Q. And do you also agree that subgroups of
 22 individuals in the population, such as individuals
 23 with cardiovascular disease or chronic lung disease

1 A. [STANNARD] Yes.
 2 Q. And SO₂ therefore poses risks not only to
 3 humans but also to the fish that are the general
 4 topic of these proceedings; correct?
 5 A. [STANNARD] Yes, it does.
 6 Q. Let's go back to Staff Exhibit 218 B, which
 7 is the Gjonaj-Wheat table.
 8 A. [STANNARD] Got it.
 9 Q. In addition to predicting increases in CO₂
 10 emissions as a result of an Indian Point
 11 construction outage, the DPS witnesses also
 12 predicted an increase in SO₂ emissions; correct?
 13 A. [STANNARD] Yes.
 14 Q. And what they predicted was an increase of
 15 1800 tons during a 42-week construction outage just
 16 in New York State; is that correct?
 17 A. [STANNARD] 1782, yes.
 18 Q. And they predicted just under 5800 tons for
 19 that larger region, including New England and the
 20 mid-Atlantic and Ontario; correct?
 21 A. [STANNARD] Yes, they did.
 22 Q. And the geographic distribution of that
 23 within New York State is fairly concentrated;

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1 correct?

2 A. [STANNARD] I don't know. Much of it is in
3 New York City, but much of it is also upstate.

4 Q. There's 100 tons predicted for an increase
5 just in the few hundred square miles of New York
6 City; correct?

7 A. [STANNARD] Yes.

8 Q. And another 800 tons on Long Island?

9 A. [STANNARD] Yes. I misspoke. When I say
10 "New York City," I'm from Albany, and I tend to
11 include Long Island.

12 Q. 57 tons for the Hudson Valley?

13 A. [STANNARD] Yes.

14 Q. On a percentage basis as well, there's a
15 fair concentration; right? If we look over seven or
16 eight columns, we start getting to percentages?

17 A. [STANNARD] Yes.

18 Q. Do you see that? And the percentage
19 increase predicted for Long Island is 14 percent?

20 A. [STANNARD] Uh-huh.

21 Q. There's a roughly 32 percent increase
22 predicted for New York City?

23 A. [STANNARD] Yes.

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1 JUDGE VILLA: Mr. Martin, just for me,
2 when I'm going back and looking through things, it's
3 a lot easier if you give me the exact percentages.
4 I can find it that much easier in the column. If
5 you can say 31.81, it would be a big help. Thank
6 you.

7 MR. MARTIN: Will do.

8 Q. And 50.91 percent for the Hudson Valley;
9 correct?

10 A. [STANNARD] 50.91. I thought you said
11 51.9.

12 Q. In your prefiled -- if you'd turn to your
13 prefiled testimony.

14 A. [STANNARD] Yes.

15 Q. And we look at Page 3 in your prefiled
16 testimony. Toward the top of the page, after
17 addressing the increases in SO₂ emissions, you say,
18 "The projected construction outage is expected to be
19 a relatively short duration, less than one year,
20 further mitigating the projected air emissions
21 impact." Did I read that correctly?

22 A. [STANNARD] Yes.

23 Q. First of all, what did you mean here by

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1 "the projected air emissions impact"?

2 A. [STANNARD] I was comparing that to the
3 overall emissions for the -- actually, let me review
4 what I wrote before I answer.

5 So I compared the entire New York State
6 emissions prepared by DPS to emissions in the New
7 York City nonattainment area. So I thought that was
8 conservative, to essentially assume that they're all
9 in the worst part of the state.

10 Q. Where is your math for that for SO₂?

11 A. [STANNARD] The SO₂ increased 3 1/2 percent.

12 Q. Right.

13 A. [STANNARD] And I compare the -- what was
14 it, 1800 tons? -- to -- in my prefiled testimony, I
15 reference to some tables from our set, and I
16 compared that to the SO₂ emissions total for 2017.

17 Q. Is that to Appendix A in your testimony?

18 A. [STANNARD] Is that Appendix A? Yes.

19 Q. Does the -- what does the New York City
20 nonattainment area include?

21 A. [STANNARD] It includes the five counties
22 of New York City, two in Long Island, Westchester,
23 Rockland, and Orange, I believe.

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1 Q. Do you know how that compares to the
2 definition of New York City that was used by DPS in
3 coming up with its numbers?

4 A. [STANNARD] I assume they just used the
5 five boroughs.

6 Q. And what they found was that there would be
7 a 100-ton increase just in the five boroughs;
8 correct?

9 A. [STANNARD] 100-ton?

10 Q. If we look back at 218 B.

11 A. [STANNARD] Yes.

12 MR. MARTIN: Just to give the judge the
13 exact number, the DPS witnesses in Exhibit 218 B
14 projected a 96-ton increase just in the five
15 boroughs.

16 Q. Mr. Stannard, has DPS -- sorry, has DEC
17 considered whether that 96-ton increase just in the
18 five boroughs poses any risk to human health of
19 residents of the five boroughs?

20 A. [STANNARD] I don't know how we would do
21 that.

22 Q. Sitting here today, can you rule out that
23 there would be a human health impact from that

(SEDEFIAN/VALIS/STANNARD - CROSS ENTERGY)
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1 Increase in SO₂ emissions in the five boroughs?
2 MR. BINDER: Objection. It calls for
3 speculation.
4 MR. SANZA: His previous answer was, "I
5 don't know how we could do that." Now he's asking
6 him to do it.
7 MR. MARTIN: I'm asking if he's ruled it
8 out. This is partially a SEQR analysis. This
9 witness was put forward, and his comment on the
10 increase in SO₂ emissions was, well, it's small. If
11 it's small but it's still going to have a human
12 health impact, I think that's something appropriate
13 for the Department of Environmental Conservation to
14 weigh against whatever benefits there may be to fish
15 as a result of imposing a CCC mandate.
16 JUDGE VILLA: Can you answer that
17 question, Mr. Stannard?
18 WITNESS STANNARD: No, I can't.
19 Q. Let me ask this, then, to wrap it up: When
20 you say in your testimony that the increase in SO₂
21 emissions as a result of installing closed-cycle
22 cooling at Indian Point and the expected
23 construction outage to accomplish that is small,

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1 this tribunal should not take away from that that
2 you are saying there will be no human health impact
3 as a result of that increase; correct?
4 A. [STANNARD] I don't really know how to
5 answer that. I can't rule that out, but I think
6 that's speculating.
7 Q. The other witnesses on the panel: None of
8 you in your prefled testimony rule out that there
9 will be a human health impact from increased SO₂
10 emissions as a result of the construction outage, do
11 you?
12 A. [VALIS] The way our regulations are
13 written and the way the permits are written, if
14 there's an increase in emissions, they would need to
15 identify those emissions increases, apply for
16 modifications to their permits or a new permit, and
17 do a demonstration of air quality impacts.
18 Q. That would be if a facility -- if an
19 individual facility was looking to increase its own
20 ability to emit above some existing permitted level;
21 correct?
22 A. [VALIS] If an existing facility or if a
23 new facility was built, they would need to apply for

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1 those permits and do an impact analysis.
2 Q. If an existing facility with an existing
3 permit is just going to be running more often in
4 order to make up for a power loss at Indian Point,
5 however, they wouldn't need to go through that step,
6 however, would they?
7 A. [VALIS] In our permits there is -- there's
8 usually one piece of the permit that says they
9 are -- they need to meet all standards, their
10 impacts need to meet the standards. So if we were
11 to understand that a certain facility was going to
12 cause or contribute to a violation of the NAAQS,
13 they would need to either have some controls put in
14 place or do something to ensure that they would not
15 cause impacts above the standards.
16 Q. If the increase in power generation was
17 spread across 10 or 15 different facilities, so that
18 no one individual facility was increasing its
19 emissions so much that it would cut across some
20 threshold, though, then none of the facilities would
21 need to do that, would they?
22 MR. GIBBS: Objection, Your Honor.
23 We're calling for speculation again. We were

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1 starting on Mr. Stannard's testimony. His testimony
2 is what his testimony was. If he wants to just ask
3 Mr. Stannard why did he say it's insignificant, why
4 doesn't he just ask that? I don't understand why
5 we're getting into all these scenarios that I don't
6 even know the relevance of.
7 MR. MARTIN: Your Honor, it's all
8 speculation and hypothesis. This is an event which
9 hasn't occurred. These are experts being asked to
10 talk about what might happen in the future. So I
11 think it's fair to ask them what they think might
12 happen or might not happen.
13 JUDGE VILLA: The question right now is,
14 if more than one facility were implicated in this,
15 would there be any effect with respect to the
16 permits and the limitations of those permits?
17 MR. MARTIN: Exactly, would they
18 actually have to go through that modeling process to
19 assure that they individually would not be causing a
20 human health impact.
21 JUDGE VILLA: Can any of you answer
22 that?
23 A. [VALIS] I can't talk to the human health

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1 effects. What I can say is, if they want to go
2 above their permit limits, they would need to come
3 in for a new permit, a modification to their permit,
4 or if it was a new facility, they would have to be
5 looked at.

6 If they stay within their permit
7 limits -- and presumably those have been looked at
8 for most of the standards or else -- if we have
9 reason to believe that they're not meeting the
10 standard at their current permit limit, DEC will
11 take corrective action.

12 Q. Thank you. Mr. Stannard, do you know --
13 you may not know. But do you know whether DPS
14 modeled if the facilities which are expected to
15 provide the replacement power would go above their
16 existing individual emissions limits?

17 A. [STANNARD] No, I don't know. But I do
18 believe that DPS keeps a fairly thorough database of
19 what rules and regulations apply in what facilities,
20 at what restrictions. So they probably did not.

21 Q. Let's move on to NO_x. Mr. Stannard, you
22 address NO_x in your prefiled testimony; right?

23 A. [STANNARD] Yes.

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1 Q. And I think you also say that the increase
2 in NO_x emissions would be small?

3 A. [STANNARD] Yes.

4 Q. You agree that NO_x also has human health
5 effects; right?

6 A. [STANNARD] Yes, it does.

7 Q. And just to get these into the record, if
8 you look at Exhibit 433, that we were looking at
9 before, and you turn in particular to Page 4 --

10 A. [STANNARD] Page 4?

11 Q. Correct.

12 A. [STANNARD] Okay.

13 Q. Do you see a discussion from Page 4 over
14 onto Page 5 of what causes NO_x and what some of the
15 human health impacts of NO_x are?

16 A. [STANNARD] Yes.

17 Q. At the top of Page 5, for example, it again
18 talks about respiratory illnesses that could be
19 caused by NO_x exposure?

20 A. [STANNARD] Yes.

21 Q. And there could be -- this says there could
22 be human health impacts even from short-term
23 exposure to NO_x; correct?

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1 A. [STANNARD] Yes.

2 Q. So, Mr. Stannard, with respect to SO₂, which
3 has short -- which has human health impacts from
4 short-term exposure, and NO_x, which has human health
5 impacts from short-term exposure, the fact that the
6 construction outage is only going to last nine or
7 ten months doesn't rule out the possibility of human
8 health impacts; correct?

9 A. [STANNARD] Correct.

10 Q. And NO_x, like SO₂, also poses environmental
11 risks; correct?

12 A. [STANNARD] Yes, it does.

13 Q. And if we look at the third paragraph on
14 Page 5, there's a description there of some of the
15 environmental impacts of NO_x; right?

16 A. [STANNARD] Yes.

17 Q. And that includes potential harm to aquatic
18 organisms; correct?

19 A. [STANNARD] Potential harm for what?

20 Q. Aquatic organisms.

21 A. [STANNARD] Yes, it could.

22 Q. Let's take a look, too, at what's been
23 marked as Entergy Exhibit 476.

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1 JUDGE VILLA: I go to 475, unless we're
2 looking at that smaller binder.

3 WITNESS STANNARD: It ends at 443.

4 JUDGE O'CONNELL: It's from the Federal
5 Register, Mr. Martin?

6 MR. MARTIN: That's correct, Your Honor.

7 JUDGE VILLA: We've got it now.

8 A. [STANNARD] Which number?

9 Q. 476.

10 A. [STANNARD] Yes.

11 Q. I'm sorry, 477 -- no, 476; that's right.
12 And Mr. Stannard, you're familiar with
13 NAAQS; correct?

14 A. [STANNARD] Yes.

15 Q. And are you familiar with the NAAQS for
16 nitrogen dioxide?

17 A. [STANNARD] I'm aware of it. I'm not well
18 versed.

19 Q. Looking at Entergy 476, do you see from the
20 front cover that this is the 2010 NAAQS for nitrogen
21 dioxide issued by the Federal EPA?

22 A. [STANNARD] Yes.

23 Q. And just for the record -- so that the

1 regional modeling for any of these pollutants, you
2 include a very large inventory of sources. So you
3 look at all sources in a given region. So the
4 modeling that was done for the existing situation
5 accounts for all those sources -- in the region, in
6 the city, what have you. So there has been some
7 assessment of that.

8 Q. Does that modeling -- is that modelling used
9 to determine whether if all those sources are
10 operating at their maximum permitted capacity, there
11 will be no human health impacts? Or could there
12 still be human health impacts just at some level
13 deemed by the Department to be acceptable?

14 A. [SEDEFIAN] I don't understand the
15 question, as far as relating the modelling to all
16 that combined.

17 Q. The mere fact that a facility is permitted
18 does not mean that if that facility is operating at
19 its permitted capacity and all other facilities are
20 operating at their permitted capacity, there will be
21 no human health impacts from their emissions also;
22 correct?

23 A. [SEDEFIAN] There are two parts of the

1 of human health impacts; correct?

2 A. [VALIS] They've been modeled to show that
3 they will meet the National Ambient Air Quality
4 Standards, which EPA has set as protective of
5 health.

6 Q. But, for example, with ozone, right now
7 EPA's --

8 A. [SEDEFIAN] Let me add to Margaret's
9 response. You are right, there are existing
10 facilities -- let's say New York City -- that do
11 operate maybe at their permitted limits. But we do
12 have a nonattainment area for ozone. So that's a
13 different question: What is the State doing to
14 alleviate the nonattainment situation for ozone? We
15 have a number of programs in place.

16 So, to answer your question, just
17 because they are operating at their permit, doesn't
18 mean there are no human health effects. That's not
19 what we're saying.

20 Q. Okay. Thank you. And actually, there's
21 some interrelationship between NO_x and ozone;
22 correct?

23 A. [SEDEFIAN] Yes.

1 modeling. One is the regional one. But as these
2 sources have been permitted in the past, they have
3 been modeled both individually and, if necessary, in
4 combination with other facilities. So you're
5 essentially looking at the micro scale, versus the
6 regional scale, which really this report is
7 addressing the regional scale emissions. So if you
8 were to take a certain region, such as New York
9 City, and say there's a 100-ton increase, or
10 whatever the tonnage increase is, and how does that
11 relate to human health effects, you cannot establish
12 a basis for saying there is a human health effect.

13 As you noted, the only thing that you
14 would imply is that a certain set of sources might
15 operate more, but they clearly cannot exceed their
16 permitted limits. So they might operate more, but
17 that doesn't mean as a consequence there are human
18 health effects.

19 Q. But the fact that they're operating within
20 their -- this is the only point I'm trying to get.
21 You guys can either say absolutely yes or absolutely
22 no. The fact that they're operating within their
23 permits does not mean that there will be an absence

1 Q. NO_x is a precursor.

2 A. [SEDEFIAN] Yes.

3 Q. So if there's an increase in NO_x emissions,
4 it's possible that that could result in the
5 formation of additional ground-level ozone and
6 consequently human health impacts; correct?

7 A. [SEDEFIAN] Not necessarily. What you
8 have, when NO_x is increased in a given area, in fact
9 it depletes ozone. The only place NO_x adds to ozone
10 is downwind. So if you increase NO_x emissions in
11 New York City, in fact you're reducing ozone levels
12 in New York City.

13 Q. But it could result in increased ozone on
14 Long Island or Connecticut?

15 A. [SEDEFIAN] Possibly.

16 Q. Has the Department -- again, I assume the
17 answer is no, but Mr. Stannard, did you do any
18 analysis to determine whether increased NO_x
19 emissions will result in human health impacts in New
20 York State as a result of the increased ground-level
21 ozone?

22 A. [STANNARD] No, I didn't.

23 Q. To your knowledge, did anybody else at DEC

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STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC. No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 8, 2014, 8:22 a.m.

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1 A. [HAVEY] The outline of what?
 2 Q. Does the part where blasting could begin
 3 include the area of the tower?
 4 A. [HAVEY] A portion of it could be in here.
 5 Again, it's an approximation.
 6 Q. Sir, do you have any information that
 7 indicates what volume of blasting that you can do
 8 before the Algonquin pipeline has been moved to the
 9 new right-of-way?
 10 MR. LUCAS: Asked and answered, Your
 11 Honor.
 12 MS. ZOLI: I'm asking if he has
 13 information. I want to know what documents.
 14 JUDGE VILLA: Go ahead. You can answer.
 15 A. [HAVEY] Information is available in the
 16 CAD drawings that produced these figures, but I
 17 don't have access to them right now.
 18 Q. Sir, you have no knowledge of whether
 19 Spectra would agree that you can conduct blasting in
 20 the area that you believe blasting can occur; right?
 21 A. [HAVEY] I do not.
 22 Q. And if they don't, sir, your construction
 23 schedule, which has some blasting overlapping with

1 circulating water higher up the hill, Tetra Tech and
 2 Hatch needed to use more powerful circulating water
 3 pumps in the hot water reservoir; correct?
 4 A. [HAVEY] Yes.
 5 A. [ORTIZ] Correct.
 6 Q. And the circulating water pumps that Hatch
 7 selected required 50 feet of pump submergence;
 8 correct?
 9 A. [ORTIZ] That's correct.
 10 Q. And for this reason, if you turn to the
 11 Hatch 2012 report at Section 3.1, Hatch stated that
 12 the discharge canal for the Clear Sky towers
 13 includes excavation to provide a pump well 76 feet
 14 by 52 feet long and by 50 feet deep; correct?
 15 A. [HAVEY] Let me get there, first. I'm
 16 sorry.
 17 Q. Certainly.
 18 A. [HAVEY] The section, again?
 19 Q. Section 3.1.
 20 A. [ORTIZ] Is that the last paragraph?
 21 Q. It begins -- or it includes, "Excludes
 22 excavation to provide a pump well." Does that help
 23 you, sir?

1 the 105 weeks allocated to the Algonquin pipeline
 2 relocation, would not be correct; right?
 3 A. [HAVEY] Would be extended.
 4 Q. And it could be extended as much as 105
 5 weeks; right?
 6 A. [HAVEY] If the entirety of the blasting
 7 effort could not proceed, then yes.
 8 Q. And your construction schedule, instead of
 9 9.5 years, would be 11.5 years; correct?
 10 A. [HAVEY] Yes, approximately.
 11 Q. Sir, I want to talk about your assumption
 12 that the construction time for modification of the
 13 discharge canal for the Clear Sky towers is the same
 14 for the round hybrid towers.
 15 You agree, Mr. Havey, that the Clear Sky
 16 towers are located at a higher elevation than where
 17 Enercon located the round hybrid towers; correct?
 18 A. [HAVEY] I believe so, yes.
 19 Q. And do you know the elevation difference,
 20 sir?
 21 A. [HAVEY] Exactly, no. I want to say it's
 22 on the order of about 20 feet.
 23 Q. Thank you, sir. And in order to pump the

1 A. [ORTIZ] That's correct.
 2 Q. And it's 76 feet by 52 feet by 50 feet
 3 deep; correct?
 4 A. [ORTIZ] Correct.
 5 Q. Thank you. And Mr. Havey, the round hybrid
 6 towers do not require 50 feet of pump submergence,
 7 do they?
 8 A. [ORTIZ] I don't recall off the top of my
 9 head. I'd have to look back at the report.
 10 Q. And sir, if you turn to Entergy Exhibit 7
 11 A, the Enercon 2010 report, at Page 12: Do you see
 12 that Enercon proposes excavating to minus 32.5 feet
 13 below mean sea level?
 14 A. [HAVEY] I'm not sure we're at the same
 15 page. I'm at 7 A, Page 12.
 16 MR. LUCAS: It's actually Exhibit 7.
 17 MS. ZOLI: Oh, just 7. I apologize.
 18 A. [HAVEY] Which value were you referring to?
 19 Q. Do you see that the Enercon proposed
 20 excavation is to minus 32.5 feet?
 21 A. [HAVEY] Correct.
 22 Q. So while the Clear Sky towers require
 23 excavation to 50 feet, the hybrid circular towers

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STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 10, 2014, 8:26 a.m.

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1 legislative proposals, and activities."
 2 Is there a question about that, Ms.
 3 Zoll? Because he's referenced the policy in the
 4 section that he cites. Is there a question about
 5 that particular section?
 6 MS. ZOLI: Sure. Let me ask:
 7 Q. Mr. Hogan, do you believe that you followed
 8 the suggestions or guidance of the policy in
 9 evaluating the proposed cooling towers at Indian
 10 Point?
 11 A. [HOGAN] We have considered -- we have --
 12 as my direct indicates, there's testimony from our
 13 air staff, from DPS that addresses the outages and
 14 potential increases, which has already been covered
 15 or will be covered.
 16 I think the -- my -- the important
 17 intent of the policy is to engage the environmental
 18 justice communities in the review. There's nothing
 19 that precludes us, when the judges issue their
 20 report, remanded to Staff, that we cannot at that
 21 point engage those communities in that review.
 22 That's what I was trying to get to. I was trying to
 23 get to the heart of not precluding their

1 A. [HOGAN] I wasn't the project manager in
 2 2003, but, you know, I guess I would just say
 3 generally it's always the Department's intent to
 4 comply with the policy and to engage the EJ
 5 communities.
 6 Q. And the environmental justice policy has
 7 some procedures and processes that help to do that;
 8 right, sir?
 9 A. [HOGAN] The policy does provide guidance,
 10 yes, how to --
 11 MR. McDONALD: I can't hear, Your Honor.
 12 A. [HOGAN] I'm sorry. The policy does have
 13 guidance as to how to go about that, yes.
 14 Q. And they include some actions to be taken
 15 to engage in preliminary screening; right, sir?
 16 A. [HOGAN] Yes.
 17 Q. And to the extent that environmental
 18 justice approaches were important to the Department,
 19 you could undertake those processes; correct?
 20 MR. SANZA: Objection, Your Honor. I
 21 think the policy applies to the applicant to
 22 undertake those programs. So again, she's trying to
 23 thrust something that's in the policy upon the

1 involvement, not doing it at all, but meeting the
 2 heart of this at that time. I mean, I can't correct
 3 what happened previously, if that's what you're
 4 getting to.
 5 Q. Oh, no. And the reason you indicate that
 6 is because, sir, the minority and disadvantaged
 7 communities should have the benefit of an
 8 environmental justice analysis without regard to
 9 whether it's taken us ten years to get to this point
 10 past the passage of the environmental justice
 11 policy; right?
 12 MR. SANZA: Object to the form.
 13 JUDGE VILLA: I'm going to sustain the
 14 objection. Can you ask it differently?
 15 MS. ZOLI: Yes.
 16 Q. Because -- sir, isn't it correct that
 17 clearly the Department wants to implement the
 18 principles established in the environmental justice
 19 policy, CP 29, and has wanted to do that since 2003?
 20 Right?
 21 A. [HOGAN] Well, I wasn't project manager in
 22 2003.
 23 MR. McDONALD: Sorry, I can't hear.

1 Department, who is not an applicant in this
 2 proceeding.
 3 Q. Please turn to Page 7 of the policy, the
 4 methodology for conducting a preliminary screening.
 5 Sir, doesn't the first paragraph indicate that the
 6 DEC Division of Environmental Permits shall conduct
 7 a preliminary screening?
 8 A. [HOGAN] Yes.
 9 Q. And sir, that's you; right?
 10 A. [HOGAN] Yes.
 11 Q. It indicates in No. 1 that the DEC Staff in
 12 the Division of Environmental Permits and the
 13 affected environmental quality divisions shall
 14 identify potential adverse environmental impacts, et
 15 cetera? Correct?
 16 A. [HOGAN] Yes, it says that.
 17 Q. So the environmental justice policy has
 18 processes which are implemented by Department Staff;
 19 correct?
 20 A. [HOGAN] Correct.
 21 Q. And has any process that is comparable to
 22 the environmental justice process been performed
 23 here?

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
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SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

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Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
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1 A. [HOGAN] Is the applicant -- In the typical
2 process, the applicant -- the Department directs the
3 applicant to comply with the policy through the
4 process. So as the applicant in this proceeding, I
5 would say that, yes, they would be obligated --

6 Let me restate that. It's the
7 Department's intent to comply with, as I've said
8 before, with the goal of the policy to engage the
9 community. I believe it would be consistent with
10 the policy that the applicant would work to engage
11 the community during that public review as well.

12 Q. So CP --

13 A. [HOGAN] It's a complicated -- complicated
14 matter in this instance since we have different
15 proposals on the table, things of that nature. So I
16 think in this case it would be -- it would have to
17 be a joint effort to engage the community, the
18 environmental justice community, during the public
19 review period.

20 Q. A joint effort between which parties?

21 A. [HOGAN] The Department and the applicant.

22 Q. So is the Department responsible for the EJ
23 consideration in partnership with the applicant?

1 A. [HOGAN] In this case --

2 JUDGE VILLA: Hang on. Ms. Wilkinson,
3 what is it?

4 MS. WILKINSON: Can we clarify whether
5 the question is addressing the SEQR balancing --
6 I'm looking for clarification whether
7 we're looking at the balancing at the end of the
8 process or the engagement during the SEQR process,
9 because I think it's a bit confusing.

10 JUDGE VILLA: I think that's a fair
11 objection. Can you break it down a little bit, Mr.
12 McDonald? Are you talking about when the process
13 gets initiated or something later?

14 MR. McDONALD: Something later. I'm
15 talking about right now, in the process.

16 Q. In your analysis, did your analysis include
17 an EJ examination with the applicant?

18 A. [HOGAN] No.

19 Q. But you believe that it is a partnership in
20 examining environmental justice between DEC and the
21 applicant?

22 MR. SANZA: That's asked and answered,
23 Your Honor.

1 JUDGE VILLA: Is there another question
2 you could ask? Because that one was asked and
3 answered. I'm not sure --

4 MR. McDONALD: I'm confused about the
5 answer. I don't remember the answer.

6 Q. Is there a partnership in considering
7 environmental justice between DEC and the applicant?

8 A. [HOGAN] I think in this particular
9 instance, this is somewhat unprecedented, in
10 that....

11 MR. McDONALD: We can move along, Your
12 Honor.

13 Q. Mr. Hogan, at Page 35, Line 17 of your
14 prefiled direct testimony you addressed screening
15 for potential environmental justice areas in
16 Peekskill.

17 A. [HOGAN] Correct.

18 Q. What category does the environmental
19 justice designation come under?

20 A. [HOGAN] For that particular environmental
21 justice?

22 Q. Yes, for Peekskill. To put it in context,
23 also, I'll add that the Monday panel, I asked about

1 whether -- I asked about potential environmental
2 justice areas, and they didn't have -- they said
3 that potential environmental justice areas were
4 considered, but they couldn't give a category.
5 That's what I'm looking for: Which category in
6 DEC's potential environmental justice areas does the
7 designation come under?

8 A. [HOGAN] I don't recall.

9 Q. That's not in your testimony?

10 A. [HOGAN] No.

11 Q. Well, how did you designate it a potential
12 environmental justice area if you don't have the
13 category that it was designated as?

14 MR. LITTLE: Your Honor, I'd like to
15 point out that he didn't say he didn't have it. He
16 said, "I don't know." If there is a screening
17 document in the record, perhaps that could be placed
18 in front of the witness and this might move along a
19 little bit more quickly.

20 JUDGE VILLA: I don't know if we have
21 that document.

22 MS. ZOLI: Does Department staff have
23 the screening record?

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1 burrows into the ground and telling them what's
2 possible, what's achievable. If they come and say,
3 "Based on what we said here, we're not going to get
4 our 100 megawatts," then the DPS has the wherewithal
5 to look at the overall RCP order and think about
6 whether or not there are other resources that they
7 need to consider to make sure they meet the overall
8 deficiency of resources if IPEC was not in service
9 in the summer of 2016.

10 MR. GOODMAN: I just have a couple of
11 remaining questions, Your Honor, on a different line
12 of questioning.

13 Q. Mr. Fagan, do you agree that, to the extent
14 that new transmission or generation resources may be
15 needed to provide replacement supply in the event of
16 an Indian Point closure, that there may be power
17 purchase agreements or contracts awarded to those
18 resources?

19 A. Not for transmission. But yes, possibly
20 for generation resources.

21 Q. Mr. Fagan, do you agree that the Public
22 Service Commission in adopting the reliability
23 contingency plan signaled that it would potentially

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1 the CHP in the New York City area, and let's hold
2 off on awarding any contracts on generation supply
3 because there's a whole host of existing and
4 potentially new merchant generation out there." And
5 they anticipated that the pricing regime for
6 capacity in the new capacity zone in the Lower
7 Hudson Valley was going into place in 2014.

8 So my understanding or interpretation of
9 that was they were saying, "We're not going to award
10 these contracts yet. Let's wait and see what
11 happens." And the docket is still open. So to the
12 extent that that doesn't unfold, I imagine that they
13 could always return and consider whether or not they
14 needed to actually think about PPAs or long-term
15 contracts for resources, if the short-term capacity
16 construct is not allowing merchant generation to
17 enter or existing generation to be -- that's not --
18 existing generation to be reactivated.

19 Q. To the extent that the Public Service
20 Commission waits to see if the merchant generators
21 enter the market and they don't, would you agree
22 that that delay in time just postpones the ultimate
23 date when new generation units that receive a PPA

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1 award contracts to generation resources?

2 MR. LUCAS: Objection, Your Honor.
3 Calls for speculation. The document speaks for
4 itself as far as what it signaled. I think that's
5 asking the witness to speculate. It either says
6 something or it doesn't. It's an official
7 government order. It generally states explicitly
8 what it's saying. It's not a James Joyce novel.

9 JUDGE VILLA: Go ahead.

10 MR. GOODMAN: In responding to
11 Mr. Lucas, unnecessary comment aside, I was asking
12 for the witness's understanding of what the
13 Commission had ordered, is it his understanding that
14 the Commission has said, "We may give contracts to
15 new generation resources," as opposed to saying,
16 "We're looking for market-based responses to a
17 potential Indian Point closure." I'm not asking for
18 him to interpret the order. I'm asking for what his
19 understanding of the order was.

20 JUDGE VILLA: Can you answer that?

21 THE WITNESS: Yes, I can.

22 A. The order specifically said, "Let's build
23 the transmission, let's do the energy efficiency and

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1 would enter the market?

2 A. It could. Timing matters.

3 Q. And you'd agree that timing particularly
4 matters if you're planning for an in-service date
5 due to a concern about a reliability need created by
6 the closure of Indian Point?

7 A. Yes, but I would assume that the DPS is
8 fully aware of these concerns.

9 MR. GOODMAN: Nothing further, Your
10 Honor.

11 MR. McDONALD: No questions, Your Honor.

12 JUDGE VILLA: Redirect?

13 MS. BRANCATO: Can we have five minutes,
14 just to step out and come right back?

15 JUDGE VILLA: We've got to finish by
16 6:00.

17 MS. BRANCATO: If anything, it will be
18 one or two questions.

19 JUDGE VILLA: All right. Come back here
20 as quick as you can, and then we'll start right up
21 again.

22 (Recess taken.)

23 JUDGE VILLA: Let's go back on the

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Pages 8730-9012

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 14, 2014 8:28 a.m.

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(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 Q. Did you do any analysis of the implications
2 of those pollutants for human health in terms of
3 regional or local impacts to human health?
4 A. [GJONAJ] No.
5 Q. Am I correct, Mr. Wheat and Mr. Gjonaj,
6 that the pollutants you looked at are NO_x, SO_x, and
7 carbon dioxide?
8 A. [GJONAJ] That's correct.
9 Q. Were those pollutants specified for you by
10 DEC Staff, or did you decide yourselves to focus on
11 those pollutants?
12 A. [GJONAJ] Well, those are the typical
13 pollutants associated with power plants, and those
14 were the ones that were in our model, so those were
15 the ones we provided to the DEC.
16 Q. Are there any other pollutants for which
17 you expect to see an increase in emissions as a
18 result of outages at Indian Point?
19 A. [GJONAJ] Other than what we modeled,
20 you're asking?
21 Q. Correct.
22 A. [GJONAJ] Perhaps.
23 Q. What other pollutants could we perhaps

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1 expect to see an increase in as a result of outages
2 at Indian Point?
3 A. [GJONAJ] Well, to the extent that depends
4 on which generating units get -- whose output
5 increases depends -- would affect other pollutants
6 that could be emitted. The obvious one, I should
7 say, or maybe not so obvious, is, say, particulate
8 matter.
9 Q. And when would you expect to see an
10 increase in particulate matter as a result of Indian
11 Point outages?
12 A. [GJONAJ] I'm sorry, I missed the very
13 first part.
14 Q. When would you expect to see an increase in
15 particulate matter as a result of Indian Point
16 outages?
17 A. [GJONAJ] I'm not really clear.
18 Q. Under what circumstances would you expect
19 to see an increase in particulate matter emissions
20 as a result of outages at Indian Point?
21 A. [GJONAJ] We modeled the New England power
22 system; we modeled the New York power system; we
23 modeled the Pennsylvania, Jersey and Maryland power

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 system, which is part of the Reliability First
2 Corporation; and we modeled the Ontario Hydro
3 system, OH as it is commonly referred to, electric
4 system operator, and we have Hydro-Quebec. So
5 there's a whole slew of generators in that large
6 pool that could be potentially affected, their
7 commitment and dispatch. So it's hard to say which
8 one in particular moves more. If the gas plant
9 moves more, they're less particulate matter. If a
10 coal plant moves more, perhaps, if it's
11 uncontrolled.
12 Q. If this helps -- I feel like I'm talking at
13 a snail's pace, and I've been told I'm still talking
14 too fast. Mr. Brock is trying to take everything
15 down, and so everyone has to talk unnaturally slow.
16 I have the worst time with it.
17 So Mr. Gjonaj, you said that it depends
18 upon what kinds of plants increase their generation
19 in response to an outage; correct?
20 A. [GJONAJ] Correct.
21 Q. And so one pollutant which could increase,
22 depending upon what plants are activated to replace
23 Indian Point, could be particulate matter; correct?

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 A. [GJONAJ] Yes.
2 Q. And that would happen if coal-burning
3 plants become more active; correct?
4 A. [GJONAJ] They're particularly associated
5 with more particulate matter, particularly older
6 plants. Newer ones have more controls on them. You
7 could have an old oil-fired plant that moves a
8 little. If it's not controlled, you'll have more
9 particulate matter. If it's not controlled, you'll
10 have less particulate matter.
11 Q. In the modeling you did --
12 A. [WHEAT] Could I just add a little
13 clarification, at least on my part? Particulate
14 matter, my understanding is -- well, the pollutants
15 primarily --
16 Well, other pollutants that we are
17 modeling that have emissions output in our modeling
18 are what is known as precursors to particulate
19 matter, is my understanding. And so I wanted to
20 clarify that, No. 1.
21 And then No. 2, in terms of the -- we
22 are modeling the standard emissions that are
23 included in these types of computer models, and so

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 Q. Mr. Wheat, when you refer to infrastructure
2 in that answer, are you referring not only to new
3 electric generation facilities but also other forms
4 of infrastructure, such as transmission lines?
5 A. [WHEAT] Yes.
6 Q. Dr. Paynter, can we turn to your testimony
7 for a moment, please, and in particular, sir, we'll
8 go to Page 5. Dr. Paynter, on Pages 5, continuing
9 roughly until Page 7, top of Page 7, you're
10 discussing the concept of the cost of new entry;
11 correct?
12 A. [PAYNTER] Yes.
13 Q. And that's known by the acronym CONE?
14 A. [PAYNTER] Yes.
15 Q. Can you describe for us briefly what the
16 concept of CONE is.
17 A. [PAYNTER] This is the average cost of
18 building a new peaking facility, such as gas
19 turbine; and it's measured generally -- it's
20 basically what it would cost on an annual basis to
21 build new plant to serve peak load.
22 Q. Does that cost vary from region to region
23 in New York?

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 A. [PAYNTER] Yes. It tends to be highest in
2 New York City.
3 Q. And does that cost vary over time?
4 A. [PAYNTER] It's based on the cost of
5 constructing a new peaking unit, so to the extent
6 that that varies over time due to changes in
7 interest rates or perhaps changes in environmental
8 regs or technological change, all of those things
9 can affect the cost of building a new peaking unit.
10 Q. Has the cost of building a new peaking unit
11 generally speaking been going up over time?
12 A. [PAYNTER] In general, but it's not an even
13 pace. It just depends on a lot of different
14 factors.
15 Q. Who calculates the CONE?
16 A. [PAYNTER] This is determined by the New
17 York Independent System Operator.
18 Q. You state at Page 5, Line 20 in your
19 testimony that the CONE for the Lower Hudson Valley
20 is presently around \$10; is that correct?
21 A. [PAYNTER] Yes.
22 Q. Do you know what it is in New York City?
23 A. [PAYNTER] Not offhand, but it's

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 considerably higher.
2 Q. Is it considerably higher, ballpark, \$15 or
3 12.50? Do you have a ballpark for us?
4 A. [PAYNTER] It's about \$15, \$14,
5 thereabouts.
6 Q. Dr. Paynter, do you know how long it takes
7 to build a new peaking facility from the initial
8 proposal until the switch gets flipped to turn it
9 on?
10 A. [PAYNTER] I believe the New York ISO
11 allows for about three years.
12 Q. And does that assume no opposition to
13 licensing and permitting of the facility, or does
14 that include some time for proceedings such as this
15 one?
16 A. [PAYNTER] Well, it includes permitting.
17 Q. Mr. Wheat and Mr. Gjonaj, let's go back to
18 your testimony, and I'm looking now at Page 6. At
19 the bottom of the page, beginning at Line 23, you
20 write, "The modeling assumptions described in our
21 testimony are intended to provide an adequate level
22 of capability for electric system reliability." And
23 then you say, "Electric system needs will be

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 satisfied in a manner reasonably consistent with the
2 most recent State Energy Plan." Did I read those
3 correctly?
4 A. [GJONAJ] Yes.
5 Q. This is for all three members of the panel:
6 When it comes to electric system reliability, did
7 you actually do an analysis of the probability of
8 sufficient capacity being in place during an Indian
9 Point outage scenario, or did you assume -- make
10 certain assumptions that resulted in there being
11 sufficient capacity for an Indian Point outage
12 scenario?
13 A. [GJONAJ] For the outage scenario, the New
14 York Public Service Commission instituted the Indian
15 Point contingency plan proceeding.
16 JUDGE VILLA: Mr. Gjonaj, I'm sorry,
17 with the elephants next door, you're going to have
18 to speak up a lot. I apologize. There's really
19 nothing we can do.
20 A. [GJONAJ] With regard to reliability, in
21 November 2012 the New York State Public Service
22 Commission instituted a proceeding referred to as
23 Indian Point contingency plan. It directed

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1 you see the sentence, "Also simulating in 2022, each
2 scenario will have generic entry as needed/economic
3 (entering at net CONE) from the capacity model"?

4 A. [PAYNTER] Yes.

5 Q. What does that mean?

6 A. [PAYNTER] This is part of the energy
7 modeling that they're talking about. My
8 understanding is that this was modeled as gas
9 turbines.

10 A. [GJONAJ] Yes. I think I've mentioned --
11 this may be the third time: As you march through
12 time, the demand grows, and that has to be met by
13 capacity. From a modeling perspective, what you do
14 is, you add typically generic gas turbines to meet
15 that capacity need, and that's all -- basically it's
16 the same here.

17 Q. I guess here, Mr. Gjonaj, the difference
18 from the ordinary case is that we're assuming Indian
19 Point will actually stay on line through the 2020s
20 except for this period of a construction outage;
21 correct?

22 A. [GJONAJ] Correct.

23 Q. And therefore the increase in load, in

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 demand, is being met by an existing source except
2 during some limited period of time; correct?

3 A. [GJONAJ] Well, I've got to think about
4 that a minute, because --

5 We modeled here -- we've had -- we
6 modeled protective outages in the summer period, and
7 then going forward, in some distant period of time,
8 there's a small construction outage. Okay?

9 For our purposes, from the reliability
10 perspective -- and I don't think this is -- if those
11 plants are not available for the summer period, you
12 have to do something. Even if they're only out for,
13 in this case, 62 days or 42 days, you have to do
14 something. And that's what prompts the need to
15 either contract with these mothballed units or
16 hopefully they're incented by market conditions to
17 construct -- I mean, to come back on line.

18 If the plant's not on in the summer, we
19 have a reliability problem. That's understood by
20 everybody. So going through time, these generic
21 additions have to be added if the plant is not
22 available in the summer. I'm not quite sure how
23 you're tying this together.

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 MR. MARTIN: I guess this leads back to
2 the issue we raised before the hearing started, Your
3 Honor, in the fact that many of the witnesses have
4 added discussions of permanent outages into their --
5 or interim outages into their testimony in this
6 phase of the proceeding, even though we're
7 addressing that in a following phase of the
8 proceeding.

9 What I'd like to be able to ask the
10 witness is: If you put aside interim outages or
11 forced outages leading up to the construction
12 outage, because it's not yet certain whether those
13 will even be ordered, what is the answer to my
14 question?

15 JUDGE VILLA: When you say "leading up
16 to," I'm not clear on what you mean.

17 MR. MARTIN: What I understood the
18 witness to say is, because there will be 42 or 62
19 unit-day outages leading up to a construction
20 outage, the market will already have baked in some
21 need for increased reliability.

22 And so my question is: If we assume
23 there won't be such outages leading up to the

(GJONAJ/WHEAT/PAYNTER - CROSS ENTERGY)
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1 construction outage, because once we get to the
2 interim-outages phase of the proceeding a decision
3 is made not to include such outages as a permit
4 condition, then isn't the answer to my question
5 such-and-such?

6 JUDGE VILLA: Can you answer that,
7 gentlemen? It's a long question.

8 A. [PAYNTER] I think all I can say is that if
9 you had a one-year outage or a 42-week outage of
10 2,000 megawatts, that that would be a big impact on
11 the system, and that the New York Independent System
12 Operator would have to ensure that there was
13 something done to ensure reliability. That might
14 mean unmothballing some existing units. It might
15 mean up-rating some existing units. It might mean
16 bringing in some new construction if necessary.

17 There might be other temporary measures
18 that could be done. It would be a big deal and a
19 big project, and I can't say for certain how that
20 would be accomplished. All I can say is that it
21 would be a fairly expensive proposition, and I think
22 that the numbers that we've provided give some
23 indication as to the order of magnitude of those

1 costs; but I really can't determine ahead of time
2 what would be done or exactly how much it would
3 cost.

4 Q. Thank you. Dr. Paynter, could we turn to
5 Page 18 in your prefiled testimony. In particular,
6 I'm looking at the answer which begins on Line 11.

7 A. [PAYNTER] Yes.

8 Q. The question you're answering here is
9 whether your projections of prices during the
10 different scenarios you modeled would exceed the
11 CONE; correct?

12 A. [PAYNTER] Yes.

13 Q. And beginning at Line 13, you state that
14 for some of the cases, including a construction
15 outage case, CONE would be exceeded in the Lower
16 Hudson Valley.

17 A. [PAYNTER] Yes.

18 Q. And the rest-of-state region?

19 A. [PAYNTER] Yes.

20 Q. How did you factor that into your
21 calculation of a dollar-value impact from a
22 construction outage?

23 A. [PAYNTER] Well, this is -- well, first of

1 kilowattmonth. That's a little bit higher than the
2 reference price, which is the CONE, of \$8.48.

3 JUDGE VILLA: Dr. Paynter, can you just
4 direct us to where on Staff 223 you're finding those
5 figures?

6 WITNESS PAYNTER: Okay. This is Page 5.
7 If you look under 2022, and the third column from
8 the right, under -- the reference price is \$8.48 per
9 kilowattmonth. That's the --

10 And if you compare that to the -- my
11 forecasted price was \$9.80. And so it ends up being
12 slightly higher.

13 JUDGE VILLA: Thank you.

14 Q. Dr. Paynter, so when you're looking at Page
15 5 in Exhibit 223 --

16 A. [PAYNTER] Yes.

17 Q. -- is the reference price the CONE price?

18 A. [PAYNTER] Yes. The reference price is
19 actually a little bit higher than CONE, but it's
20 approximately CONE.

21 Q. Mr. Gjonaj, are you familiar with the
22 concept of fuel diversity?

23 A. [GJONAJ] Yes, I am.

1 all, this did flow through into a price -- I don't
2 know it was significant -- but some increase, a
3 price slightly above the estimated CONE for those
4 regions for that period. So it gives you an impact
5 that is slightly higher than just going up to CONE.

6 Q. So just to be clear, did you cap your
7 prices at CONE when you were creating what's been
8 marked as Staff 223?

9 A. [PAYNTER] No. In those particular cases I
10 did allow the price to go slightly above CONE, and
11 that's due to --

12 But in all cases the resource adequacy
13 needs were met, so the system should be reliable
14 from that perspective.

15 Q. Dr. Paynter, just so I'm clear: You state
16 in your prefiled testimony, that answer we were just
17 looking at on Page 18, that prices in those two
18 regions significantly exceeded the estimated CONE,
19 and just now you stated that you allowed the price
20 to go slightly above CONE. Can you just explain
21 what you mean?

22 A. [PAYNTER] As an example, the rest-of-state
23 price was estimated at about \$9.80 per

1 Q. Is that an element of the PSC's
2 consideration of system reliability?

3 A. [GJONAJ] To my knowledge, that has not
4 been priced in or factored into any reliability
5 needs assessments that I've seen.

6 Q. Is it considered on a qualitative basis by
7 the Commission as it considers the reliability of
8 New York City's electric system? Sorry, New York
9 State's electric system.

10 A. [GJONAJ] We worry about it, and the State
11 Energy Plan mentions that fuel diversity is a good
12 thing.

13 Q. Can you describe for the record what "fuel
14 diversity" means?

15 A. [GJONAJ] Well, fuel diversity, as I
16 understand it, is generally understood that you have
17 multiple sources of fuels in your power plants that
18 provide the energy needed. So, for example, you'd
19 have no fuel diversity if all your power plants were
20 powered by gas. You'd have more fuel diversity if
21 you had some power plants powered by gas, some
22 powered by water in terms of hydroelectric, some
23 powered by nuclear. So the broader mix of fuels

1 gives you more fuel diversity.
2 And you do that primarily because, if
3 something happens to the supply of one fuel, you're
4 not so reliant on it that it hurts your overall
5 reliability.

6 Q. During the term of an Indian Point
7 construction outage, is it fair to say that you've
8 assumed that most of the replacement power will be
9 coming from natural gas sources?

10 A. [GJONAJ] Primarily natural gas, yes.

11 Q. So during the term of the Indian Point
12 construction outage, fuel diversity in the state
13 would be lessened; correct?

14 A. [GJONAJ] Well, to the extent it's a
15 percentage of your energy output you're using
16 nuclear fuel and you replace it with gas, yes, I
17 would say that.

18 Q. Over a number of years has the amount of
19 gas generation been increasing?

20 A. [GJONAJ] Relative to?

21 Q. As a percentage of the whole.

22 A. [GJONAJ] Every new plant that's been
23 constructed has been natural gas.

1 Q. What are the risks to the reliability of
2 New York's electric system from having an increased
3 concentration of natural gas generation?

4 A. [GJONAJ] I don't know the quantitative
5 limit, as to what that is. I don't know. I don't
6 know what's the quantitative limit -- in other
7 words, the reliability limit -- as to how much gas
8 generation you have with current transmission
9 infrastructure, when you reach it, I don't know
10 those numbers. But qualitative, the more gas you
11 add, the less fuel diversity you have, I guess.

12 Q. Are there any risks that are particular to
13 natural gas supply that the Public Service
14 Commission is concerned about?

15 A. [GJONAJ] You're talking about just in
16 terms of shortages of gas as a result of overall
17 demand all across the country? Are you talking
18 about a gas line blowing up?

19 Q. Everything. You said you're concerned
20 about fuel diversity. I'm wondering if there are
21 any concerns particular to natural gas that the
22 Public Service Commission is looking at.

23 A. [GJONAJ] This is sort of anecdotal at this

1 point. This past winter it was a pretty severe
2 winter, and there were constraints on the natural
3 gas pipelines, and that resulted in very high prices
4 for a short period of time. That's a concern, for
5 example.

6 MR. MARTIN: Thank you. I have no
7 further questions.

8 JUDGE VILLA: How about if we come back
9 at 20 minutes after 10:00.

10 (Recess taken.)

11 JUDGE VILLA: Let's go back on the
12 record. We'll continue now with Riverkeeper's
13 cross.

14 MS. BRANCATO: Thank you, Your Honor.

15 CROSS-EXAMINATION

16 BY MS. BRANCATO:

17 Q. Good morning. My name is Deborah Brancato.
18 I'm an attorney with Riverkeeper, and I just have a
19 few followup questions for you.

20 On Page 7 of your rebuttal, as well as
21 here today, you've testified that your air emissions
22 forecasts assumed largely fossil-fuel replacement
23 resources. I just wanted to ask: Is it possible

1 that a more diverse range of replacement resources
2 could make up the difference in the event of a
3 construction outage at Indian Point for closed-cycle
4 cooling?

5 A. [GJONAJ] Could a more diverse group of
6 resources act as replacements? Yes, it's possible.

7 Q. So is it your understanding that demand
8 reduction, energy efficiency, other renewable
9 resources could make up part of the difference in
10 the power?

11 A. [GJONAJ] It's certainly possible.

12 Q. And because you made an assumption of
13 largely fossil-fuel replacement resources, would you
14 say that your analysis represents an upper limit of
15 what the air emissions increases would be for the
16 given outage durations that you looked at?

17 A. [GJONAJ] The air emissions impacts would
18 certainly be higher for these fossil-fuel plants
19 than if energy was supplemented from renewables. I
20 don't know if I would go as far as saying this is an
21 upper limit.

22 Q. But it would represent a slight
23 overestimation?

1 come down during the summer peaking period?

2 A. [GJONAJ] That's generally not the
3 preferred time to take a maintenance outage, no.

4 Q. Isn't it correct that during -- in New
5 York, during summer peak periods, every generating
6 facility that is capable of operating in New York
7 has been operating, over the last few years?

8 A. [GJONAJ] Every generating facility has
9 been operating during peak?

10 Q. During the peak periods as discussed by the
11 New York Independent System Operator.

12 A. [GJONAJ] I don't know that, that every
13 generator in New York State has been operating
14 during the peak period. I don't know that.

15 Q. Have you reviewed the operation of the
16 electric system during the summer peaks in, let's
17 say, 2012 and 2013?

18 A. [GJONAJ] Just in general.

19 Q. By virtue of your roles as part of the NY
20 ISO team at the Department of Public Service, have
21 you been involved in briefings to NY ISO related to
22 performance during those summer peak periods?
23 A. [GJONAJ] Yes.

1 Q. And do you recall what the NY ISO reported
2 as the operating status of the generating facilities
3 during those periods?

4 A. [GJONAJ] I don't recall that at this
5 point.

6 Q. Do you know whether the NY ISO puts out a
7 report related to performance during summer peak
8 periods?

9 A. [GJONAJ] It may. I'm not familiar with
10 the exact name of the report. We have conversations
11 with the ISO staff all the time. We learn or hear
12 things that may be in a report. I don't know.

13 Q. Dr. Paynter, are you familiar with the
14 reports that are provided to the management
15 committee of the NY ISO?

16 A. [GJONAJ] I don't recall that particular
17 report, but I'm generally aware that they analyze
18 peak periods.

19 Q. If 2,000 megawatts were unavailable during
20 the summer peak period and that capacity is not
21 replaced, would that have a potential serious
22 impact, such as a blackout? Could it have such an
23 impact?

1 A. [GJONAJ] I think we need to take a step
2 back here. The whole point -- the whole point to
3 the Commission's Indian Point contingency plan was
4 to make a plan in the event this facility is not
5 available starting the summer of 2016. Part of
6 these plans are these Transmission Owner
7 Transmission Solutions, the demand reduction and
8 some level of generation in southeast New York.

9 So if Indian Point is not there, with
10 those three components, you'll have -- there will be
11 a reliable system in New York State.

12 Q. Mr. Gjonaj, the PSC was considering a plan
13 where Indian Point is retired; correct?

14 A. [GJONAJ] Is not available.

15 Q. Is not available. Did the PSC specifically
16 consider this concept of protective outages?

17 A. [GJONAJ] Protective outages were certainly
18 not part of the IP contingency plan. The fact is,
19 if that plant is not available in the summer, you
20 have a problem. It's as simple as that.

21 Q. Wait. Is it that the protective outages
22 were not part of the contingency plan? That's what
23 you just said?

1 A. [GJONAJ] I'm not sure exactly what I just
2 said. But in other words, if those plants, for
3 whatever reason -- let's leave it at that -- are not
4 available in the summer period, there is a problem.

5 Q. Turning to Page 5 of your direct testimony.
6 You make reference that one of the offsetting
7 impacts would be something called transmission
8 congestion contracts. Do you see that, at the very
9 top of Page 5?

10 A. [GJONAJ] Yes.

11 Q. How are those an offset to the loss of
12 Indian Point? Excuse me; I'll rephrase.

13 How do those lessen the impact of the
14 loss of Indian Point?

15 A. [GJONAJ] I'll take a crack at it, as a
16 noneconomist. What we found here is, if we do those
17 transmission projects, demand reduction, do some
18 level of generation replacement, our exhibits show
19 that there is an increase in wholesale market
20 prices. However, those wholesale market price
21 impacts don't flow 100 percent directly to the
22 ratepayer, because part of what offsets some of
23 those higher prices are these TCC congestion

1 Q. And do you know whether USPG is willing to
2 go forward with its projects without a PPA?

3 A. [GJONAJ] I'm sure they would like one,
4 too. But if the market conditions seem good in the
5 future to them, they'll do what every rational
6 businessperson would do.

7 Q. Have you spoken to USPG about their plans?

8 A. [GJONAJ] I have not.

9 Q. Do you know whether they would go forward
10 on a merchant basis?

11 A. [GJONAJ] I do not.

12 Q. Do you know whether NRG at any point in
13 time would go forward with its projects on a
14 merchant basis?

15 A. [GJONAJ] I don't know what's in the
16 investors' minds -- what's in NRG's mind. I'm just
17 saying that these are out there, and they're waiting
18 for the right time.

19 Q. But do you know, sir, whether they would go
20 forward on a merchant basis?

21 MR. BLOW: Objection, asked and
22 answered.

23 MR. LANG: He didn't answer the

1 Q. The demand-curve price signals at most go
2 out for a three-year period. In other words, the
3 reset period for the demand curve is three years;
4 correct?

5 A. [GJONAJ] Correct.

6 Q. So the only information you have about
7 forward prices that's out there right now is based
8 on the demand curve; correct? I mean, everyone can
9 have their assumptions, but in terms of actually
10 knowing the price, the only source of actual pricing
11 is based on the demand curve; correct?

12 A. [PAYNTER] Right. The demand curve is
13 based on the cost of new entry, so the NY ISO
14 estimates the cost of building a new plant in
15 various locations, including New York City. That's
16 the basis for the demand-curve price. That price is
17 estimated every three years. So when you say the
18 price is only out there for three years, that simply
19 means that the price has been estimated, that the
20 cost of the new construction has been estimated for
21 the next three years. At three years from now,
22 there will be another estimate updating the cost of
23 new construction.. So it's the same thing you're

1 question. He said --

2 A. [GJONAJ] I don't know what's on their
3 minds. They'd all love a PPA. Or if the market
4 conditions are good or they foresee them to go good,
5 they would do what any rational businessperson would
6 do.

7 Q. That's your opinion; correct?

8 A. [GJONAJ] Yes.

9 Q. But do you know what NRG's belief is?

10 A. [GJONAJ] I have no idea.

11 Q. Thank you. The cost of a new power plant
12 in New York City at, say, 500 megawatts, would you
13 agree with me that it's well over a billion dollars?

14 A. [GJONAJ] Well over a billion? It's about
15 \$2,000 a kw typically, so it's about that.

16 Q. Do you know what it cost to build the
17 Astoria Energy 2 plant?

18 A. [GJONAJ] I heard -- you get different
19 numbers. What I read in the trade press is about
20 \$1.1 billion. I read somewhere it's 1.5 billion. I
21 don't know.

22 Q. Over a billion dollars, though.

23 A. [GJONAJ] Right.

1 estimating every time. It's just the cost to build
2 a new peaking unit. It's just that you're redoing
3 your estimates every three years.

4 Q. But the market signal that's conveyed by
5 the capacity clearing price, all the market signal
6 that's out there is what's based on the demand
7 curve; correct?

8 A. [PAYNTER] That's true. It is a spot
9 market.

10 Q. I'd like to now turn to what's been marked
11 as City 22, which is probably in the binder you guys
12 have.

13 MR. LUCAS: Once again, for foundation
14 purposes, Your Honor, it's not clear from the face
15 of this document what it is, but it looks like it's
16 something somebody compiled from other sources.

17 MR. LANG: We're going to go through it
18 with the witness and have him lay the foundation for
19 it, Your Honor.

20 JUDGE VILLA: All right. Go ahead.

21 Q. Dr. Paynter, in your testimony you stated
22 that because there is no demand-curve price for
23 2022, that you took the 2016 price and you just

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Pages 9376-9725

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 16, 2014, 8:29 a.m.

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FARMER ARSENAULT BROCK LLC

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)
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1 Q. Mr. Russo, do you recognize Entergy Exhibit
2 405?
3 A. This document appears to be the 2012 NY ISO
4 RNA.
5 Q. What is an RNA?
6 A. The RNA is a biannual reliability needs
7 assessment performed by the NY ISO, the grid
8 operator for New York, which is used to evaluate the
9 reliability or the security of the transmission grid
10 under different scenarios.
11 Q. Can we look at Page 24 in this document,
12 please.
13 A. Okay.
14 Q. Do you see Table 3-5 in this document?
15 A. I do.
16 Q. Looking at Table 3-5, this appears to be a
17 list of proposed retirements or mothballs of plants.
18 Is that accurate?
19 A. That's what it appears to be, yes.
20 Q. Comparing this to your Table 27 in your
21 report, this seems to have substantially more units
22 in megawatts of capacity on it. Can you explain or
23 do you understand why there's a difference between

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1 the two?
2 A. Well, the first and most obvious reason is
3 that this RNA was produced after the date of
4 finality of our report and incorporates information
5 that wasn't available at the time when we produced
6 this retirement report.
7 The principal reason is probably that
8 the situation changed and a greater number of units
9 were proposed to retire subsequent to the issuance
10 of our analysis.
11 Q. If we look at the date on your report, it's
12 August 2nd, 2011; is that correct?
13 A. That sounds right, yes.
14 Q. And the date on this reliability needs
15 assessment was just about 12 months later, September
16 18th, 2012?
17 A. That's correct.
18 Q. So Mr. Russo, is it your understanding that
19 over the course of 12 months between your report and
20 this NY ISO report the additional megawattage listed
21 on Page 24 of Entergy 405 announced plans to retire
22 or go into mothball status?
23 A. I'm sorry, I'm not quite exactly clear on

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1 what the question was.
2 Q. Over the 12-month period between your
3 report coming out and the NY ISO report coming out,
4 is it your understanding that the additional
5 facilities listed on Page 24 of Exhibit 405
6 announced their plans to either retire or go into
7 mothball status?
8 A. That's my understanding from the RNA.
9 Q. Eyeballing your report, is it fair to say
10 there's about 450 or so megawatts listed there?
11 A. I'll accept your math, subject to check.
12 But that seems about right.
13 Q. And if we look at the 2012 reliability
14 needs assessment report, it does the math for us,
15 and it provides 1,527 megawatts proposed
16 retirements?
17 A. That's what I read on the table.
18 Q. The difference, then, over the course of 12
19 months was about an additional 1,000 planned
20 megawatts coming off the grid; is that right?
21 A. That's roughly right.
22 Q. In recent years has the load for New York
23 State been increasing or decreasing?

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1 A. It has been increasing.
2 Q. And is load expected to continue increasing
3 over the foreseeable future?
4 A. The NY ISO has forecast it to do so.
5 Q. So when units retire or mothball, that adds
6 to -- that decreases the margin in New York between
7 capacity and load; correct?
8 A. Yes, although it's important to remember
9 that there are import resources which can qualify to
10 meet some of the load in New York. But as a general
11 matter, yes.
12 Q. When you refer to import resources, do you
13 mean power being transmitted over lines from Canada
14 or other states?
15 A. Sure, Canada, New England, PJM, Ontario.
16 Q. Can that power -- I'm sorry, were you
17 finished?
18 A. To be more specific, Quebec and Ontario. I
19 said Canada and Ontario, which are pretty much the
20 same thing.
21 Q. Can that power satisfy voltage -- in all
22 instances can that power coming in from other states
23 or from Canada satisfy voltage requirements in New

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1 York State?

2 A. It has the potential to do so under some
3 circumstances.

4 Q. Under what circumstances?

5 A. Perhaps it would be helpful to just give a
6 very, very brief definition of what voltage support
7 is. The alternating current power -- the
8 alternating current transmission system in New York
9 has two principal products or quantities which
10 comprise it. One is active power, which we
11 frequently measure in terms of megawatthours. The
12 other one is reactive power, typically measured in
13 terms of megaVARs, or volt amperes reactive. The
14 latter quantity is sometimes referred to as
15 imaginary power, which is a term that I'm
16 actually -- doesn't go over well sometimes in
17 hearings. But both of these quantities are
18 necessary to maintain the stability of the system.

19 Megawatthours is a quantity which
20 typically goes towards useful work, making machines
21 run, things like that. Reactive power is a bit more
22 difficult and subtle to explain, but it's the
23 quantity generated by generators which allows --

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1 which supports the system and supports the voltage,
2 which allows the active power to be transmitted from
3 one location to another. This is typically done by
4 field current production on generators and can only
5 be produced by AC generators.

6 So to answer your question more
7 directly: The power would have to be alternating
8 current power and would have to be transmitted over
9 an alternating current connection from an adjacent
10 region, which is the case in several cases, I
11 believe. Ontario certainly is AC power. PJM is AC
12 power. But there are some proposals on the table
13 for imported power from Canada, or Quebec more
14 precisely, which would be direct current and thus
15 would not supply this reactive support to the grid.

16 Q. Mr. Russo, let's look next at the bottom of
17 Page 9 in your prefiled direct testimony.

18 Mr. Russo, do you see there a discussion of price
19 spikes in natural gas?

20 A. Let me turn there. Give me one moment,
21 please.

22 Yes, I do.

23 Q. What can cause price spikes in natural-gas

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1 prices?

2 A. There are two principal components of what
3 makes up the cost for natural gas, and they have
4 very different dynamics and functions. The first is
5 what we call the commodity point -- commodity cost,
6 which is typically priced at a location in
7 Louisiana, of all places, called Henry Hub. And
8 that is generally -- that is the general index for
9 United States natural-gas prices. That fluctuates
10 up and down in response to demand and the
11 availability of supply.

12 The second component is what we refer to
13 as basis, which is the locational price of natural
14 gas, which is more specifically the delivered price
15 in New York City, in Boston, Pennsylvania, anywhere
16 else. The basis, and in particular the basis for
17 the Northeast and New York City, is driven more than
18 anything else, I would say, by the need for natural
19 gas and the unavailability of transmission for that
20 natural gas sometimes.

21 So there may well be ample gas in
22 Pennsylvania in the Marcellus, but when people need
23 to heat their homes in New York City in January

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1 there's limited capacity on the pipelines and thus
2 the price can spike fairly substantially.

3 Q. Are there price spikes that also occur on a
4 national basis?

5 A. There are fluctuations. I'm not sure I'd
6 characterize them as spikes without actually looking
7 at the data.

8 Q. Can we take a look at Entergy 521, please.

9 A. I've got it.

10 MR. BINDER: Is that a printout from the
11 EIA?

12 MR. MARTIN: Yes.

13 MR. BINDER: Thanks.

14 Q. Mr. Russo, are you familiar with the U.S.
15 Energy Information Administration?

16 A. Yes, I am.

17 Q. If I call that the EIA, you know what I'm
18 talking about?

19 A. I would.

20 Q. What is the EIA?

21 A. The EIA is a Federal organization which
22 compiles and distributes national energy
23 statistics -- natural gas, electricity, oil prices.

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1 It's commonly used in the industry as a source of
2 information and data.

3 Q. In response to one of my earlier questions,
4 you referred to Henry Hub as the national index for
5 natural gas pricing; correct?

6 A. That's correct.

7 Q. We've printed off of the EIA website its
8 report on Henry Hub natural gas spot prices on a
9 monthly average basis from 1997 through 2014, which
10 is what you have in front of you as Entergy 521.

11 And what I would like to direct your attention to
12 are the various spikes that occur over different
13 points. It looks like one might be 2001, another in
14 2005 or 2006, a third in 2008, and it looks like
15 prices have been coming up in sort of a baby spike
16 in the last few months. Do you see those?

17 A. I see the data you've described, yes.

18 Q. Do you know what's been causing prices to
19 increase as measured by the Henry Hub spot price
20 from between about 2012 and recent months?

21 A. There are a number of factors, many of
22 which were outside the scope of our analysis and
23 certainly postdate the report that we produced. In

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1 But it's really very location-dependent and time-
2 dependent.

3 Q. Let's move to New York, then, specifically.
4 In New York are the peaking facilities typically
5 natural gas facilities?

6 A. It depends on the facility, but by and
7 large, yes.

8 Q. And have most recent power plant additions
9 in New York State been natural gas facilities, or
10 mixed natural gas/oil facilities?

11 A. The last several I can think of off the top
12 of my head have been natural gas, yes.

13 Q. Has the percentage of power produced in New
14 York State using natural gas been increasing in
15 recent years?

16 A. I would have to check with the NY ISO
17 statistics to confirm that, but I believe that's the
18 case, yes.

19 Q. Did you analyze whether in an IPEC outage
20 scenario most of its electricity generation will be
21 replaced by natural gas?

22 A. We did.

23 Q. And what was your finding?

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1 general, it's the supply-demand balance. There has
2 been a secular shift towards natural-gas-fired
3 generation in recent months, we've had a
4 particularly cold winter, and production from some
5 of the shale wells in Marcellus has trailed off a
6 little bit. The production yield has been less than
7 expected.

8 So it's fundamentally a supply-and-
9 demand issue, although I'm sure there are other
10 factors which might be affecting the commodity
11 price.

12 Q. I assume the answer is yes, but do
13 increasing natural gas prices as measured at Henry
14 Hub translate into higher bills for consumers?

15 A. Under certain circumstances, they can. If
16 we're talking about electricity prices -- if we're
17 talking about electricity prices --

18 Q. I should clarify: electricity bills.

19 A. It depends on the market. In markets where
20 the marginal fuel tends to be natural gas -- in
21 other words, the last power plant turned on is a
22 natural-gas-fired plant -- ceteris paribus, higher
23 gas prices generally mean higher electricity prices.

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1 MS. BRANCATO: Could I just ask for a
2 clarification? When you refer to an outage pretty
3 generically --

4 MR. MARTIN: We're talking about
5 construction outages for this -- unless I specify
6 otherwise, all my questions are concerning a
7 construction outage.

8 MS. BRANCATO: Then I'll further object
9 that the retirement report is specifically about
10 retirement of the facility and not about
11 construction outages. So I just wonder how that
12 question can be asked.

13 MR. LUCAS: Excuse me, Your Honor:
14 Also, it's not clear to me what the time period of
15 this outage would be, either. In 2016, to say
16 everything's going to be replaced by natural gas is
17 one thing. If the outage is in 2020 or 2022, I
18 think the answer might be different. So we're just
19 not clear on that.

20 MR. LANG: I think the witness could
21 actually answer that question as to what his
22 assumptions were on a going-forward basis. And as
23 to Ms. Brancato's objection about is an outage and

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1 characteristics of the New York grid, where those
2 power plants are is particularly significant.
3 And -- I'll stop.
4 Q. I wasn't making you stop. At least on a
5 statewide basis, Mr. Russo, if we look at, for
6 example, 2026, which actually totals on the next
7 page -- the way I was reading this, and correct me
8 if I'm wrong, is that on a statewide basis 45,980
9 megawatts are need to do satisfy statewide
10 reliability requirements and 46,015 megawatts
11 actually are projected to exist, which leaves only
12 25 megawatts of wiggle room between what's projected
13 to be there and what's needed. Is that accurate?
14 And if not, please tell me how I'm off.
15 A. That's generally correct.
16 Q. And in your available ICAP resources, are
17 you including the roughly 2,000 megawatts of power
18 generated by Indian Point in this Table 9?
19 A. This would be the base case, so IPEC would
20 be included in this table.
21 Q. So if we take out IPEC in 2026 for a
22 construction outage, if there's only 25 megawatts of
23 wiggle room, we'd be about 2,000 megawatts below

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1 what's needed to assure reliability?
2 MR. LUCAS: Objection, Your Honor,
3 foundation. That assumes that Indian Point is the
4 only plant that comes on-or offline and that no
5 transmission improvements or demand-side management
6 measures have been undertaken. That's just looking
7 at Indian Point in a vacuum. It's misleading.
8 There's no foundation.
9 MR. MARTIN: I can ask the question with
10 that clarification, Your Honor.
11 JUDGE VILLA: Okay.
12 A. If that were the only change, then yes.
13 But I would expect that that might not be the only
14 change.
15 Q. Your base case does have some other
16 changes; correct?
17 A. I'm sorry, other changes in regards to?
18 Q. I'm sorry, does your base case also have
19 other units coming on and offline, or is your base
20 case the present situation with no changes
21 whatsoever?
22 A. The base case as of the date of finality of
23 the report in 2011, does include changes subsequent

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1 to 2011 and subsequent to both 2013 and '15,
2 respectively, the dates at which IPEC could be
3 presumed to retire.
4 Q. So you've already included some
5 improvements to the system; correct?
6 A. I'm not sure I'd characterize them as
7 improvements. I'd characterize them as changes in
8 the assumptions.
9 Q. To adopt Mr. Lucas's clarification, in
10 2026, barring additional transmission capacity or
11 additional generating capacity, if you took
12 Entergy's 2,000 megawatts out of the system, you'd
13 be looking at about a 2,000-megawatt shortfall;
14 correct?
15 A. If that were the only change, then yes.
16 MR. LUCAS: Just for the record, Your
17 Honor, I'm sorry, my clarification was also related
18 to demand-side management/conservation measures.
19 I'm not asking the witness to answer that now.
20 Q. And going back to you to Riverkeeper 165,
21 which is the New York Energy Highway Blueprint
22 update: We just saw the cost of one such potential
23 change to the system, the addition of approximately

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1 1200 megawatts of additional capacity, and the
2 projected cost of that was between 1 and 2 billion
3 dollars. Correct?
4 A. That's correct, although it's -- I want to
5 note one thing about the Energy Highway: It's not
6 clear whether this represents the capital cost of
7 the plants or additional funding that would be
8 necessary to remunerate or compensate the plants
9 beyond those revenues that they might get from the
10 market. So it's not clear from the blueprint which
11 is the case.
12 Q. So Mr. Russo, is it your understanding that
13 the additional capacity could actually cost 1 to 2
14 billion -- sorry, could actually cost more than 1 to
15 2 billion dollars to build and this simply
16 represents a funding mechanism to help those plants
17 with the -- the owners of those plants with the cost
18 of building them?
19 MR. LUCAS: Objection, calls for
20 speculation. He's just testified to the fact he
21 doesn't know.
22 MR. MARTIN: Your Honor, I asked the
23 witness what his understanding was.

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1 about needing to have both reactors on line is
2 qualified by "unless new sources of generation are
3 constructed in a location and on the scale that
4 could offset the simultaneous loss of both
5 reactors-of-" -- which is exactly what Mr. Fagan's
6 report is dealing with: What do we have that could
7 offset it?

8 So just viewed in isolation like that --
9 I know the testimony speaks for itself, but I want
10 the record to be clear, and the witness can then
11 appropriately answer.

12 JUDGE VILLA: Okay. Right.

13 MR. MARTIN: My question has nothing to
14 do with that, Your Honor.

15 Q. It's just simply: Do you know if anyone
16 has said it's possible to retrofit the units one at
17 a time?

18 A. I'm not aware that anybody has testified to
19 that effect.

20 Q. Could we take a look at Entergy 408,
21 please?

22 A. This is the written statement of Tom
23 Rumsey?

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1 A. That's correct. But if you were talking
2 about those tables which specifically quantify
3 reliability, they're elsewhere in the report. I can
4 locate them if you give me a moment.

5 Q. All right. Thank you.

6 A. I believe the tables you are looking for
7 begin on Page 64 of Exhibit -- of the retirement
8 report, beginning with Table 36.

9 Q. These are your calculations of loss-of-load
10 expectation?

11 A. That's correct. Would it be helpful for
12 the record or four Your Honors to understand what
13 loss-of-load expectation is?

14 JUDGE VILLA: Oh, yes.

15 THE WITNESS: There's a lot of Greek
16 letters involved. So loss-of-load expectation is a
17 probability which the NY ISO and other grid
18 operators calculate, which indicates the probability
19 of what's called a load-shedding event during any
20 given year. And a load-shedding event is simply a
21 technical term for turning people off, rolling
22 blackouts.

23 And so the reliability of the power

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)

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1 Q. Right. First of all, let me ask you this,
2 Mr. Russo: On Page 11, when you're talking about
3 the need to keep one unit online at all times for
4 electric system reliability purposes, are you
5 talking about any particular time frame where that
6 will be true? Is that true now?

7 A. I wasn't referring to any particular time
8 frame in my testimony. Typically, reliability's
9 evaluated in summer peak conditions, when the load
10 is highest.

11 Q. Do you have tables in your retirement
12 report which discuss the summer peak period and what
13 power needs are during that period?

14 A. We have tables in the retirement report
15 which evaluate reliability on an annual basis. They
16 are not demarcated by summer and winter peak
17 periods.

18 Q. Well, in fairness, if you look at Page 47
19 or what's Page 48 of 104.

20 A. I'm sorry, I'm looking at Page 48 of 104.
21 Yep.

22 Q. Is that in fact a table which shows the
23 summer peak load?

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)

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1 system is actually done on a probabilistic basis,
2 and there's a standard called minimum LOLE, which is
3 typically characterized in terms of frequency in
4 terms of one day in ten years.

5 And the standard is that the NY ISO grid
6 operator determines that the probability of having a
7 load-shedding event must be less than .1, which
8 translates roughly to a frequency of happening once
9 every ten years. It doesn't mean the system is
10 perfectly reliable. It means there's an acceptable
11 probability of such an outage occurring.

12 So the Tables 36 through 42, inclusive,
13 calculate the loss-of-load expectation under various
14 scenarios. And by this metric, a higher number
15 indicates a less -- a higher loss-of-load
16 expectation and thus a less reliable system.

17 Q. Mr. Russo, I'm probably terrible at
18 statistics, so help me out. If there's a
19 probability of one day in ten years, does that mean
20 the probability of having one day in any given year
21 is 10 percent?

22 A. No.

23 Q. So help me out.

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)
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1 In these tables; correct?
2 A. I honestly wouldn't want to make a
3 judgment. It's a complex calculation, and a number
4 of variables have changed. The composition of
5 generating resources has changed. The
6 composition -- the load forecast has changed.
7 The most recent that I'm aware of
8 official reliability analysis is the one performed
9 by the NY ISO in 2012, which is largely consistent
10 with our findings.
11 Q. Which is a violation by 2016, barring
12 substantial new capacity?
13 A. To -- the take-away or the main point of
14 the NY ISO's reliability analysis in 2012 is that if
15 full achievement of energy efficiency targets was
16 achieved, the generating resources as forecast --
17 retirements and additions as forecast actually
18 happened, they forecast that there would be
19 reliability violations if both reactors were to
20 retire.
21 Q. Mr. Russo, do you have any reason to
22 believe that that same violation wouldn't occur if
23 the units, instead of retiring, were simply both out

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)
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1 for nine to ten months, including the summer peak
2 period, for a construction outage?
3 A. No, I don't. The duration of the outage
4 has no bearing on the calculation of the LOLE.
5 Q. If we turn to Page 19 in your testimony,
6 Mr. Russo. It's still direct.
7 A. 19 in my direct. I'm there, yes.
8 Q. At about Line 10, or starting on Line 9,
9 leading on through Line 12, you discuss New York's
10 progress towards achieving its energy efficiency
11 targets; correct?
12 A. I do. I did.
13 Q. Is this what you were referring to a little
14 while back in our discussion of your loss-of-load
15 expectation tables, when you mentioned New York not
16 actually achieving its targets?
17 A. Yes, that's correct.
18 Q. And when you say -- when you refer on
19 Page 19, Line 10, to New York achieving 57 percent of
20 its base case, do you mean 57 percent of the amount
21 it eventually wants to achieve or 57 percent of what
22 it had hoped to achieve through the date of the
23 analysis?

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)
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1 A. Let me be precise, and let me also note
2 that the NY ISO was part of our stakeholder group
3 when we conducted our analysis. I'm going from
4 memory here, but subject to check, if I remember
5 correctly, the load forecast that we used at the
6 time reflected achievement of 91 percent of the
7 statewide goals.
8 Historic -- the NY ISO, shortly before
9 the issuance of our report published statistics
10 saying that they achieved 57 percent of that goal.
11 And so we picked a round number. We picked 50
12 percent, which roughly translates to roughly .57
13 times .91, and used that to reflect the fact that
14 historically they had achieved roughly half of their
15 goals.
16 MR. LUCAS: Your Honor, we're going
17 object to that subject to check. That is not the
18 correctness of the calculation. That is not what a
19 document says. It's without prejudice for the
20 witness to connect up that subject to check. But
21 that's a little bit of a different animal for a
22 subject to check, in terms of a prediction like
23 that.

(CHRISTOPHER J. RUSSO - CROSS ENTERGY)
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1 JUDGE VILLA: All right. I think the
2 answer can stay. If we want to do any cross with
3 respect to it, that's fine.
4 Q. Mr. Russo, we're going to turn to your
5 rebuttal testimony now.
6 A. Sure.
7 Q. Let's turn to Page 8 in your rebuttal
8 testimony, please. Mr. Russo, generally speaking,
9 what are you discussing in the Q&A which begins on
10 Line 6 in your rebuttal testimony?
11 A. The question that begins with, "Are there
12 other factors that Dr. Paynter failed to consider?"
13 Q. Correct.
14 A. Let me review it to be certain that I can
15 summarize it well.
16 What I discuss here are two general
17 matters. The first, which is the one focused on in
18 the testimony, is the fact that it takes a
19 significant amount of time to construct and build a
20 power plant, several years at a minimum. And I
21 think one of the proposed replacements for Indian
22 Point in fact said they'd need a minimum of two to
23 three years from the signing of a contract to

1 actually being in commercial operation. So it's
2 simply stating that there needs to be sufficient
3 lead time for power plants to get on line.

4 The second issue which is touched on
5 here is that there's considerable uncertainty among
6 market participants about regulatory intervention in
7 the market. And I elaborate on that later in my
8 rebuttal testimony.

9 But those investors which might enter
10 the market with replacement capacity I think would
11 be looking very closely to regulatory rulings from
12 the PSC and other parties regarding what prices
13 would be before they made the leap to commit
14 substantial sums to invest.

15 Q. Mr. Russo, do you work with companies
16 seeking to build new electric generation facilities?

17 A. Very frequently.

18 Q. You mentioned in the answer you gave just
19 then that it could take two to three years from the
20 signing of a contract for a new plant to be built.
21 What needs to occur before a contract is even
22 signed?

23 A. Very dependent on the situation. In in

1 particular -- but as a general --

2 Well, in this specific case it may be
3 easier to identify what might have to horsepower
4 here. An appropriate counterparty would need to be
5 identified. It could be NYPA. It could be the
6 State. It could be LIPA. There would have to be
7 regulatory approvals, permits, siting processes to
8 go through. And I would imagine in this case, given
9 the fact that -- given the PSC's stance regarding
10 the potential need for contracts, that there would
11 have to be some regulatory approval for these
12 contracts to go forward before they could be
13 executed.

14 Q. Can that process itself take a number of
15 years?

16 A. Many years.

17 Q. Let's turn to Page 10 in your rebuttal
18 testimony, please. And there's a paragraph
19 beginning "Under those market rules." Do you see
20 that paragraph?

21 A. Yes.

22 Q. And you go on to discuss the concept of
23 mitigation; correct?

1 A. That's correct.

2 Q. What does "mitigation" mean in this
3 context?

4 A. I'm going to oversimplify a bit. But as a
5 general matter, market mitigation is a regulatory
6 construct that prohibits artificially reducing
7 capacity prices. And again, I'm glossing over some
8 of the details.

9 But traditionally in New York there has
10 been a large amount of market concentration on both
11 the buyer side and the seller side when it comes to
12 capacity. And mitigation -- the mitigation I'm
13 referring to here specifically is what's called
14 buyer side mitigation. At a high level what it
15 means is that if capacity enters the market, if
16 somebody enters the market to sell capacity, and
17 that capacity by itself would not be economic -- in
18 other words, it would not be fully remunerated by
19 market revenues -- then it's prohibited at offering
20 at an inframarginal price, which is just a fancy
21 economist way of saying that it probably wouldn't
22 receive capacity revenues.

23 So it's intended to provide a strong

1 disincentive to enter the market in periods where
2 that -- enter the market where that capacity isn't
3 needed. And the reason this exists is -- and the
4 reason it's referred to as buyer-side mitigation is
5 that there can be instances in which a large
6 consumer of energy, a monopsonistic purchaser could
7 add additional capacity into the market and thus
8 suppress prices for the rest of the capacity that
9 loses -- lose a little bit of money on this project
10 but save a lot of money on the other capacity that
11 it buys. There are obviously a lot of nuances and
12 details that go beyond it, but that's a good working
13 definition for this proceeding, I think.

14 Q. Mr. Russo, you used a phrase during that
15 answer which I'm going to ask you to try to put a
16 little more into laymen's terms, which is capacity
17 that is not being fully remunerated by market -- by
18 the market.

19 A. Sure.

20 Q. What does that mean?

21 A. New York and many other markets depend on
22 private capital for investment, and the intent of
23 the market and the desire of regulators is that

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Pages 9726-10045

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

In the Matter of:

Entergy Nuclear Indian Point 2, LLC,
and Entergy Nuclear Indian Point 3, LLC

DEC No.:
3-5522-00011/00004
SPDES No.:
NY-0004472

For a State Pollution Discharge
Elimination System Permit Renewal and Modification

Entergy Nuclear Indian Point 2, LLC,
Entergy Nuclear Indian Point 3, LLC, and
Entergy Nuclear Operations, Inc.

DEC App. Nos.
3-5522-00011/00030 (IP2)
3-5522-00105/00031

Joint Application for CWA § 401 Water Quality
Certification

ADJUDICATION BEFORE:

Daniel P. O'Connell, ALJ
Maria E. Villa, ALJ

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
625 Broadway
Albany, New York 12233

April 17, 2014, 8:24 a.m.

----- Reporter: Alan H. Brock, RDR, CRR -----
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FARMER ARSENAULT BROCK LLC

1 A. You read that correctly.

2 Q. Now, you've used the term "solely" when
3 referring to these two elements of energy efficiency
4 and transmission lines, and I just would like to
5 clarify that.

6 Would you agree that incremental energy
7 efficiency can contribute some level of voltage
8 support to the New York electrical system?

9 A. On a technical level, no, I wouldn't.

10 Q. Would you agree that transmission lines
11 contribute voltage support to the New York
12 electrical system?

13 A. On a strictly technical level, no.

14 Q. On the same page, Line 12, you discuss
15 reactive power provided by Indian Point?

16 A. I do.

17 Q. Is reactive power from Indian Point the
18 only source of voltage support to the New York grid?

19 A. Well, there's reactive power from other
20 plants as well.

21 Q. And is the only local source, meaning to
22 the Lower Hudson Valley, local source of reactive
23 power from Indian Point?

1 stable.

2 JUDGE VILLA: As you were talking about
3 yesterday.

4 THE WITNESS: Yes.

5 JUDGE VILLA: Okay.

6 THE WITNESS: I just wanted to draw the
7 nexus between reactive power and voltage support,
8 because it's not immediately obvious to the
9 nonspecialist why these two things are related.

10 JUDGE VILLA: Thanks.

11 Q. So in the event that the voltage support
12 you identify in your direct testimony from Indian
13 Point is no longer available, is it your
14 understanding that there are alternative forms of
15 voltage support from either existing equipment or
16 potentially new equipment that could provide that
17 voltage support?

18 A. Certainly there might be other sources.
19 But my understanding is that the NY ISO itself
20 concluded in 2012 that absent the voltage support
21 from Indian Point, you would need additional
22 incremental voltage support apart from those plants,
23 or even replacement capacity, to keep the grid

1 A. I haven't made a specific evaluation, but I
2 feel confident that there is some measure of
3 reactive power from other AC generators.

4 THE WITNESS: Can I clarify one thing
5 for the Court which might be helpful? We're talking
6 about several quantities here, which are a bit
7 confusing. So when we talk about -- would it be
8 helpful to give a working definition of "voltage"
9 for the purposes of this?

10 JUDGE VILLA: Please.

11 THE WITNESS: I can express this in
12 hydraulic terms or water terms. Voltage is like a
13 pressure in a series of pipes. In order to transmit
14 power or water from one place to another, you need
15 to have sufficient pressure.

16 Reactive power is simply a quantity
17 generated by a large AC generator -- or any AC
18 generator, really -- that contributes to keeping the
19 voltage or the pressure high enough in a system.

20 So when we talk about reactive power
21 being generated by power plants, we're talking about
22 that reactive power serves to keep the pressure of
23 the voltage sufficiently high to keep the grid

1 stable.

2 The other point worth noting that is the
3 electrical location of where this voltage support is
4 provided is very -- is very important. Providing
5 voltage support physically at the site of Buchanan
6 is very different from providing voltage support at
7 Danskammer or one of the other plants in the Lower
8 Hudson Valley.

9 Q. But in the event that that voltage support
10 is lost, could the NY ISO reconfigure different
11 voltage devices in different locations to adjust the
12 system?

13 A. Potentially, yes. But that's well outside
14 the scope of any analysis I've done, nor am I aware
15 of any analysis to that effect from any other party.

16 Q. Does the NY ISO or Consolidated Edison
17 regularly assess voltage issues, though?

18 A. They do.

19 Q. And they monitor the amount of voltage in
20 the system to assure an adequate amount of voltage?

21 A. I was.

22 Q. And you might have already answered this,
23 but you have not quantified the degree to which

Health Impact in New York City During the Northeastern Blackout of 2003

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ABSTRACT

Objective. This study assessed the health effects of the 2003 Northeastern blackout, the largest one in history, on mortality and hospital admissions due to respiratory, cardiovascular, and renal diseases in New York City (NYC), and compared the disease patterns and sociodemographic profiles of cases during the blackout with those on control days.

Method. We investigated the effects of the blackout on health using incidence rate ratios to compare the disease on blackout days (August 14 and 15, 2003) with those on normal and comparably hot days (controls). Normal days were defined as summer days (June–August) between the 25th and 75th percentiles of maximum temperature during 1991–2004. Comparably hot days were days with maximum temperatures in the same range as that of the blackout days. We evaluated the interactive effects of demographics and the blackout using a case-only design.

Results. We found that mortality and respiratory hospital admissions in NYC increased significantly (two- to eightfold) during the blackout, but cardiovascular and renal hospitalizations did not. The most striking increases occurred among elderly, female, and chronic bronchitis admissions. We identified stronger effects during the blackout than on comparably hot days. In contrast to the pattern observed for comparably hot days, higher socioeconomic status groups were more likely to be hospitalized during the blackout.

Conclusions. This study suggests that power outages may have important health impacts, even stronger than the effects of heat alone. The findings provide some direction for future emergency planning and public health preparedness.

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On August 14, 2003, a series of small disturbances in power generation and transmission triggered protective shutdowns of power plants that cascaded into a massive power outage affecting tens of millions of people throughout the Northeastern United States beginning at 4:11 p.m. on August 14 and lasting approximately 31 hours.¹ The magnitude of the threat to human health and safety is illustrated by statistics from a U.S. Department of Transportation report on the effects of the blackout in New York City (NYC): 11,600 traffic signals went dark, 413 subway trains stopped with 400,000 passengers aboard, and 800 elevator rescues were made.² In addition, high-rise apartment buildings were without water because they rely on electric pumps to move the water to the upper floors, and raw sewage was released into lakes and rivers as the loss of electric power shut down wastewater treatment plants.

Several studies have been published that detail some of the health-related issues posed by the blackout. Most of these studies focus on the increased use of various health-care sectors during the blackout. For example, an increase in calls to 9-1-1 and emergency services,³⁻⁵ including a poison control center, was noted.⁶ Klein et al. documented that while the power outage increased the utilization of hospitals' emergency services, the effective operation of hospitals was compromised by the loss of power.⁷ Beatty and colleagues described the public health responses in NYC to risks posed by the power outage, such as spoilage of food and contamination and/or lack of water.⁸

The increases in health service provider activity reported by these studies suggest an increase in health problems associated with the blackout, but only one study reported actual cases of illness. In a case-control investigation of diarrheal illness, Marx and colleagues found that cases were 2.7 times and 1.6 times more likely than controls to have eaten meat and seafood, respectively, during the period between the blackout and the onset of symptoms.⁹

Just as food spoilage caused by the blackout-induced loss of refrigeration posed a risk for gastrointestinal illness, it is hypothesized that the interruption of air conditioning and mechanized transportation and the resulting heat exposure and exertion may have posed a risk for other health problems. As no studies had been conducted in these areas, this study aimed to (1) assess the health effects of the 2003 blackout on mortality and hospital admissions for respiratory, cardiovascular, and renal diseases in NYC; (2) compare the pattern of health outcomes during the blackout with that during days of comparable temperatures and during normal summer days; and (3) identify the socioeconomic groups most susceptible to the combined effects of heat and power outage.

METHODS

Study population and data sources

The study population included all residents of NYC. Hospital discharge data in NYC from 1991 to 2004 for respiratory, renal, and cardiovascular diseases were obtained from the New York State Department of Health's Statewide Planning and Research Cooperative System (SPARCS).¹⁰ SPARCS is a legislatively mandated database that contains hospital discharge data for at least 95% of all acute care hospital admissions in New York State, excluding admissions to psychiatric and federal hospitals. The data included principal diagnoses, hospital admission date, sources of payment, date of birth, gender, race/ethnicity, and street address. Data from the 1990 and 2000 U.S. Census at the census block level were used to derive an indicator of socioeconomic status (SES).

We obtained mortality data from NYC Vital Records for the years 1995–2004. The data included principle diagnoses (International Classification of Diseases, Ninth Revision [ICD-9] code)¹¹ for death causes, date and time of death, residential county, city and street information, ZIP code, gender, race/ethnicity, age, and birth date of decedent.

The Data Support Section of the Computational and Information Systems Laboratory at the National Center for Atmospheric Research provided hourly observations of temperature (T) and dew point (DP) from the National Weather Service (NWS) stations in NYC. Two NWS stations, LaGuardia Airport (LGA) and John F. Kennedy Airport (JFK), had complete data for the period of the study, June 1–August 31, 1991–2004. Because of its more central location compared with JFK, and the fact that more than 85% of NYC residents live within its buffer, the station at LGA was used as the T and DP data source for all of NYC.

Blackout and control definition

We classified August 14 and 15, 2003, as blackout days. We used two referent groups, "normal summer days" and "comparably hot days," as the control (comparison) groups to assess the effects of the blackout and to compare/separate the effects of the blackout from those of temperature. We defined normal summer days as the summer days from June through August (1991–2004), after excluding the blackout days, and days on which the daily maximum temperature was <25th percentile or >75th percentile of daily maximum temperature in NYC during the summer months. The temperature range of the normal days in this study was between 78.1°F and 87.1°F (June 1–August 31, 1991–2004). Comparably hot days were days in the same period on which the maximum temperatures

were in the same range as those of the blackout days (89.1°F to 91.0°F).

Health outcomes

The health outcomes examined were all-cause deaths and hospital admissions due to respiratory, renal, and cardiovascular diseases. For hospitalizations, a case was defined as a resident of NYC who was admitted to a hospital in the summer (i.e., June, July, and August) from 1991 to 2004 with a principal diagnosis of respiratory, renal, or cardiovascular disease. We used ICD-9 codes to classify cases.

Respiratory disease diagnoses included chronic bronchitis (491), emphysema (492), asthma (493), and chronic airway obstruction not elsewhere classified (496). For children aged 0–4 years, we included acute bronchitis and bronchiolitis (466) and bronchitis, not specified as acute or chronic (490), because these are common respiratory illnesses among very young children and their symptoms are difficult to distinguish from asthma in young children. Renal diagnoses included nephritis, nephrotic syndrome and nephrosis (580–589), other diseases of the urinary system (590–599), and symptoms involving the urinary system (788). Cardiovascular diagnoses included chronic rheumatic heart disease (393–396), hypertension (401–405), ischemic heart diseases (410–414), cardiac dysrhythmias (427), congestive heart failure (428), and cerebrovascular diseases (430–434, 436–438). Deaths from all causes were included in the mortality analyses.

Data processing and geocoding

To define the study population more precisely, the residential address from each hospital admission record due to respiratory diseases was geocoded and assigned a latitude and longitude using MapMarker Plus® 12.¹² About 84% of the residential addresses were geocoded automatically, 15% were geocoded interactively, 94% were geocoded to street level, 5% were geocoded to ZIP code level, and fewer than 1% (about 6,110 records) could not be geocoded. Admission records for cardiovascular diseases, renal diseases, and mortality records were also geocoded to at least ZIP code level. The map of geocoded addresses was overlaid onto the map of exposure regions using MapInfo Professional® 8.5.¹³ We then calculated daily hospital admission counts for each outcome of interest between 1991 and 2004.

Statistical analysis

We used time-series plots to make time-based, within-community comparisons of mortality and morbidity during blackout and non-blackout periods. To control for the potential effect of high temperatures on hos-

pital admissions, non-blackout days were partitioned into normal summer days and days that were as hot as the blackout (comparably hot days). We computed the mean daily rates of each outcome, and compared rates during blackout days, normal summer days, and comparably hot days using incidence rate ratios (IRRs). We calculated Wald 95% confidence intervals (CIs) assuming a Poisson distribution of daily admission counts.

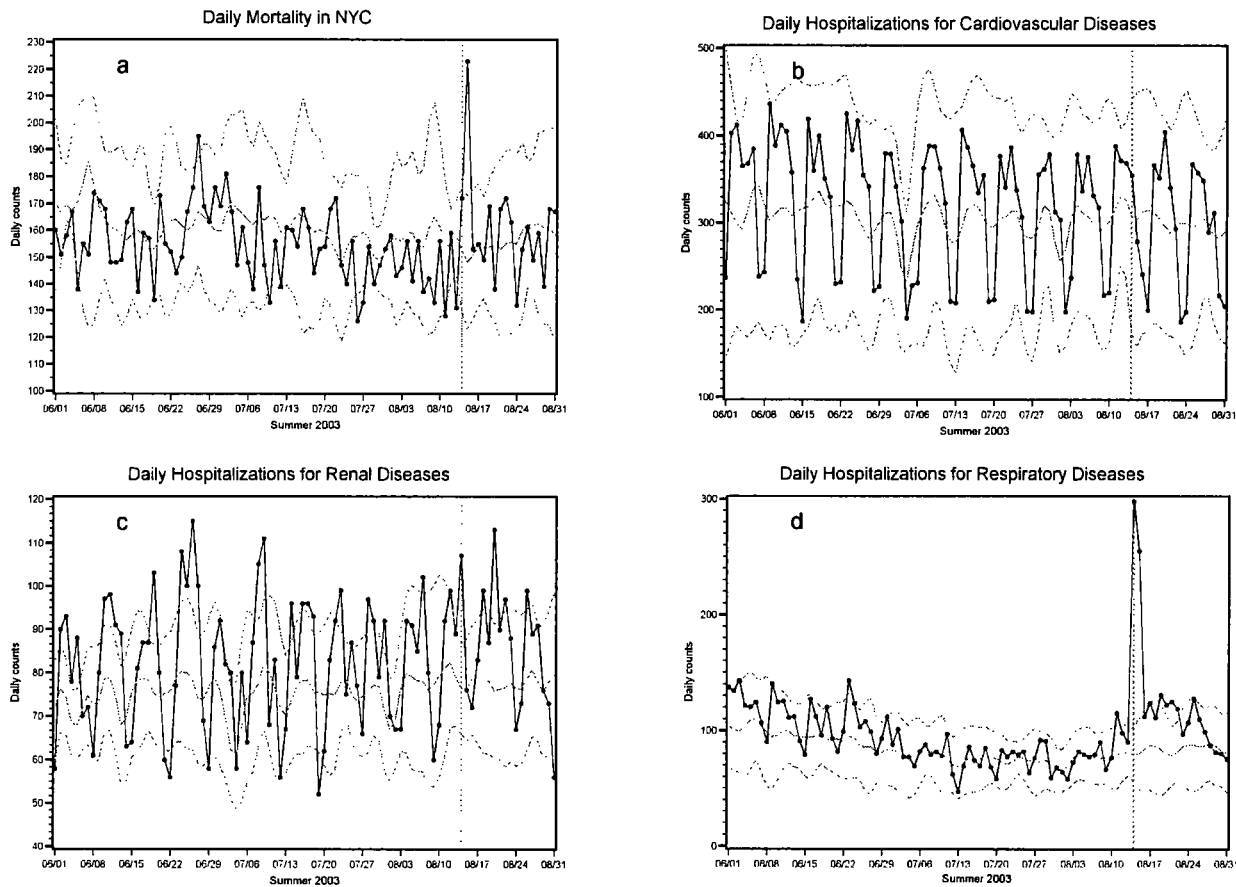
To assess whether some people were more vulnerable than others to being hospitalized during the blackout, we examined several demographic characteristics: race/ethnicity, SES, gender, and age as potential modifiers of the effect of the exposure. We used a “case only” design, which, according to Armstrong and Schwartz,^{14,15} assesses the interaction between demographic variables and the exposure. Use of this method requires independence of the modifiers and the exposure, a condition met by these data. We calculated odds ratios (ORs) for each stratum to examine whether the proportion of a given demographic subgroup that was hospitalized during the blackout differed from the proportion hospitalized during normal summer days. For comparison, we conducted the same analyses to assess demographic modification of the effect of comparably hot days.

RESULTS

The blackout lasted for two days with maximum temperatures of 91.0°F and 89.1°F. There were 110 days with maximum temperatures comparable to those of the blackout days. A total of 703 days in June through August, 1991–2004, fell between the 25th and 75th percentiles of maximum temperature and were classified as normal summer days. We excluded 289 days having a maximum temperature <25th percentile (78.1°F) and 296 days having a maximum temperature >75th percentile (87.1°F).

We conducted a preliminary examination of the effects of the blackout on hospital admissions and mortality by plotting the daily counts of these outcomes from June through August of 2003. Part “a” of the Figure shows daily mortality counts across summer 2003. A significant increase in deaths was seen on August 15, the day after the blackout. Figure part “b” shows no changes in the patterns of daily counts of cardiovascular admissions during the blackout period. For renal diseases (Figure part “c”), although the admissions count on August 14 was relatively high, it was not higher than days with very high temperatures (e.g., June 24–27, July 6, and August 20). In contrast, a large spike in hospital admissions for respiratory diseases occurred on the day

Figure. Daily mortality and morbidity counts in New York City during summer 2003



Note: The vertical reference lines point to the date of August 14, 2003; dots and black lines represent observed daily morbidity and mortality counts; gray curves are daily normals and their 95% confidence intervals. Daily normals are the mean daily mortality or morbidity counts for the same date in the years 1991–2004, with temperatures between 78.1°F and 87.1°F (the 25th and 75th percentile of the distribution of maximum temperature in New York City from June through August), excluding blackout days.

NYC = New York City

of the blackout and continued on the day after the blackout (Figure part “d”). The increase in mortality will be explored in future work. Only the results for respiratory admissions are presented in this article.

Table 1 presents data comparing the observed maximum temperatures and the observed and expected mean temperatures for the day before, the day of, and the day after the blackout, as well as the observed and expected values for humidity and respiratory admissions. Each expected value is the mean of the values on the same dates for all other years (1991–2002 and 2004). The observed mean temperatures for the three days did not differ from the expected temperatures. The relative humidity on the day before the blackout did not differ from expected, while on the day of the blackout (Day 0) and the day after the blackout

(Day 1) it was lower than expected. The maximum temperatures for the three days were 89.1°F, 91.0°F, and 89.1°F, respectively. On the day before the blackout, there were 90 respiratory admissions in NYC, which did not differ significantly from the expected value of 80. However, on Day 0 and Day 1, hospital admissions for respiratory diagnoses were 298 and 255, respectively, each of which was more than three times higher than expected (IRR=3.87, 95% CI 3.00, 5.04; and IRR=3.27, 95% CI 2.54, 4.26, respectively).

For all respiratory diagnoses combined, the rates of admissions were 276.5 per day during the blackout, 82.8 per day during comparably hot days, and 82.6 per day during normal days (data not shown). Within each diagnostic subgroup, the rates of admissions during each of the exposure types (blackout and comparably

Table 1. Temperature, humidity, and hospitalizations for respiratory diseases during the Northeastern blackout: August 13–15, 2003, New York City

Date	Temperature (°F)			Relative humidity (percent)		Hospital admissions		
	Observed maximum	Observed mean	Expected mean (95% CI) ^a	Observed mean	Expected mean (95% CI) ^a	Observed counts	Expected counts (95% CI) ^a	Cumulative incidence ratio (95% CI) ^a
8/13/03 ^b	89.1	81.5	75.9 (64.6, 87.3)	78	74 (64, 87)	90	80 (64, 96)	1.13 (0.87, 1.48)
8/14/03	91.0	83.7	76.1 (65.7, 86.5)	62 ^c	70 (66, 87)	298 ^c	77 (50, 103)	3.87 (3.00, 5.04) ^c
8/15/03	89.1	81.9	74.8 (65.7, 84.0)	57 ^c	71 (66, 84)	255 ^c	78 (43, 113)	3.27 (2.54, 4.26) ^c

^aBased on the daily admission counts, mean temperatures, and relative humidity on the same dates in 1991–2002 and 2004.

^bAugust 13, 2003, is the day prior to the blackout, which began on August 14, 2003, at 4 p.m. and continued for 31 hours.

^cSignificant at $p < 0.05$

CI = confidence interval

hot) were compared with the rates of admissions on normal days and reported as IRRs (Table 2). Of the diagnostic subgroups, chronic bronchitis admissions were most strongly affected by the blackout, showing a 717% increase compared with normal days (IRR=8.17, 95% CI 7.14, 9.36). Likewise, admissions for emphysema, chronic airway obstruction, and asthma were increased during the blackout, with IRRs of 3.87, 3.79, and 2.41, respectively. Comparably hot days did not have a similar effect on admissions; only one IRR approached statistical significance: emphysema admissions compared with normal days (IRR=1.12, 95% CI 0.99, 1.26).

During the blackout days, 52.1% of chronic bronchitis cases were ≥75 years of age compared with 39% during the comparably hot days. For chronic airway obstruction, the proportion of cases ≥75 years of age was 51% during the blackout and 40.7% during comparably hot days. Examination of the blackout effects in nearby areas of New York (e.g., Long Island, White Plains, and the Lower Hudson Valley) revealed significantly increased respiratory admissions (percentage increases of 1.61, 1.99, and 0.67, respectively) (data not shown).

To assess whether some people were more vulnerable to being hospitalized for respiratory conditions during the blackout, we examined several SES variables, including race/ethnicity, socioeconomic factors, income, gender, and age, as potential modifiers of the effect of the exposure (Table 3). We calculated ORs for each stratum as a measure of how likely a demographic subgroup was to be hospitalized during the blackout compared with others not in that subgroup. For comparison, we conducted the same analyses to assess demographic modification of the effects of normal days and comparably hot days. Excess vulnerability to the effects of the blackout was found among the elderly (OR=2.58, 95% CI 2.16, 3.09), non-Hispanic people (OR=1.55, 95% CI 1.24, 1.94), white people (OR=1.36, 95% CI 1.14, 1.62), and those residing in higher socioeconomic areas (OR=1.23, 95% CI 1.03, 1.46). People of a race other than black or white (OR=0.73), Hispanic people (OR=0.64), and those <50 years of age (OR=0.38 for those aged 20–49 years and OR=0.72 for those aged <20 years) had reduced odds of being admitted to the hospital during the two blackout days. Gender, being black, or being aged 50–74 years had no differential effect on blackout-related hospitalizations.

Table 2. Total hospitalizations and IRRs for respiratory admissions by disease subgroups during the Northeastern blackout: August 13–15, 2003, New York City

ICD-9 code: disease group	Hospital admissions			IRR (95% CI)	
	Blackout days (n=2) Total (mean daily)	Comparably ^a hot days (n=110) Total (mean daily)	Normal days ^b (n=703) Total (mean daily)	Blackout vs. normal	Comparably hot vs. normal
466: Acute bronchitis and bronchiolitis	9 (4.5)	609 (5.5)	4,155 (5.9)	0.76 (0.40, 1.46)	0.94 (0.86, 1.02)
490: Bronchitis, not specified as acute or chronic	0 (0.0)	53 (0.6)	393 (0.6)	NA	0.86 (0.65, 1.15)
491: Chronic bronchitis	215 (107.5)	1,477 (13.4)	9,247 (13.2)	8.17 (7.14, 9.36) ^c	1.02 (0.97, 1.08)
492: Emphysema	19 (9.5)	301 (2.7)	1,725 (2.5)	3.87 (2.46, 6.08) ^c	1.12 (0.99, 1.26)
493: Asthma	259 (129.5)	5,937 (54.0)	37,825 (53.8)	2.41 (2.13, 2.72) ^c	1.00 (0.98, 1.03)
496: Chronic airway obstruction, not elsewhere classified	51 (25.5)	729 (6.6)	4,736 (6.7)	3.79 (2.87, 4.99) ^c	0.98 (0.91, 1.06)

^aComparably hot days are days with maximum temperatures between 89.1°F and 91.0°F (the maximum temperatures on August 14 and 15, 2003).

^bNormal days are days with maximum temperatures between 78.1°F and 87.1°F (the 25th and 75th percentile of the distribution of maximum temperature in New York City) from June 1 through August 31, 1991–2004, excluding blackout days.

^cSignificant at p<0.05

IRR = incidence rate ratio

CI = confidence interval

ICD-9 = International Classification of Diseases, Ninth Revision

NA = not applicable

Table 3. Total hospitalizations and ORs for respiratory admissions by demographic characteristics during the Northeastern blackout: August 13–15, 2003, New York City

Demographic characteristic	Hospital admissions			OR ^a (95% CI)	
	Blackout days (n=2) N (percent)	Comparably hot ^b days (n=110) N (percent)	Normal days ^c (n=703) N (percent)	Blackout vs. normal	Comparably hot vs. normal
Race					
White	218 (42.0)	3,085 (35.3)	19,360 (34.7)	1.36 (1.14, 1.62) ^e	1.02 (0.98, 1.07)
Black	180 (34.7)	3,105 (35.5)	20,086 (36.0)	0.94 (0.79, 1.13)	0.98 (0.93, 1.03)
Other	121 (23.3)	2,555 (29.2)	16,330 (29.3)	0.73 (0.60, 0.90) ^e	1.00 (0.95, 1.05)
Ethnicity^d					
Hispanic	95 (18.8)	2,140 (27.5)	13,072 (26.4)	0.64 (0.52, 0.81) ^e	1.06 (1.00, 1.12)
Non-Hispanic	411 (81.2)	5,643 (72.5)	36,444 (73.6)	1.55 (1.24, 1.94) ^e	0.95 (0.90, 1.00)
Socioeconomic status					
High-income area	217 (39.4)	3,050 (34.2)	19,722 (34.6)	1.23 (1.03, 1.46) ^e	0.98 (0.94, 1.03)
Low-income area	334 (60.6)	5,871 (65.8)	37,243 (65.4)	0.82 (0.69, 0.97) ^e	1.02 (0.97, 1.07)
Gender					
Female	333 (60.2)	6,045 (56.3)	32,486 (55.9)	1.19 (1.01, 1.41) ^e	1.01 (0.97, 1.06)
Male	220 (39.8)	4,754 (43.7)	25,595 (44.1)	0.84 (0.71, 0.99) ^e	0.98 (0.94, 1.03)
Age (in years)					
<20	109 (19.7)	2,295 (25.2)	14,772 (25.4)	0.72 (0.58, 0.89) ^e	0.98 (0.94, 1.04)
20–49	63 (11.4)	2,275 (25.0)	14,545 (25.0)	0.38 (0.30, 0.50) ^e	1.00 (0.95, 1.05)
50–74	196 (35.4)	3,016 (33.1)	19,309 (33.2)	1.10 (0.93, 1.31)	0.99 (0.95, 1.04)
≥75	185 (33.5)	1,520 (16.7)	9,455 (16.3)	2.58 (2.16, 3.09) ^e	1.03 (0.97, 1.09)

^aORs are based on comparing the selected stratum with all other strata.

^bComparably hot days are days with maximum temperatures between 89.1°F and 91.0°F (the maximum temperatures on August 14 and 15, 2003).

^cNormal days are days with maximum temperatures between 78.1°F and 87.1°F (the 25th and 75th percentile of the distribution of maximum temperature in New York City) from June 1 through August 31, 1991–2004, excluding blackout days.

^dMissing values are approximately 8% for blackout days, 15% for comparably hot days, and 15% for normal days.

^eSignificant at $p < 0.05$

OR = odds ratio

CI = confidence interval

Table 3 shows that most of the ORs for the interactions between demographic characteristics and exposure to comparably hot days were very close to 1.0, indicating that hospitalizations on these days were unaffected by demographics.

DISCUSSION

We found that respiratory hospital admissions and total mortality in NYC increased significantly during the 2003 Northeastern blackout relative to normal summer days, while hospitalization due to cardiovascular or renal diseases did not. The only previous study assessing a health effect was a case-control study examining diarrheal illness in NYC after the 2003 blackout.⁹ In that study, there was a significant increase in diarrhea cases identified through the NYC Syndromic Surveillance System; diarrhea cases occurring after the blackout were associated with eating meat (OR=2.7, 95% CI

1.2, 6.1) and seafood (OR=4.8, 95% CI 1.6, 14) that presumably had spoiled due to the power outage. No other studies of specific health endpoints after a massive power outage were available for comparison.

A question that might be asked is, what environmental factors changed due to the blackout and potentially contributed to the health effects we found? The blackout exposed people to a number of conditions that could have contributed to the surge in respiratory admissions, including heat, poor air quality, exertion, and psychological stress.

The heat effect during the blackout may have been an important contributor to the increase in admissions we observed. The ambient maximum temperature in NYC was 91.0°F on the day of the blackout and 89.1°F on the day after the blackout. In addition to the very high outdoor temperature, the loss of air conditioning and mechanical ventilation caused indoor temperatures to rise, leaving people with no respite from the

outdoor heat. Previous studies have reported positive associations between very high temperatures and increased risk of mortality,^{16,17} respiratory diseases,^{18,19} and heat-related diseases.²⁰

Poor air quality is a well-known risk factor for respiratory diseases²¹ and mortality.²² The 2003 blackout affected air quality on both the regional and local levels. The regional effect was due to the cascading electrical grid problems that caused power generation plants to shut down across the northeastern U.S. Evidence of large reductions in sulfur dioxide (SO₂) (>90%), ozone (50%), and light scattering by particles (70%) was recorded by aircraft over central Pennsylvania on August 15, 2003, 24 hours after the blackout began. Similarly, nitrogen oxide and SO₂ emissions from upwind power plants were down to 34% and 20%, respectively, of that normally found.²³ Projections suggest that areas such as NYC may have experienced a reduction in pollution drift as a result of the power plant shutdowns.

On the local level, people's exposures to vehicular emissions were potentially higher than usual. With the loss of trains and subways, more people crowded the streets, walking or attempting to use buses or taxicabs. But vehicular traffic was snarled due to the absence of traffic signals, and it is likely that exhaust emissions were higher than usual on the streets as vehicles waited, with engines running, for the traffic jams to clear.

The increased need for physical exertion during the blackout would also be an important concern for the elderly, people with underlying diseases, and other vulnerable populations. With transit within NYC brought to a standstill, people were exerting themselves by walking longer distances under harsher conditions than they would have on a typical day. The U.S. Department of Transportation reported that 400,000 people were evacuated from stopped subway trains during the blackout.² Many of these trains were stopped far from platforms and passengers had to walk on the train tracks in the dark tunnels that were now without ventilation. Similarly, people who ordinarily rode elevators now walked stairs in buildings without air conditioning or ventilation.

The effects of these three factors—heat, poor air quality, and exertion—were likely aggravated by a fourth factor: the psychological stress of not knowing what had happened, not knowing what else might happen, not knowing how to get home, and worrying about loved ones. The terrorist attacks on the World Trade Center had occurred less than two years previously, and many people feared that the blackout they were experiencing was the result of terrorism. In addition, home health aids for people with respiratory

diseases (e.g., nebulizers and oxygen enrichers) would not be working during a blackout. Greenwald found that patients who were dependent on home electrical medical devices, mainly oxygen conservers, sought care in emergency departments and hospitals when the power failed.²⁴ Due to the power outage, major municipal water pumping stations and fuel stations failed for 24 hours in NYC. The consequences of this series of problems after the blackout caused physical and emotional stress on local residents, especially those with existing chronic diseases.

This study demonstrates much stronger effects on respiratory diseases during the blackout than during heat wave days. These stronger effects were shown in almost all respiratory disease categories except for acute bronchitis, bronchiolitis, and non-specified bronchitis. The most striking increase during the blackout was in admissions due to chronic bronchitis, which were eight times the rate on normal days. Hospitalizations for emphysema, asthma, and chronic airway obstruction increased by 1.5- to threefold compared with normal days. The very large increase in risk for chronic bronchitis admissions could be due to the fact that there was a larger proportion of the elderly with this disease who were more susceptible to heat. Although there was also a large proportion of the elderly with chronic airway obstruction, the effect of the blackout on this disease is not as strong as the effect on chronic bronchitis for unknown reasons or unstable estimate due to small sample sizes. The stronger health effect during the blackout compared with comparably hot days may be due to the combined effects from heat and the additional risk factors, such as poor air quality, high exertion, psychological stress, and loss of access to electric medical devices, as mentioned previously.

In contrast to previous studies regarding heat effects,^{15,25} our study did not find increased susceptibility among the elderly during comparably hot days compared with normal summer days, which may be due to the temperature during the blackout being lower than that of a heat wave. However, our study found increased susceptibility among the elderly (those ≥ 75 years of age) during the blackout. Older people have a reduced biological capacity to acclimate to thermal extremes because of their higher sweating threshold.²⁶ Thus, the loss of air conditioning and fans may have contributed to this increased effect. Furthermore, aging is often accompanied by chronic illness and social isolation.²⁷ Finally, impaired cognitive function in older adults may affect their decision-making and make them less likely to avoid heat exposure or seek necessary medical assistance.²⁸

Our study found that a greater proportion of women

were hospitalized during the blackout compared with normal summer days, but gender had no effect during comparably hot days, which is consistent with other research.²⁹ Because there are no other blackout studies for comparison, it is unclear why females would be more vulnerable.

One of the most interesting findings of the current study was that the demographic patterns of respiratory admissions during the 2003 blackout were quite different from those during comparably hot days. High sociodemographic (SES) groups such as white people, non-Hispanic people, and those living in higher income areas had a significantly increased risk of admission for respiratory diseases during the blackout. On the other hand, our previous studies in NYC found that lower SES populations were more susceptible to the heat's health effects during extremely hot days.¹⁸ Higher SES groups are more likely to use nebulizers or other electric home aids and air conditioners than lower SES groups in summer. Thus, they depend on electric equipment to manage disease and are adapted to living in cooler conditions, making them more susceptible to heat during a power outage.

We found that large increases in respiratory hospital admissions and mortality occurred in NYC during the 2003 blackout. This study may be the first epidemiologic study investigating the direct health effects of electrical power outages. To improve the design of an ecological study, we used individual-level demographic data and several strategies in controlling for time-varying confounders and selecting appropriate reference periods for comparison. For instance, the use of the summer days in the past 14 years and excluding the days with temperatures at the higher and lowest quartiles as the reference minimized the confounding effects of season, long-term trends, annual temperature/air pollution fluctuation, and extreme temperature outliers. Our use of population-based admission and mortality data with multiple outcomes (mortality and several morbidity diagnoses) and two reference time periods (normal summer days and comparably hot days to separate the effects of blackout from high temperature only) demonstrates the unique characteristics of this event and its potential health impact.

Limitations

Our study was limited to some extent, however, by the lack of individual-level or activity pattern information regarding the circumstances of hospitalization. For instance, we did not know where people were or what they were doing when they began having symptoms or whether they were accustomed to the use of air conditioning prior to the blackout. Such information

would have allowed us to draw conclusions about the factors related to the blackout that were most responsible for triggering hospital admissions. Similarly, while we did not have information on people's preexisting conditions, it is tempting to speculate that people with preexisting respiratory disorders would be more susceptible to exacerbations during the conditions associated with a power outage.

As the current study design is an ecological study, which cannot illustrate the antecedent consequence effect, it is possible that the increase in respiratory admissions the day following the blackout was due to simple accumulation. However, we found that hospital admissions due to respiratory diseases and mortality significantly increased on both days of the blackout (August 14 and 15, 2003). These increases were the highest peaks of the entire summer without following secondary peaks. Additionally, unlike clinic visits, hospital admissions are very severe, and those cases may not be able to wait another one or two days. Therefore, it is less likely that the increased admissions we observed in this study were due to accumulation.

CONCLUSIONS

The results of this study suggest that power outages can pose a public health threat requiring preparedness planning. While an individual blackout cannot be anticipated, it is thought by experts in the power generation field that blackouts are an ever-present risk given that much of the nation's transmission grid is quite aged and there have been multiple smaller blackouts in summer and in winter snowstorms.¹ Traffic authorities and public health officials need to be aware of the increased risk of respiratory disease and mortality, as well as the unique demographic composition of the potential cases. Hospitals need to anticipate surges in admissions. Future studies should focus on identifying the individual characteristics and circumstances linked to the increased risk of hospital admissions to plan emergency responses to a blackout.

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Blackout of 2003: Public Health Effects and Emergency Response

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SYNOPSIS

We examined the public health effects of the Northeast blackout of August 2003 and the emergency response to the blackout by the New York City Department of Health and Mental Hygiene (DOHMH). We reviewed departmental documents from the DOHMH Emergency Operations Center and surveyed DOHMH employees to identify deficiencies in the response and elicit suggestions for improvement.

DOHMH deployed its all-hazards, scalable public health Incident Management System to respond to several impacts: (1) failure of multiple hospital emergency generators; (2) patients dependent on electrically powered equipment; (3) loss of electronic data input to the DOHMH syndromic surveillance system from hospital emergency departments; (4) potential for vaccine spoilage due to loss of refrigeration; (5) beach contamination with untreated sewage; (6) heat-related health effects and increase of foodborne disease; and (7) potential for an increased rodent population as a result of increased amounts of discarded perishables. Areas identified for improvement included communications during the event, DOHMH dependence on an external source of electricity, facility management during the response, and lack of readily available and appropriate emergency supplies.

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Electrical power failure is not a new phenomenon. Massive power failures have occurred throughout the United States and the world.¹⁻⁶ The heavy dependence of modern infrastructure on electricity can lead to public health effects when power is lost. Assessment of the public health effects of power failures has been limited to events occurring at hospitals and related emergency medical services. O'Hara and Higgins described events occurring in a cardiothoracic intensive care unit during a blackout in Ireland.³ Hargrove et al. reviewed the health outcomes for patients on cardiopulmonary bypass during three blackouts in Cleveland, Ohio.⁴ Spivak described the experience of emergency medical services during a citywide blackout in San Francisco.⁵ Schaffer reported medical staff activities during a blackout that affected a New York City neonatal intensive care unit.⁶ In this article, we describe the responses of the New York City Department of Health and Mental Hygiene (DOHMH) during the blackout of August 14-17, 2003, to increase awareness of the important public health issues that might arise during a blackout and to share our experiences during the response.

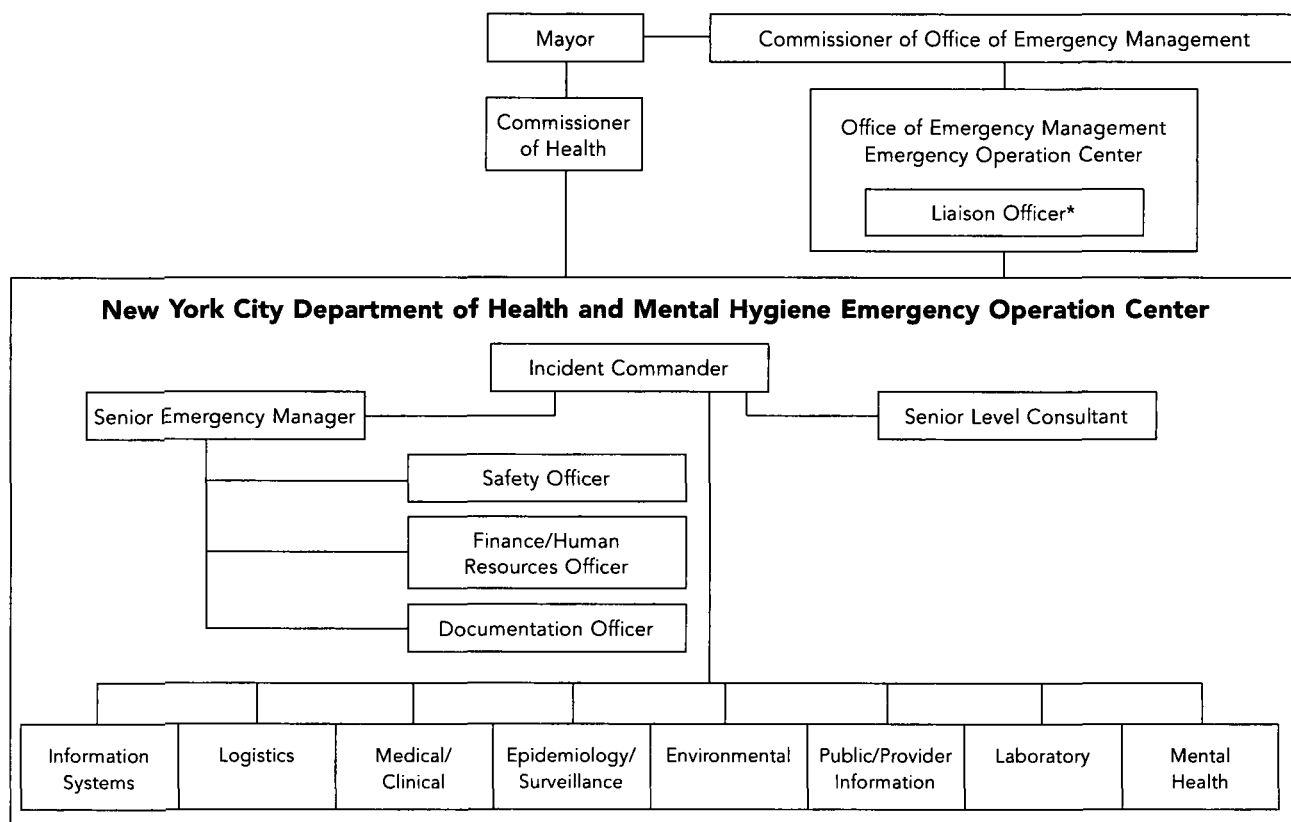
DOHMH EMERGENCY RESPONSE STRUCTURE

During an emergency, individual agencies operate under their own command structure responding to aspects of the emergency that fall under the range of that agency's mandate. However, since multiple agencies are involved, the overall response must be coordinated. This improves communication, allows for pooling of resources, enhances the collaboration between agencies, and improves the efficiency of the response.

The New York City (NYC) Office of Emergency Management coordinates the citywide response to emergencies (Figure 1). Liaisons for all agencies and organizations involved in the city's response activities are based in the Office of Emergency Management's Emergency Operations Center (EOC) in Brooklyn. In addition, agencies involved in emergency response have their own EOCs.

The DOHMH's EOC is located at DOHMH headquarters in lower Manhattan and employs the Incident Management System, the same predefined chain-of-command system that other emergency response agencies use. The Commissioner of Health, the lead

Figure 1. New York City Department of Health and Mental Hygiene's public health incident management system



*Department of Health and Mental Hygiene Employee located at the Office of Emergency Management Emergency Operation Center

official at DOHMH, determines the need to activate the Incident Management System and to establish an EOC. He appoints the initial incident commander, prioritizes issues, and acts as the public spokesperson for the agency. The incident commander is the operational decision maker for DOHMH during the event. The incident commander's duties also include evaluating the need for outside assistance, responding to interagency requests, and presenting major policy issues to the Commissioner of Health for resolution.

A senior emergency manager from the DOHMH's Bureau of Emergency Management assists the incident commander in coordinating the administrative and logistical operations of the EOC. The senior emergency manager directs the activities of Bureau of Emergency Management staff members, who include a DOHMH liaison officer assigned to the Office of Emergency Management's EOC, a safety officer, a finance/human resources officer, and a documentation officer. The DOHMH liaison updates the DOHMH incident commander on the activities of other agencies involved in the emergency and transmits information and requests between DOHMH and these agencies. The safety officer monitors the working conditions in the EOC and in the field. The finance officer tracks expenditures during the response. If state or federal agencies can provide the city reimbursement for a response, the finance officer prepares the appropriate documentation regarding the response cost. The documentation officer chronologically records events, responses, and other activities occurring in the EOC and prepares a shift report summarizing the activities of field staff to maintain an adequate flow of information between shifts. Not all of these roles are necessary in every response. During the blackout, only a documentation officer and a liaison to the citywide EOC were needed.

In addition to Bureau of Emergency Management staffing, the expertise of additional consultants may be needed to assist the incident commander. During the blackout, legal counsel was consulted on the health code and assisted the incident commander in its application during the emergency.

Rather than develop individual plans with detailed instructions specific to each type of incident, DOHMH recognizes that certain public health issues are common to most incidents and has adopted an "all-hazards" approach to incident management. Because DOHMH activities during emergencies do not necessarily correspond to its routine operating divisions, eight emergency response sections were created to respond to emergency events: information systems, logistics, medical/clinical, epidemiology/surveillance, environmen-

tal, public/provider information, laboratory, and mental health (Figure 1).

Each section has an appointed chief and pre-assigned staff members. Due to DOHMH initiatives to improve preparedness (implemented prior to the blackout), all employees were informed of their section designation in the event of emergency during agency-wide training and orientation on the Incident Management System. During this training, employees were also provided a wallet card with 24-hour contact information and other key Incident Management System information including location and directions to the primary and alternate EOCs. After reporting to their response sections, employees are provided a brief description of their primary role and the duties they are expected to complete (e.g., job action sheet). These duties are prioritized by urgency. In an emergency, employees might not have the same duties they perform routinely; the job action sheets provide direction and clarity by predetermining these duties.

After notification of an incident, the incident commander meets with the section chiefs in the EOC to conduct an initial assessment and determine the response. Actions are identified and then assigned to the appropriate sections. Shifts are established and staff members are assigned, including incident commanders for subsequent shifts. Regular meetings of the incident commander and section chiefs are scheduled for development and prioritization of response activities, updates on pending activities, problem-solving barriers to completion of activities, and identification of prevention activities in anticipation of future public health issues. At the end of each shift, an EOC staff meeting is held to brief incoming staff members on recent events and to identify pending actions. Each employee meets with his or her replacement for the next shift and provides them with specific details regarding duties.

THE BLACKOUT

At 4:15 p.m. on Thursday, August 14, 2003, a cascading electrical power failure across the northeastern United States resulted in power failure in all five New York City boroughs. The Commissioner of Health immediately called for the establishment of an EOC and deployment of the Incident Management System. The DOHMH EOC was located at the central office in Manhattan and a DOHMH liaison was dispatched to the Office of Emergency Management EOC, where the citywide response was coordinated. Twelve-hour shifts were established, and the DOHMH EOC operated with continuous coverage throughout the black-

out and for an additional 24 hours after citywide resumption of power. EOC coverage ended at 8:00 a.m. Monday, August 18.

DOHMH RESPONSE

Immediately following the blackout, Bureau of Emergency Management staff distributed flashlights, provided 800-megahertz radios, and assessed the status of the telephone system at DOHMH. Because the blackout occurred in the afternoon, there was sufficient daylight to work at the EOC without the need for electrical lighting. However, the battery-powered emergency lamps, which were the only source of lighting in hallways and stairwells, ran out within 2 to 3 hours, making traveling between floors hazardous without a flashlight. During the ensuing 90 hours, the DOHMH provided continuous coverage, including critical emergency response functions as well as routine DOHMH operations.

Logistics and information systems

The logistics section provided physical security for the building and ensured that the emergency generators at the Public Health Laboratory were operating and had adequate fuel. This section then secured perishable vaccines from DOHMH clinics where refrigeration units had lost power and transferred them to storage at the Public Health Laboratory. Because EOC did not have emergency generators on site, flashlights were the only source of lighting during the evening of August 14. By 2:00 a.m., the logistics section had secured two generators to supply limited power. Floor lamps were moved into the EOC to supply lighting. When the generators arrived, the information systems section equipped EOC with laptop computers, a printer, and wireless Internet connections. The information systems section also played a key role following the return of external power when several network routers failed to reset. This prevented full restoration of the agency's computer network.

Medical/clinical

The medical/clinical section monitored the delivery of health care during the emergency. Despite having emergency generators, four of 75 hospitals in the city were temporarily without electricity when the blackout occurred. The longest interruption was 2 hours and 45 minutes. The medical/clinical section interviewed hospital administrators to determine the extent of the loss and its impact on services. Several hospitals also depend on steam produced by electrically powered systems to sterilize hospital equipment.

When the blackout occurred, these systems failed and alternative facilities for sterilizing equipment were needed. The medical/clinical section advised medical providers about the risk of vaccine spoilage that could result from a loss of refrigeration. The Office of Emergency Management opened cooling centers and the medical/clinical section was ready to supply staff members if needed. The medical/clinical section coordinated with the New York City Housing Authority to contact housing facilities for vulnerable populations (e.g., elderly and mentally impaired) and conducted a needs assessment. The Office of Emergency Management coordinated with the New York City Housing Authority to ensure that these facilities had functioning emergency generators to provide adequate cooling for these facilities. Facilities with a history of repeated housing violations were targeted for site visits during the blackout; the remaining facilities were contacted by telephone. The Office of Emergency Management provided several facilities with additional fuel for their emergency generators during the blackout.

Persons dependent on medical devices (e.g., home ventilators and medication nebulizers) encountered problems.¹⁰ Patients presented to hospital emergency departments to access electricity to power their devices. Emergency medical services and other ambulance services transported patients dependent on electrically powered medical devices, but the large number of patients requiring assistance due to the blackout caused a strain on both emergency medical services and hospitals where these patients were delivered.¹¹ This increased demand was in addition to injuries and deaths attributable to the blackout.^{12,13} Radio and newspaper announcements were released by the Mayor's Office suggesting that in addition to hospital emergency departments, cooling centers, fire stations, and other facilities were available for this purpose. If they resided on the upper floors of high-rise apartments, homebound persons might not have been able to leave their floors, but there was no way for DOHMH to identify who, where, and what the needs of this group were. Instead, in a press conference, the mayor encouraged New Yorkers to visit older or otherwise vulnerable neighbors and assist them as needed.

Epidemiology/surveillance

The DOHMH's epidemiology/surveillance section maintained syndromic surveillance activities¹⁴ to ensure the blackout was not part of a bioterrorist or other attack. This section also monitored potential health-related effects of the blackout (e.g., heat stroke and carbon monoxide poisoning). Typically, hospitals gather these data electronically; however, during the

blackout, the same computers that accessed and transmitted the data to DOHMH were not part of the electrical systems supplied by the emergency generators. In response, the epidemiology/surveillance section dispatched staff members to participating hospitals to manually gather the data for an interim emergency department syndromic surveillance system until the restoration of power allowed resumption of the daily transmission of emergency department data. Issues of possible public health concern arising from the tallies were investigated immediately. Of note, three days after the blackout, a robust increase in diarrheal illness was detected. In response, a case-control investigation was conducted to determine risk factors for diarrheal illness after the blackout. The results of this investigation are described by Marx et al.⁸

Environmental

The DOHMH environmental section contacted the New York City Department of Environmental Protection to determine if the city's drinking water supply was safe for drinking. Because the city's potable water system was constructed such that gravity alone can maintain water pressure, there was no loss of pressure during the blackout, and therefore no additional risk of contamination. DOHMH maintained routine microbial monitoring of potable water during the blackout. Residents of high-rise apartment buildings depend on electrical pumps to raise potable water from street level to their homes. With the loss of power, these residents were left without ready access to potable water for several days. The DOHMH EOC considered plans to determine how to provide potable water to these residents if the blackout continued.

Perishables were subject to rapid spoilage with the loss of refrigeration. To ensure that restaurants appropriately discarded these items, DOHMH continued restaurant inspections throughout the city during the daylight hours of the blackout. With the assistance of inspectors from Dutchess and Nassau counties and the New York City Department of Agriculture and Markets, approximately 500 inspections were completed. If the increased amount of discarded perishables was not disposed of in a timely manner, the city's rodent population could grow as a result of the increased food supply. Typically, private contractors haul away the waste from retail food service businesses. During the blackout, the contractors had difficulty hauling away the increased volume of refuse at the regularly scheduled intervals. Therefore, DOHMH issued emergency public health orders allowing the Department of Sanitation to cart this waste. As an added measure, routine pest-control services were continued during

the blackout; approximately 400 rodent extermination sites were baited during the blackout.

The blackout resulted in the accidental release of 500 million gallons of untreated sewage into the recreational waterways surrounding the city when backup generators powering several treatment facilities failed. This accidental release resulted in an overflow past treatment facilities. Beaches were immediately closed. Because the ambient temperatures during the day were an average of 95° F, reopening the beaches at the earliest possible time when safe was a priority. In coordination with the New York City Department of Environmental Protection, 50 sets of samples from affected New York City beaches were collected for testing, allowing the reopening of beaches at the earliest safe time, three days after the blackout began.

Public/provider information

DOHMH's public/provider information section developed and issued public health alerts for radio or newspaper dissemination regarding the contamination of the recreational waterways and subsequent beach closures. This section addressed the potential threat of heat-related health effects by issuing press releases to educate the public. The public/provider information section also alerted the public of food safety issues during the blackout and encouraged New Yorkers to discard spoiled food.

Laboratory

The Public Health Laboratory, which functions as the laboratory section during emergencies, maintained services despite the blackout, including maintaining refrigeration of the clinical specimens received for immediate testing and millions of specimens archived for investigations and research studies. Ensuring the laboratory refrigeration units continued to function required close monitoring of the laboratory generators' diesel fuel supply. A possible rabies exposure occurred during the blackout. Animal testing was successfully completed at the Public Health Laboratory despite the blackout. The laboratory section conducted fecal coliform testing on 200 beach water specimens collected during 50 sets of sampling by the Department of Environmental Protection. The Public Health Laboratory is also responsible for testing air filters used for environmental surveillance. These units are an early warning system against aerosol releases of hazardous agents by terrorists. Although the laboratory had functioning emergency generators, the protective hoods where the filters could be safely processed were not functioning. As part of the Public Health Laboratory's emergency response plan, agree-

ments to provide backup assistance with predetermined laboratories throughout New York City, the tri-state area, and the country were in place. One of the alternative laboratories in the city was used for processing the filters and results were available on time.

Mental health

The mental health section ensured that LifeNet, the city's 24-hour emergency mental health referral service, continued to function during the blackout. However, contact with the service was reduced to calling the telephone number that was usually devoted to faxing because the digital phone system required supplemental power to function.

Routine DOHMH activities

In addition to blackout-related activities, maintaining routine DOHMH activities was important. The Poison Control Center answered more than 1,000 calls during the blackout. The burial desk issued 400 death certificates. The West Nile Control Program applied larvicide to 16 acres. The Office of the Chief Medical Examiner continued operations despite the blackout, and DOHMH clinics were open Friday, August 15, and offered limited services, although few patients kept appointments that day.

EVALUATION/LESSONS LEARNED

To determine the quality of our response to the blackout event, we conducted a retrospective program evaluation using methods adapted from the Centers for Disease Control and Prevention's *Framework for Program Evaluation in Public Health*.⁷ To recount the DOHMH response, we relied on personal experience, the notes of documentation officers, and shift reports prepared during EOC coverage. Notes created by the documentation officers provided a chronological description of events, activities, and responses occurring at the EOC. Shift reports provided a summary of field activities performed by each section. In addition, we reviewed all available reports prepared on specific aspects of the DOHMH response.^{8,9}

To evaluate the DOHMH response, the senior emergency manager asked personnel working in the DOHMH EOC to complete a quality-assessment form. The forms requested a simple listing of activities that achieved their intended goal efficiently and a list of barriers encountered during the response. Respondents were also asked to suggest ways to improve the response. The quality-assessment forms were made available in EOC. Responses were solicited during the blackout to ensure timely and accurate reporting of

issues. Responses to the open-ended questions were entered into a spreadsheet and categorized by topic.

Forty-nine (35%) of the approximately 140 staff members working in the DOHMH EOC during the blackout completed quality-assurance forms. All responses were reviewed by Bureau of Emergency Management staff and subjectively evaluated for practicality, impact, and cost. The responses were then prioritized, assigned to the operating division or section where the change needed to occur, and tracked through regular meetings with the assignee to ensure attainment of the goal. Figure 2 lists the 25 recommendations developed based on the 49 returned quality assurance forms. The recommendations can be summarized in four major categories: (1) communication, (2) EOC dependence on an external source of electricity, (3) facility management during the response, and (4) adequacy of emergency supplies.

Communication

All respondents listed at least one item related to problems with communication during the response. During emergencies, employees contact the DOHMH employee call center to obtain information regarding if, when, and where to report for work. However, like other telephones at DOHMH, call center telephones require supplemental electricity to operate. The call center did have a universal power pack, a back-up battery that allowed continued call center operations after the blackout began, but the charge was insufficient to maintain continuous service for the duration of the blackout. In addition, the call center had inadequate telephone lines to respond to the volume of employee calls. Increasing the capabilities of the call center was suggested, but further improvement of protocols could also improve the public health response. The recommended protocols include (1) which, when, and where employees should report during future emergencies; (2) establishing a directory of employees' skills and emergency contact information that would be readily accessible during an emergency; and (3) conducting drills and other training sessions to ensure that employees are aware of these details.

To communicate with key staff members and the citywide EOC, 800-megahertz radios were critical, but their limited battery life eventually resulted in communication difficulties. Extra batteries or emergency power to recharge the radios would improve communications. Although the city's telephone system was on a separate and unaffected power grid, the majority of DOHMH telephones required additional electrical power to function, and therefore did not operate during the blackout. EOC needs telephones that do not

Figure 2. DOHMH employee recommendations for improvement of the blackout response

<i>Number</i>	<i>Recommendation</i>
1	Develop a definition and method of emergency notification for core and essential emergency staff.
2	Strengthen self-activating emergency plans for essential staff.
3	Develop a hardened citywide communications infrastructure with the capacity to survive public infrastructure failures.
4	Develop an improved identification system recognized by other emergency response agencies.
5	Develop a database of employees with essential skills.
6	Develop an emergency resources database.
7	Conduct a backup power survey and develop a backup power installation plan.
8	Enhance the agency's emergency fuel management plan.
9	Strengthen communications with businesses whose assistance may be needed during an emergency.
10	Ensure building management where agency offices are located have evacuation plans and drill regularly on plans.
11	Develop guidance for emergency kits for the workplace.
12	Explore revisions to the building code to ensure evacuation safety and mitigation of emergency-related hazards.
13	Review backup power systems at telecommunications facilities.
14	Integrate agency vehicle location and routing capability into city's emergency dispatch operations.
15	Provide additional training in use of emergency radio equipment.
16	Consider public-private initiatives to create redundant wireless telecommunications systems to ensure communication in an emergency.
17	Formalize communications and response protocols between the agency and telecommunications carriers.
18	Review emergency communications systems.
19	Upgrade generator testing standards and emergency preparedness for State Department of Health-regulated health care facilities.
20	Require emergency preparedness plans for city human service vendors and programs.
21	Expand the use of the 311 Citizen Service Center or dedicate a phone line to respond to the needs of vulnerable populations during a crisis.
22	Develop cooperative arrangements with private-sector entities to expand the inventory of comfort stations.
23	Enhance plan for the availability of potable water.
24	Encourage vulnerable populations, caregivers, and community groups to develop individual preparedness plans for those with special needs and consider expanding the city's Ready New York campaign to specifically address the preparedness needs of these individuals.
25	Assess the comprehensiveness of existing school safety plans and continue to provide a resource to independent and other nonpublic schools for emergency preparedness.

DOHMH = Department of Health and Mental Hygiene

require additional power to maintain open lines of communication. Finally, preparing press releases and public health advisories on generic health issues expected during an emergency prior to an event was also suggested because preparing these documents during the emergency without computers caused delays.

EOC dependence on electricity

Fourteen respondents (30%) identified issues related to the EOC's critical dependence on electricity to power lights, computers, printers, and other essential equipment. Although emergency generators were eventually obtained, a lack of power for 10 hours caused delays in completing action plans. Storing battery-

operated equipment and emergency generators at DOHMH would improve the efficiency of response in the critical first hours after an event. Key operation plans, contact information, and other documents stored on specific desktop computers were not accessible. Because emergency generators can supply power only to select computers during an emergency, creating a backup, paper library of important documents needed during an emergency would also improve response time.

Facilities management

Eight respondents (17%) commented on problems relating to facilities management during the blackout

response. Items mentioned included problems with access to locked offices and buildings and the absence of housekeeping services during the event.

Lack of emergency supplies

Six respondents (13%) listed issues relating to a lack of key emergency items not readily available during the response (e.g., flashlights, food, batteries for laptops, and battery-operated printers). Supplies for EOC should be stored on-site or at a nearby location rather than at a distant agency warehouse. DOHMH plans to stock adequate supplies on-site to provide 48 hours of self-sufficiency for EOC. Additionally, it was suggested that petty cash be made available for emergency purchases.

DISCUSSION

The blackout that occurred on August 14, 2003, affected a substantial area of the Northeast United States, including all five boroughs of New York City. Although power was returned to the majority of the city by the evening of Saturday, August 16, DOHMH encountered several issues during its response to the emergency: failure of hospital emergency generators, large numbers of patients dependent on electrically powered medical equipment, and contamination of recreational waterways. DOHMH anticipated other potential problems, including spoilage of perishable foods, which could potentially result in foodborne disease and pest-control issues and vaccine spoilage. Indeed, syndromic surveillance did detect an increased incidence of gastrointestinal disease in New York City following the blackout.⁸ While responding to the blackout and resulting public health impacts, DOHMH was also able to maintain important routine functions, such as its burial desk, poison control call center, West Nile pesticide spraying activities, and 24-hour mental health referral hotline.

The events that occurred on September 11, 2001, provided New York City's public agencies with considerable experience in emergency response. For example, following 9/11, the DOHMH adopted the Incident Management System, a scalable, all-hazards approach to incident management used by many emergency response agencies. Our review of DOHMH's response to the blackout revealed that this unified command structure was an efficient means of managing the response. The system allows for easier communication among emergency response agencies during an event due to adoption of a common command structure and familiarity with response-specific language and procedures.

New York City was also affected by citywide blackouts in 1965 and 1977. DOHMH activities during the 1965 blackout were similar to the recent blackout.^{15,16} DOHMH monitored food wholesalers and retail stores for spoilage of food and monitored hospitals' admissions to detect increases in disease caused by spoiled food and or contaminated water.¹⁶ In addition, DOHMH monitored blood banks for the potential spoilage of banked blood because approximately one-third of the blood banks did not have emergency generators.¹⁶ In addition, 37% of New York City hospitals did not have emergency generators.¹⁶ Among the measures implemented in response to the 1965 blackout was a plan to have standby crews with 55 kW mobile generators to reduce the time required to provide auxiliary power to police and other agencies as needed.¹⁶

Communications were also an issue during the 1965 blackout. The DOHMH telephone system was without power, and because of a failure of several networks, citywide radio communications were also interrupted.¹⁶ Initial mobilization of personnel was successful during the 1965 blackout because it occurred during the shift change for civil employees. However, subsequent difficulties were encountered in attempts to locate specific personnel and to locate the post from which emergency operations of their respective departments were being directed. As a result of this blackout, a city EOC was established.¹⁶

The blackout of July 13–14, 1977, was dominated by criminal activities.^{17,18} During the 26.5 hours of the blackout, 3,418 persons were arrested, primarily for looting.¹⁷ No archived information was available on the activities of DOHMH during this incident.

Because of the events and evaluation of response to the previous blackouts in New York City, the DOHMH was better prepared for the blackout of 2003. However, our employee survey identified areas for further improvement (Figure 2). DOHMH is actively pursuing plans to address these identified needs.

Although blackouts affecting large parts of the United States are uncommon, blackouts can occur in association with natural disasters. Improvements in technology and other safeguards might reduce the incidence of future blackouts, but the possibility of blackouts associated with natural disasters will remain. Preparedness for blackouts is therefore of prime importance. DOHMH is improving its preparedness through a review of performance during the blackout. Because the events and responses are specific to New York City, other municipalities should consider the particulars of their own resources and requirements when enhancing their preparedness for blackouts. In

an effort to develop more general guidance for blackout preparedness, DOHMH shared its experiences with the Centers for Disease Control and Prevention in the development of a guide to blackout preparedness: *Power Outages: Public Health Issues and Recommendations*.¹⁹

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Subject: Riverkeeper BTA Withdrawal

Your Honors and Counsel:

Riverkeeper writes to provide notice of its withdrawal of its proposed BTA configurations, as set forth in the Powers Engineering Report dated October 24, 2012 and in Riverkeeper's November 22, 2013 BTA Selection. Riverkeeper will apprise the Tribunal and the parties by close of business Monday as to which of its disclosed witnesses will be presenting direct testimony and reserves its rights to offer rebuttal witnesses with respect to the direct testimony of any party, including without limitation such witnesses as Riverkeeper has previously disclosed pursuant to the Tribunal's directives and Riverkeeper's discovery obligations. Thank you.

Respectfully,

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