

INDIAN POINT UNIT 2 AND UNIT 3



Coastal Zone Management Act Consistency Certification

In support of
Renewal of Indian Point Unit 2 and Unit 3 USNRC Operating Licenses

Submitted by:

Entergy Nuclear Indian Point 2, LLC
Entergy Nuclear Indian Point 3, LLC
Entergy Nuclear Operations, Inc.



**SUPPLEMENTAL INFORMATION
REGARDING NYSDEC RECORD**

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**Evidence Presented to the New York Department of Environmental Conservation
Regarding Possible Future Implementation of Technological Improvements at Indian Point**

I. The Need for Supplemental Information.

On December 3, 2013, Entergy Nuclear Indian Point 2, LLC, Entergy Nuclear Indian Point 3, LLC and Entergy Nuclear Operations, Inc. (collectively, “Entergy”) and the New York State Department of State (the “Department”) engaged in a consultation session at which the Department requested supplemental information regarding several topics of interest to the Department in connection with the Department’s consistency review of license renewal (“License Renewal”) by the Nuclear Regulatory Commission (“NRC”) of operating licenses for Indian Point Unit 2 and Unit 3 (“Indian Point”). At that consultation session, the Department explained that the potential for impacts of Indian Point operations on fisheries resources was a core issue bearing upon several policies of the New York Coastal Management Program (“CMP”).¹ Entergy asserted that its State Pollutant Discharge Elimination System (“SPDES”) permits for Indian Point have and will assure compliance with the water quality and fisheries aspects of the CMP, including any aspects related to protection of aquatic organisms. The Department, however, appears to have taken the position that it can and should independently review any aquatic impacts caused by Indian Point’s operation during the License Renewal Period. Entergy does not concede that the Department has any authority independently to review

¹ See Letter of Martin R. Healy to Linda M. Baldwin dated December 20, 2013, in connection with the Department’s File # F-2012-1028.

aquatic impacts (including the use of new technologies to reduce aquatic impacts) at Indian Point. Such issues have been delegated to NYSDEC, not the Department, under the federal Clean Water Act and New York law.

Nonetheless, to the extent the Department intends to consider these issues, then Entergy is providing to the Department evidence presented at an ongoing New York Department of Environmental Conservation (“NYSDEC”) adjudicatory hearing that is relevant to such issues. This same proceeding also has generated a substantial body of evidence concerning the significantly adverse impacts to New York that would arise from Indian Point’s closure or an extended outage. In particular, this evidence, gathered over a decade of proceedings and comprising expert testimony and scientific consensus, concerns such important issues as:

- (1) the detrimental impact that Indian Point’s closure (or any lengthy outage) would have on New York’s electric system reliability (*i.e.*, the risk of blackouts), electricity pricing, and pollutant emissions from fossil fuel burning units in New York;
- (2) the question whether Indian Point’s operations are having a detrimental impact on fish populations and fish catch in the Hudson River;
- (3) the extent to which various proposed mitigating technologies would change any such aquatic impacts (and at what cost);
- (4) the question whether alternative mitigating technologies (*e.g.*, cooling towers) proposed by NYSDEC Staff for Indian Point are feasible and can be permitted on a site-specific basis; and
- (5) assuming such technologies are actually available, then the issue of these technologies’ own adverse impacts to air quality, aesthetics, noise levels, environmental justice areas, and so forth.

This evidence points to the critical importance of Indian Point’s continued operation for New York’s citizens and environment, and the infeasibility and detrimental impacts of permit modifications that have been proposed by NYSDEC Staff.

II. The Purpose of the NYSDEC Hearing

Under the federal Clean Water Act, Entergy is required to operate Indian Point consistent with the terms of a SPDES permit, the terms of which must ensure compliance with state water quality standards. SPDES permits expire in five years unless administratively continued during renewal proceedings, and Indian Point’s prior owner long ago timely applied for renewal of the facility’s current permit. In response to that application, and now for well over a decade, NYSDEC has been conducting hearings on a proposal by NYSDEC Staff to modify the terms of Entergy’s SPDES permit upon permit renewal. NYSDEC has consolidated that SPDES modification proceeding with a proceeding to consider Entergy’s application for a water quality certification under Section 401 of the federal Clean Water Act.

The proposed SPDES permit modification of most significance for present purposes concerns Indian Point's withdrawals of water from the Hudson River in order to cool the steam generated by the plants' turbines. Indian Point presently operates with a "once-through" cooling system, in which water withdrawn from the River is used to cool the steam and then returned to the River. In this process, smaller aquatic organisms (almost entirely eggs and larvae) can be drawn through the cooling system (entrained) or pinned against screens at the end of the cooling water intakes (impinged), with some mortality of such organisms. Acting pursuant to 6 NYCRR § 704.5, which governs technologies used to minimize the environmental impacts of cooling water intake structures, NYSDEC Staff proposed (in 2003) that Entergy replace Indian Point's once-through cooling system with cooling towers. Cooling towers require less water than a once-through cooling system and hence use of towers is a potential means to reduce impingement and entrainment mortality. More recently (2013), NYSDEC Staff proposed that, in lieu of cooling towers, Indian Point might be required to cease operations for up to 92 days each summer; it is presently unclear whether that proposal, which was the subject of a public hearing and issues conference in July 2014, will continue to be advanced. Entergy, for its part, has proposed cylindrical wedge-wire screens at its cooling water intakes as a potential means to minimize entrainment and effectively eliminate impingement.

The adjudicatory hearing to decide what permit modification (if any) to require under Section 704.5 has been proceeding for many years and is likely to continue for several more. Both the closed-cycle cooling and cylindrical wedge-wire screen proposals have been the subject of numerous expert reports that would fill book shelves, thousands of pages of pre-filed expert testimony, and months' worth of live cross-examination of witnesses. The volume of evidence collected to date dwarfs what is presently before the Department and much more is expected, particularly if the new outages proposal moves forward to adjudication. At the conclusion of the administrative hearing and any administrative appeals, NYSDEC will decide whether to issue a permit containing any of the proposed permit modifications.² Predicting what permit modification NYSDEC may select (if any) in advance of completion of the adjudicatory process would be speculation. When NYSDEC makes its final decision, NYSDEC—not the Department—is vested under New York law with authority to decide whether any such technology is consistent with the CMP.³

As part of this adjudicatory hearing process, NYSDEC will be preparing a Supplemental Environmental Impact Statement ("SEIS") under the State Environmental Quality Review Act ("SEQRA"). SEQRA and NYSDEC's implementing regulations require New York agencies to "weigh and balance" the environmental benefits and impacts of proposed projects—such as the installation of cooling towers or an outages mandate—against their "social, economic, and other impacts," and requires the minimization of adverse impacts including by substitution of

² NYSDEC has already concluded that ongoing operation of Indian Point, with new SPDES permits, is consistent with the CMP. See NYSDEC, *Final Environmental Impact Statement, New York State Pollutant Discharge Elimination Systems Permits for the Roseton 1 & 2, Bowline 1 & 2, and Indian Point 2 & 3 Steam Electric Generating Stations* (Jun. 25, 2003), at 24 ("The SPDES permit renewals [for these electric generating facilities] . . . will not result in any new effects on coastal zone policies.")

³ See 6 NYCRR § 617.9(a)(1) & (b)(5)(vi) (mandating that draft environmental impact statement, which NYSDEC as lead agency is responsible for preparing or ordering, must contain statement of "action's consistency with the applicable coastal policies contained in 19 NYCRR 600.5").

alternatives where reasonable. Thus, NYSDEC already has stated that proposed intake structure technologies, such as cooling towers, can be rejected under SEQRA if their adverse environmental impacts are too great.⁴ This SEIS, based on evidence submitted during the hearing process, will document any adverse environmental and socio-economic impacts associated with the technologies under consideration (in comparison to each other and to the “no action” alternative of continued operation using once-through cooling).⁵ Once again, the volume of expert testimony and evidence collected on SEQRA impacts in the SPDES proceeding is massive, filling a wall in the NYSDEC hearing room.

Notably, NYSDEC has proceeded at a deliberate pace and relied upon extensive amounts of outside assistance in considering the proposed permit modifications. In particular, NYSDEC has relied upon numerous outside experts to assist it in consideration of the issues. It initially required Entergy to commission expert engineers (at Enercon) to address the engineering feasibility of cooling towers, then itself hired more engineers and project managers from Tetra Tech and Hatch to address the feasibility of another conceptual design for towers. NYSDEC relied on Tetra Tech and several other vendors to address adverse environmental impacts of cooling towers such as aesthetics and noise for SEQRA purposes. Perhaps most notably, it relied on three experts from the New York State Department of Public Service (“DPS”) to address electric system and air emissions impacts from an extended outage at Indian Point. All of these outside experts were joined by experts retained by other parties—Entergy, as well as the City of New York and the African American Environmentalist Association (both opposing cooling towers and outages), and Riverkeeper, Inc., (supporting the NYSDEC proposal)—in creating an extensive analysis of the issues at stake in the proceeding.

In summary, and as will be discussed in greater detail below and can be seen in the documents accompanying this memorandum (the “NYSDEC Evidence Summary”), the evidence and testimony collected by the NYSDEC tribunal during its extensive and ongoing adjudicatory proceeding include, *inter alia*:

- information concerning the electric system, electricity pricing, and pollutant emissions impacts that would result from closing Indian Point or triggering a lengthy outage to construct cooling towers (9 months or longer). Evidence on these topics has been submitted by Entergy, which retained NERA Economic Consulting; NYSDEC, which relied upon staff at the DPS; the City of New York, which retained Charles River Associates; Riverkeeper, Inc., which relied on Synapse Energy Economics, Inc.; and the African American Environmentalist Association.

⁴ See *Matter of Entergy Nuclear Indian Point 2, LLC & Entergy Nuclear Indian Point 3, LLC (SPDES)*, Interim Decision (Aug. 13, 2008), at 20-21 (“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 In those circumstances, it may be determined that the proposed BTA technology would not satisfy the requirements of SEQRA, and Department staff may then be obligated to revisit the BTA determination.”).

⁵ The SEIS that NYSDEC is preparing in the SPDES proceeding should not be confused with the supplemental FSEIS on aquatics issues and other matters that NRC is preparing for purposes of federal License Renewal. While Entergy has requested the Department to stay federal consistency review until it has time to consider NRC’s supplemental FSEIS, Entergy does not request such a stay in connection with the NYSDEC SEIS.

- evidence concerning the adverse environmental impacts that temporarily shutting down Indian Point to install cooling towers would cause, including increased emissions of NO_x, SO_x, and CO₂ by fossil fuel burning units that would increase generation to replace Indian Point's lost output, and the differential impact that these emissions would have on environmental justice areas. More such information will be submitted to the NYSDEC tribunal if the tribunal allows the issue of summertime outages to move forward to adjudication. Environmental impacts from the cooling tower proposal also would include visual impacts to areas of statewide scenic significance in the Hudson River Valley, undisputed noise impacts to public parks along the Hudson and to areas in the Village of Buchanan, and the destruction of wooded areas.
- evidence concerning the feasibility of the proposed cooling towers (that is, whether they even can be built at the Indian Point site), including information on the consistency of such technologies with federal, state, and local licensing, permitting, and zoning laws.

This evidence has been submitted in the NYSDEC proceeding mainly for purposes of analyzing a cooling tower proposal and the potential implications of such a proposal under the CWA and Section 704.5. Nonetheless, this evidence is relevant to several issues of importance to the Department's consistency review, as reflected in the national policies set forth in the CZMA and the national and state policies found in the CMP. For example, many of the impacts of a construction outage to install cooling towers are similar or identical to the impacts that would occur if Indian Point is required to close. Because this evidence has been subject to cross-examination and the rigors of an adjudicatory process, it should have significant value to the Department as it weighs whether to object to License Renewal.

The Department should be aware of this evidence because the CMP—consistent with the federal CZMA—is not myopically focused on the protection of aquatic organisms or any other single aspect of the environment or economy. Rather, the CMP is intended and designed to require a holistic embrace of the coastal zone's many important aspects. This includes, *inter alia*, the important role that the coastal zone plays in energy generation.⁶ It also includes a recognition of the importance of combating both local and regional air pollution and the global impacts of greenhouse gasses.⁷

III. Summary of Facts Shown By the NYSDEC Hearing Record.

There is no way to set forth, in a single memorandum of manageable length, all of the evidence potentially relevant to the Department's consistency review that has been adduced in the NYSDEC adjudicatory hearing. This NYSDEC Evidence Summary, accordingly, is intended to

⁶ See, e.g., New York State Department of State, *New York State Coastal Management Program and CZM Program Final Environmental Impact Statement* (with changes from 1982 to 2006) (hereinafter, "CMP"), at II-5 pages 23-25 (explaining the important role the coast plays in New York's energy production), II-6 pages 85-92 (setting forth coastal policies that encourage energy development in coastal areas and also on the public's need), II-9 page 3 ("The State has demonstrated its recognition of the national interest in energy facilities by the number and scope of facilities already located in or planned for New York's coastal area.").

⁷ CMP at II-1, pages 101-103 (setting forth CMP policies 41 and 43, which prohibit coastal development that causes a violation of national or State air quality standards or the generation of significant acid rain precursors).

serve only as a roadmap to the materials that accompany it. Even so, the conclusion that the Department should reach following review of this NYSDEC Evidence Summary, standing alone, is clear: an objection to Entergy's Consistency Certification resulting in closure of Indian Point would inflict harm on the people of New York across a breadth of measures including human health, the environment, public safety, and the economy. Moreover, as contemplated under the federal Clean Water Act and New York law, responsibility for addressing water quality and aquatics issues has been vested in NYSDEC, not the Department. The Department should therefore defer to Entergy's existing SPDES permits, and to the eventual outcome of the NYSDEC proceedings, as addressing any concerns under the CMP about the potential aquatic impacts of Indian Point operations. Any attempt by the Department either to anticipate the outcome of the NYSDEC proceedings, or to reach its own independent conclusions about aquatic issues without a final decision from NYSDEC, would be without legal basis or support in the available evidence.

A. Closing Indian Point Would Lead To An Unreliable New York Electric System.

Shutting down Indian Point would threaten the reliability of the New York electric system. "Electric system reliability" is a stark issue: it means whether New York would suffer another blackout such as that which occurred in 2003. Blackout events are unquestionably serious, both from an economic perspective and with respect to human health and safety. The risk of blackouts therefore cannot be taken lightly. It is no exaggeration to say that blackouts not only cost billions of dollars in lost economic activity and damage to infrastructure, they also cause serious harm to human health and safety.⁸

That Indian Point's closure would diminish electric system reliability in New York to unacceptable levels has been established in the NYSDEC proceeding. DPS witnesses testifying in that proceeding described the loss of Indian Point's generation capacity "for any reason" as "a big deal."⁹ They testified that a 42-week outage at Indian Point would have "a big impact on the system, and that the [NYISO] would have to ensure that there was something done to ensure reliability," which "would be a big deal and a big project," which they could not "say for certain how it would be accomplished," only "that it would be a fairly expensive proposition."¹⁰ As of now, no credible plans to replace all of Indian Point's generation exist.

The City of New York's expert, Christopher Russo, assigned some numbers to the reliability issue. Under applicable law, the electric system must have a "loss of load expectation" ("LOLE")—the statistical probability of a blackout—of 0.10 or lower, which equates to an expectation of one blackout day every 10 years.¹¹ With Indian Point out of service (whether for

⁸ See Lin et al., *Health Impact in New York City During the Northeastern Blackout of 2003*, Public Health Reports, 126(3):384-393 (2011); Beatty et al., *Blackout of 2003: Public Health Effects and Emergency Response*, Public Health Reports, 121(1):36-44 (2006).

⁹ Hearing Transcript (Apr. 14, 2014), at 8790:8-8791:3 (testimony of Department of Public Service staffer Thomas S. Paynter); *id.* at 8788 (testimony of NYSDEC Staff witness Gjonaj).

¹⁰ Hearing Transcript (Apr. 14, 2014), at 8790:8-8791:3 (Paynter).

¹¹ Charles River Associates, *Indian Point Energy Center Retirement Analysis* (2011) (New York City Ex. 2), at 12; Hearing Transcript (Apr. 16, 2014), at 9627-28 (Russo).

a cooling tower construction outage or otherwise), Mr. Russo calculated that the 0.10 LOLE requirement for the New York Control Area would be exceeded in 2016 under certain parameters, and by 2020 even if new generation capacity is added to the system.¹² The implication of the numbers is clear: shutting down Indian Point would make it more likely that there would be a serious failure of reliability standards that are intended to protect the public health and safety.

This capacity issue is joined by the problem of voltage support. It is no easy thing for power to be sent long distances over the electric grid.¹³ Rather, generation or other sources of voltage support must be located in strategic locations along the grid to support transmission requirements.¹⁴ Indian Point is located in a key area along the Hudson River for providing voltage support, and without Indian Point on line there is a risk of voltage collapsing, with dire consequences for the system.¹⁵

Shutting down Indian Point for any reason would also pose substantial risks to New York's energy diversity. The experts testifying at the NYSDEC proceeding agree that it is likely that Indian Point's nuclear generation would largely be replaced by units burning natural gas. "Annual natural gas usage for electricity would increase by about 94 million MMBtu if Indian Point were not available,"¹⁶ an increase of more than 18%, as compared with Indian Point operating. This would exacerbate the over-dependence in New York City and Long Island on energy produced by natural gas. This is problematic for two reasons. First, while natural gas prices currently are low by historical standards, they are subject to price spikes particularly during periods of high demand, such as seen during the "polar vortex" events of this past winter.¹⁷ Second, there is the constant risk of supply disruption on the few pipelines delivering gas to the region.¹⁸ Removing Indian Point's baseload nuclear generation from the grid exacerbates these risks.

Replacing Indian Point to avoid these reliability concerns would be no small feat. As explained below, the costs of doing so would run into the billions of dollars and it would take years to

¹² New York City Ex. 2 at 23 tbl. 1.

¹³ Hearing Transcript (Apr. 16, 2014), at 9593:5-9594:5 (Russo) (explaining concept of voltage support and why it is required for electric system stability); Hearing Transcript (Apr. 17, 2014), at 9792-94 (same).

¹⁴ 2012 NYISO Reliability Needs Assessment (Attachment 71 to Entergy's Coastal Zone Management Act Consistency Certification in Support of USNRC's Renewal of Indian Point Unit 2 and 3 Operating Licenses (Dec. 2012) (hereinafter "Consistency Certification"), at 43. *See also* NERA Impacts Report at B-11 (concluding that 500 MW of additional generation capacity must be located in vicinity of Indian Point to maintain voltage support in the event of Indian Point's retirement); Russo Prefiled Direct at 13.

¹⁵ Hearing Transcript (Apr. 16, 2014) at 8817-18 (DPS Staff testimony explaining voltage support issues if IPEC is not in service).

¹⁶ NERA Impacts Report at S-7.

¹⁷ *See* EIA, Henry Hub Natural Gas Spot Price, <http://www.eia.gov/dnav/ng/hist/mgwhhdM.htm> (April 16, 2014) (Entergy Ex. 521); Hearing Transcript (Apr. 16, 2014), at 9594-98 (Russo).

¹⁸ Hearing Transcript (Apr. 14, 2014), at 8793:21-8797:5 (DPS Staff) (explaining reliability concerns that may be implicated by overreliance on natural gas-fired generation, including supply constraints); NERA Impacts Report at 30-31 (same); Russo Prefiled Direct at 21-22 (same); Russo Prefiled Rebuttal at 15 (same).

accomplish. Nor can all new capacity expected to come online in the short or medium term be slated to replace Indian Point, as other generation facilities continue to retire or mothball for economic and other reasons.¹⁹ Looking at NYISO's Gold Book numbers, there could be a shortfall of up to 2,000 MW by the mid-2020s with Indian Point offline, a number that not coincidentally approximates Indian Point's output.²⁰

B. Closing Indian Point Would Increase Air Pollution Harmful To Humans And The Environment.

Continued operation of Indian Point would be tremendously beneficial to air quality in New York State. Nuclear facilities do not use any meaningful quantities of fossil fuel in their operations and therefore, unlike fossil fuel facilities, do not contribute to air quality problems such as acid rain, smog, ground-level ozone, particulate matter, or global warming. Indian Point generates more than 2,000 MW of baseload electricity without emitting any meaningful amounts of either (1) criteria air pollutants, such as NO_x and SO_x, regulated under the federal Clean Air Act, or (2) CO₂ or other greenhouse gasses. If Indian Point shuts down, the power it contributes to the electrical system must be replaced from somewhere. As all witnesses testifying in the NYSDEC adjudicatory proceeding agree, shutting down Indian Point likely would result in the increased operation (and new construction) of fossil-fueled power plants with consequent impacts on New York's air quality and the fight against global climate change.

1. NO_x and SO_x Emissions.

NO_x and SO_x are regulated by the federal Environmental Protection Agency ("EPA") for their impacts on human health and well-being, including demonstrated risks of morbidity and mortality. NO_x both contributes to ground-level ozone and has its own negative health effects. Exposure to atmospheric NO_x for even three hours at ambient levels commonly experienced in the United States results in increases in a number of adverse health effects, including respiratory illnesses in children 5-12 years old and impairment of pulmonary function in individuals with preexisting respiratory illnesses.²¹

Ozone, a prime component of smog, is a highly reactive gas that is irritating and toxic at low concentrations, and exposures to ground-level ozone can result in coughing, shortness of breath, lung inflammation, decreased lung function, and increased susceptibility to respiratory infection, particularly in persons who are active outdoors or have preexisting respiratory disorders such as asthma.²² Millions of New Yorkers are at risk of suffering the adverse health impacts of increased ozone emissions, as significant portions of the state, including New York City and its surrounding area, are classified as being in nonattainment for the 8-hour ozone NAAQS set by

¹⁹ See Hearing Transcript (Apr. 16, 2014), at 9591-92 (Russo).

²⁰ See Hearing Transcript (Apr. 16, 2014), at 9615 (Russo).

²¹ NYSDEC, *Network Plan Part 13 – CO, NO_x, Pb, PM, SO₂, Ozone* ("NYSDEC Network Plan") (Entergy Ex. 433 at 5); see also *Matter of Entergy Nuclear Indian Point 2, LLC & Entergy Nuclear Indian Point 3, LLC (SPDES)*, Hearing Transcript (hereinafter "Hearing Transcript") (Apr. 7, 2014), at 7330:17-20 (testimony of NYSDEC Staff witness Ronald Stannard).

²² See NYSDEC Network Plan at 23-24; NYSDEC, *About Ozone*, <http://www.dec.ny.gov/chemical/8400.html> (Entergy Ex. 483), at 1.

EPA.²³ Indeed, studies have shown that exposures to heightened ozone levels over a period as short as one week can lead to an increase in cardiovascular and respiratory deaths.²⁴

Likewise, the evidence is undisputed that even short-term exposure to SO_x can cause morbidity and mortality in humans. The human health impacts from even short-term (5-minute to 24-hour) exposure to elevated SO_x levels include impaired breathing for asthmatic children, the elderly, and adults who are even moderately active outdoors.²⁵

The expert witnesses who testified in the NYSDEC adjudicatory proceeding agree that, if Indian Point shuts down for any significant period of time, then replacement generation from fossil fuel facilities would increase emissions of criteria air pollutants, including NO_x and SO_x, in comparison to what would be emitted with Indian Point operating. NERA estimated that loss of Indian Point would increase annual NO_x emissions (a precursor to ozone) from other power plants by about 3,000 tons.²⁶ In certain scenarios, the City of New York's expert estimated an increase of NO_x emissions of 10% or more across New York State, and 14% or more in New York City.²⁷ Modeling a construction outage of about 9 months, DPS Staff testifying on behalf of NYSDEC predicted a 1,500 ton increase in NO_x emissions in New York (and nearly 4,000 tons across the broader region including Pennsylvania, New Jersey, New England, and the eastern Canadian provinces), representing a 7% increase in New York State and nearly 24% increase in New York City.²⁸

The testifying experts also agree that shutting down Indian Point would increase emissions of SO_x considerably. DPS Staff estimated that a 9-month construction outage at Indian Point would increase SO_x emissions in New York by about 1,800 tons (and nearly 5,800 tons across the broader northeastern U.S. and Canada regions).²⁹ Much of New York's increase in SO_x emissions would be concentrated in the five boroughs of New York City (96 tons, an increase of

²³ See EPA, *Current Nonattainment Counties for All Criteria Pollutants*, available at: <http://www.epa.gov/oaqps001/greenbk/ancl.html>; see also Hearing Transcript (Apr. 7, 2014), at 7322:5-7 (Stannard).

²⁴ See NYC Health, *Air Pollution and the Health of New Yorkers: The Impact of Fine Particles and Ozone Entergy* (Entergy Ex. 484) at 11 (2.3% increase in daily cardiovascular and respiratory deaths for every 10 parts per billion increase in average ozone concentrations over the week before death); see also NO_x NAAQS (Entergy Ex. 476) at 6482 (recognizing cardiovascular and respiratory mortality resulting from increases in short-term exposures).

²⁵ See NYSDEC Network Plan Part 13 at 22; see also EPA, *Primary National Ambient Air Quality Standard for Sulfur Dioxide*, 75 Fed. Reg. 35520 (Jun. 22, 2010), at 35525; Hearing Transcript (Apr. 7, 2014) at 7317:1-20 (Stannard).

²⁶ NERA Impacts Report at S-5.

²⁷ Charles River Associates, *Indian Point Energy Center Retirement Analysis* (Aug. 2, 2011) (New York City Ex. 2), at 28.

²⁸ See Leka P. Gjonaj and David W. Wheat, *Year-2022 Forecast Air Emissions and Generation Impacts from Indian Point Outage Scenarios* (Staff Ex. 218B); see also Prefiled Direct Testimony of Leka P. Gjonaj and David W. Wheat (Feb. 28, 2014), at 15-16; Prefiled Direct Testimony of Ronald Stannard (Feb. 28, 2014), at 2.

²⁹ See Gjonaj-Wheat Emissions Impacts; Prefiled Direct Testimony of Ronald Stannard (Feb. 28, 2014), at 2; Hearing Transcript (Apr. 7, 2014), at 7319:18-20 (Stannard).

almost 32%), nearby Long Island (814 tons, an increase of more than 14%), and the Hudson River valley (57 tons, or an increase of 50.91%).³⁰

NYSDEC air quality experts testifying at the proceeding conceded that they cannot rule out that these increased emissions would negatively impact human health.³¹ In particular, the NYSDEC witnesses admitted that they had not analyzed the human health implications of these increased emissions and could not rule out human health impacts.³² Other evidence shows that increasing emissions by shutting down Indian Point, even temporarily to construct cooling towers and even more so on a permanent basis, would exacerbate the already significant human health impacts of ground-level ozone.³³ And in that regard, the African American Environmentalist Association explained that these emissions would be concentrated in environmental justice areas containing a disproportionate number of minority residents, areas that already tend to suffer the brunt of pollution and high asthma rates.³⁴

2. Carbon Dioxide Emissions.

It goes without saying that the fight against global climate change—and the consequent need to limit emissions of greenhouse gasses such as carbon dioxide—is a national and New York priority, reflected in efforts by the United States government to negotiate international treaties and by New York’s entry into the Regional Greenhouse Gas Initiative (“RGGI”). No one wants to see the odds of another Superstorm Sandy increase. The evidence in the NYSDEC adjudicatory proceeding reflects this. The Environmental Impact Statement prepared by NYSDEC in connection with RGGI plainly states that “[m]itigating the impacts of a changing climate represents one of the most pressing environmental challenges for the state, the nation, and the world,” and that “any effort to curb the state’s contribution to atmospheric contributions of CO₂ must address CO₂ pollution from power plants.”³⁵

Experts testifying in the NYSDEC proceeding agreed that closing Indian Point would lead to increases in greenhouse gas emissions from fossil fuel units and hence increase the risk and potential impacts of global climate change. NERA estimated that if Indian Point is not in service then CO₂ emissions would increase by about 6.7 million tons each year.³⁶ DPS Staff came up

³⁰ See Gonaj-Wheat Emissions Impacts; Hearing Transcript (Apr. 7, 2014), at 7320:4-13, 7321:8-10 (Stannard).

³¹ Hearing Transcript (Apr. 7, 2014), at 7285:11-7286:9 (Stannard).

³² See Hearing Transcript (Apr. 14, 2014), at 8739:1-4 (testimony of NYSDEC Staff witnesses Leka P. Gjonaj and David V. Wheat); (Apr. 7, 2014), at 7343:16-22, 7324:19 – 7325:6 (Stannard); 7327:17 – 7328:5 (testimony of NYSDEC Staff witness Margaret Valis).

³³ See NYSDEC, *Network Plan Part 13 – CO, NOx, Pb, PM, SO2, Ozone*, <http://www.dec.ny.gov/chemical/54359.html> (accessed April 2, 2014) (Entergy Ex. 433) (listing adverse effects of NOx and SOx); EPA, Primary National Ambient Air Quality Standards for Nitrogen Dioxide: Final Rule, 75 Fed. Reg. 26 (February 9, 2010) (listing adverse impacts of NOx).

³⁴ African American Environmentalist Association (“AAEA”), *Fish Eggs Versus Asthmatic Children in Harlem* (February 2014) (AAEA Ex. 1), at 52.

³⁵ NYSDEC, *6 NYCRR Parts 242 and 200 Regulatory Impact Statement*, <http://www.dec.ny.gov/regulations/94833.html> (Apr. 2, 2014) (Entergy Ex. 417), at 5, 17.

³⁶ NERA Impacts Report at S-5.

with similar estimates: an increase of about 5 million tons just in New York from a 9-month outage, adding up to about 7.5 million tons when increased emissions in neighboring states are included.³⁷ To put that in perspective, New York's regulated CO₂ emissions under the Regional Greenhouse Gas Initiative are slated to be about 40 million tons with Indian Point out of service, meaning increased emissions to account for Indian Point's closure make up about 12.5% of the state's emissions subject to RGGI.³⁸ By any metric, the increase in CO₂ emissions due to Indian Point's closure would be substantial. As reflected in RGGI and other documents it indisputably is New York State policy to combat climate change by decreasing CO₂ emissions from power plants.³⁹ Closing Indian Point would be a massive step in the wrong direction.

C. Closing Indian Point Would Hurt New York's Economy.

Closing Indian Point, whether to construct cooling towers or otherwise, would result in significant economic impacts to consumers of electricity in New York. Witnesses for Entergy, the City of New York, and the DPS Staff agreed that if Indian Point is out of service then consumers are likely to wind up paying \$1 billion or more, each year, in increased wholesale and capacity market prices. DPS witnesses, for example, put the wholesale price impact from a one-year construction outage at about \$276 million and the capacity price impact in 2016 at \$1.451 billion—a combined \$1.73 billion more that consumers would pay for electricity in a single year than if Indian Point were in service.⁴⁰ That is almost identical to the \$1.71 billion estimated by NERA for an outage in 2016, and within the range of \$1.37 billion to \$2.06 billion provided by the City of New York's expert.⁴¹

If Indian Point is closed for good, these are increased costs that New York consumers would continue to bear, year after year, unless and until sufficient additional capacity enters the New York market to make up for Indian Point's loss. The evidence in the NYSDEC proceeding is that adding such increased capacity is not cheap, easy, or fast. Even assuming investors are in place, new power plants, particularly those located in the coastal zone, must go through the same rigorous regulatory and environmental review that is being applied to Indian Point, a process that can take years before a facility is finally approved.⁴² It is estimated that building a single new

³⁷ Staff Exhibit 218B.

³⁸ Entergy Ex. 417 at 18.

³⁹ Regional Greenhouse Gas Initiative, Memorandum of Understanding (2005) (Entergy Ex. 425); Hearing Transcript (Apr. 7, 2014), at 7291-92 (Stannard) (agreeing that NYSDEC's position is that "climate change poses risks to human health and to the ecology in New York State").

⁴⁰ See NYSDEC Staff, *Potential Capacity Market Impacts* (Staff Ex. 223), at 1 and NYSDEC Staff, *Year-2016 Forecasts of Wholesale Energy Market Impacts from Indian Point Outage Scenarios* (Staff Ex. 218D); see also NERA Impacts Report at S-3.

⁴¹ NERA Impacts Report at S-5, fig. S-1; Prefiled Direct Testimony of Christopher J. Russo (Feb. 28, 2014), at 6-7; see also New York City Ex. 2 at 11-26 (summarizing similar findings by New York City's expert witness with respect to electricity price impacts from possible Indian Point outages).

⁴² See Hearing Transcript (Apr. 14, 2014), at 8753 (DPS Staff testifying that it can take many years for a new power plant to be permitted and constructed); Hearing Transcript (Apr. 16, 2014), at 9640-42 (Russo) (same); Prefiled Rebuttal Testimony of Christopher J. Russo (Mar. 28, 2014), at 8 ("The lead time for new facilities is at least two years. For many projects, it can take even longer to secure the regulatory approvals, permits and financing needed to begin construction and commence commercial operations.").

500 MW generating unit would cost \$1 billion, and Indian Point currently produces four times as much power: 2,000 MW.⁴³ Based on recent history, some or all of the cost of constructing new units would be borne by ratepayers or taxpayers, in the form of subsidies or contractual support for the new unit.⁴⁴

All told, the evidence in the NYSDEC proceeding is that taking Indian Point out of service for any significant period of time would cost New Yorkers billions of dollars.

D. Cooling Water Towers And Summertime Outages Are Not a “Reasonable” Alternative To Continuation of Status Quo Operations.

To be clear, and once again, federal and New York law do not allow the Department to object to a consistency certification on the basis of undecided matters that are delegated to NYSDEC under the federal Clean Water Act and the CMP, or to condition a concurrence on changes to a project that are within NYSDEC’s purview under federal and state law. The Department, for example, should not object to Entergy’s consistency certification on the basis that Indian Point does not employ cooling towers. Nor should the Department anticipate the outcome of the SPDES proceeding in making its consistency determination. Nonetheless, if the Department decides to take into account permit modifications proposed by NYSDEC Staff in that proceeding, then it must know that the evidence in the NYSDEC proceeding demonstrates that the cooling towers and summertime outages proposed by NYSDEC Staff are neither reasonable nor available alternatives to continuation of status quo operations.

The NYSDEC record indicates that cooling towers would be accompanied by adverse environmental, economic, and power system reliability impacts that render their installation inappropriate. Among other things:

- Cooling water towers confront feasibility, operability, and permitting barriers that cannot be avoided or resolved. For example, the engineers retained by DEC Staff to consider the site-specific feasibility of installing cooling towers at the space-constrained Indian Point site proposed locating the towers on top of existing buildings and infrastructure (including structures containing radionuclides, such as the independent spent fuel storage installation), never analyzed the feasibility of relocating the structures in question, and generally could not even say what those buildings are or what they do.⁴⁵ The specific towers proposed by DEC Staff are experimental and have no operational history at a

⁴³ See, e.g., Hearing Transcript (Apr. 14, 2014), at 8956 (DPS Staff agreeing that a new 500 MW plant would cost about \$1 billion, or \$2 million per MW); New York Energy Highway Taskforce, *New York State Energy Highway Blueprint Update* (Apr. 2013) (Riverkeeper Ex. 165), at 30 (estimating “between \$1 billion and \$2 billion [potential cost] for approximately 1,200 MW of additional capacity if needed,” “[d]epending on selected solution”).

⁴⁴ Prefiled Direct Testimony of Christopher J. Russo (Feb. 28, 2014), at 18 (“[P]ower plants larger than roughly 500 megawatts would require contractual support to be constructed if IPEC were to retire.”).

⁴⁵ See, e.g., Prefiled Direct Testimony of Eduardo Ortiz De Zarate (Feb. 28, 2014), at 6:5-12, 9:20-10:11; Prefiled Direct Testimony of Tim Havey (Feb. 28, 2014), at 13:1-7, 19:20-20:3; Hearing Transcript (Apr. 8, 2014), at 7606:1-9, 7612:6-7, 7612:20-7613:13, 7615:2-7617:19, 7617:12-19, 7619:1-7620:23, 7623:18-7624:5, and 7632:19-22 (testimony of NYSDEC Staff witnesses Tim Havey and Eduardo Ortiz de Zarate).

nuclear power plant or in the environmental conditions present at Indian Point.⁴⁶ Even if the towers could be built and receive all necessary permits, licenses, and permissions from federal, state, and local authorities (which is highly doubtful), the towers would cause adverse impacts to Indian Point, including a significant decrease in electrical output, and icing, fogging, electrical arcing, and missile risks that could endanger the plant employees and the plant itself.⁴⁷ Indeed, after itself advocating cooling towers for more than a decade, Riverkeeper abandoned its proposal on the cusp of trial;⁴⁸

- The alleged environmental benefits of cooling towers have not been established, especially during the License Renewal period. Available analysis indicates that necessary permits for cooling towers would not be issued and, even if issued, would be delayed for years (up to 13 years) by litigation against the Village of Buchanan and other stakeholders, thus vitiating any alleged benefits. Entergy's experts believe it is unlikely that cooling towers could be permitted and built before the mid-2030s, while NYSDEC Staff's witnesses concede that the towers could not be built before the late 2020s and that a 2030 date is entirely plausible;⁴⁹ and
- Sufficient analysis has not been prepared to satisfy SEQRA for the cooling tower technology. Available information already indicates numerous large and moderate environmental impacts which stand in the way of SEQRA approval, including particulate matter emissions by the towers that would affect the health of local communities; the air emissions impacts (NO_x, SO_x, and CO₂) during a construction outage discussed above; significantly negative aesthetic impacts from cooling towers to areas of statewide scenic significance; the economic and reliability impacts discussed above during the construction outage; violation of local noise ordinances; and many more.⁵⁰ NYSDEC Staff, meanwhile, acknowledge that no real consideration of environmental justice impacts has yet to be performed.⁵¹

NYSDEC Staff's new proposal to require outages at Indian Point every summer is similarly flawed. As detailed in pleadings and argument before NYSDEC, the outages proposal is preempted by the federal Atomic Energy Act, which leaves to the federal Nuclear Regulatory

⁴⁶ See, e.g., Beaver Prefiled Direct at 7:21-23; Beaver Prefiled Rebuttal at 15:5-17:13; Enercon Services Inc., *ENERCON Response to Tetra Tech's Indian Point Closed-Cycle Cooling System Retrofit Evaluation Report* (December 13, 2013) (Entergy Ex. 296A), at 14-16.

⁴⁷ See generally Kevin M. Young, Esq. and Elizabeth M. Morss, Esq., Young/Sommer LLC, *Analysis of Municipal and County Permitting for Closed-Cycle Cooling System Retrofit at Indian Point* (December 13, 2013) (Entergy Ex. 296C) ("Young Report"). Enercon Services Inc., *ENERCON Response to Tetra Tech's Indian Point Closed-Cycle Cooling System Retrofit Evaluation Report* (December 13, 2013) (Entergy Ex. 296A) at 23-35.

⁴⁸ See Email from Mark Lucas, Esq. to the Honorable Maria Villa et al., dated February 21, 2014.

⁴⁹ See Young Report at 50; Hearing Transcript (Apr. 8, 2014, at 7662:18-7663:10 (Havey)).

⁵⁰ See TRC Environmental Corporation, *New York State Environmental Quality Review Act: Entergy Response Document To the Tetra Tech Report and the Powers Engineering Report In Support of the Draft SEIS for a State Pollutant Discharge Elimination System (SPDES) Permit (No. NY-0004472)* (Dec. 13, 2013) (Entergy Ex. 296).

⁵¹ See, e.g., Hearing Transcript (Apr. 10, 11, 2014), at 8353, 8410:16-18 (testimony of NYSDEC Staff witness Christopher M. Hogan)

Commission sole authority to determine how long and when a nuclear plants' generators operate, and sole authority over related issues such as (*inter alia*) nuclear fuel and spent-fuel management and safety risks associated with handling nuclear fuel more often in order to accommodate more outages.⁵² The outages proposal also is plagued by feasibility concerns that NYSDEC Staff has not addressed and has not identified witnesses capable of addressing.⁵³ As of the date of this letter, the NYSDEC Administrative Law Judges responsible for the NYSDEC proceeding have not decided to move the outages proposal forward to adjudication, and they may decide not to do so. If outages should move to adjudication, then Entergy expects that the record evidence concerning the flaws of outages would be at least as extensive as the evidence demonstrating the flaws of cooling towers. Some evidence already admitted in the NYSDEC adjudicatory proceeding demonstrates that summertime outages would introduce the same risks of blackouts and the same problem with ground-level ozone (and much the same problem with greenhouse gas emissions) as a construction outage for cooling towers, while costing consumers hundreds of millions of dollars, or more, each year in increased electricity prices. Out of the many dozens of members of the public and representatives of entities and interest groups representing hundreds of thousands of New Yorkers (including government bodies, unions, chambers of commerce, business associations, hospitals, and citizens groups) who spoke at a public hearing held by NYSDEC on July 22, 2014, only a single person spoke in favor of outages, and that was a lawyer for Riverkeeper. Outages, in short, are an ill-founded idea that has not been adequately studied by NYSDEC, and certainly should not even be considered by the Department during its consistency review.

IV. Conclusion

For well over a decade, NYSDEC has been considering what additional technology, if any, should be installed at Indian Point to address concerns about potential aquatic impacts from Indian Point's withdrawals of cooling water. NYSDEC's eventual decision will be reflected in a SPDES permit, which is entirely unrelated to the separate License Renewal process that is before the NRC. Only NRC License Renewal is the subject of this Department's review under the CMP. Nonetheless, the NYSDEC SPDES proceeding, and the vast quantities of evidence and sworn testimony that proceeding has generated, demonstrate the complexity of the issues pending before NYSDEC and the adverse "unintended consequences" that would result from closing Indian Point or requiring cooling towers or annual outages. Ultimately, NYSDEC will select the technology that it concludes will minimize adverse environmental impacts under 6 NYCRR § 704.5, consistent with the consideration of economic and other environmental impacts under NYSDEC's regulations and SEQRA, as well as the CMP. If upheld by the courts, that decision will then be binding on Entergy through its SPDES permit and will ensure protection of state water quality standards. Respectfully, given NYSDEC's pending review of these issues, taking into account sworn expert testimony and hundreds of exhibits, over a period of years, the Department should not attempt either to assume the result of the NYSDEC proceeding, or to exercise its judgment on matters over which NYSDEC has exclusive jurisdiction. Indeed,

⁵² See Entergy, *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* (July 11, 2014), at 9-10.

⁵³ *Id.* at 15-17.

Entergy believes that the Department should defer to Entergy's existing SPDES permits, and to NYSDEC and the SPDES process, for protection of aquatic resources. Nonetheless, to the extent the same information already before NYSDEC may be of value to the Department in its consistency review under the CMP, Entergy submits the most relevant materials herewith, as described in the list that follows.

LIST OF ATTACHMENTS

CLOSING INDIAN POINT, EVEN TEMPORARILY WOULD CAUSE ADVERSE EFFECTS ON THE ENVIRONMENT AND THE NEW YORK POWER SUPPLY SYSTEM

Prefiled Testimony of Entergy Witnesses and Selected Exhibits

- Prefiled Direct Testimony of David Harrison, Jr., Ph.D. (February 28, 2014).
 - **Entergy Ex. 296E:** NERA Economic Consulting, *Impacts to the New York Electric System if Indian Point Energy Center Were Not Available* (December 13, 2013)
 - **Entergy Ex. 296D:** NERA Economic Consulting, *Benefits and Costs of Cylindrical Wedgewire Screens and Cooling Towers at IPEC* (December 13, 2013)
 - **Entergy Ex. 297:** NERA Economic Consulting, *“Wholly Disproportionate” Assessments of Cylindrical Wedgewire Screens and Cooling Towers at IPEC* (December 2013)
- Prefiled Rebuttal Testimony of David Harrison, Jr., Ph.D. (March 28, 2014)

Prefiled Testimony of New York City Witnesses and Selected Exhibits

- Prefiled Direct Testimony of Christopher J. Russo (February 28, 2014)
 - **City Ex. 1:** Resume: Christopher J. Russo, Vice President, Charles River Associates
 - **City Ex. 2:** Charles River Associates, Indian Point Energy Center Retirement Analysis (August 2, 2011)⁵⁴
 - **City Ex. 3:** Charts: Average Yearly LMPs (Local Marginal Prices) of electricity in New York State, 2004-2013 (Accessed February 6, 2014)
 - **City Ex. 4:** Chart: Average Monthly Natural Gas Prices for Transco Zone 6 Delivery Point, Jan. 2013-Feb. 2014 (Accessed February 6, 2014)
- Prefiled Rebuttal Testimony of Christopher J. Russo (March 28, 2014)

Prefiled Testimony of NYSDEC Staff Witnesses and Selected Exhibits

- Prefiled Direct Testimony of Thomas S. Paynter (February 28, 2014)
 - **Staff Ex. 222 (TP-1):** Witness Information for Thomas S. Paynter
 - **Staff Ex. 223 (TP-2):** Table: Potential Capacity Market Impacts
- Combined Prefiled Direct Testimony of Leka P. Gjonaj and David V. Wheat (February 28, 2014)

⁵⁴ Previously provided as Attachment 48 to Entergy’s Coastal Zone Management Act Consistency Certification in Support of USNRC’s Renewal of Indian Point Unit 2 and 3 Operating Licenses (December 2012).

- **Staff Ex. 221:** Witness Information for Leka P. Gjonaj and David V. Wheat
- **Staff Ex. 218:** The Brattle Group, Request for Exemption from FOIL Disclosure (August 28, 2013)
- **Staff Ex. 218A:** Indian Point Outage Scenario Definitions for GE-MAPS Simulations
- **Staff Ex. 218B:** Year-2022 Forecast Air Emissions and Generation Impacts from Indian Point Outage Scenarios
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- Combined Prefiled Rebuttal Testimony of Leka P. Gjonaj and David V. Wheat (March 28, 2014)
- Prefiled Direct Testimony of Ronald Stannard (February 28, 2014)

CLOSED-CYCLE COOLING TOWERS ARE NOT A FEASIBLE OR SUITABLE TECHNOLOGY AT INDIAN POINT

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- Prefiled Direct Testimony of Sam Beaver (February 28, 2014)
 - **Entergy Ex. 296A:** Enercon Services Inc., *ENERCON Response to Tetra Tech's Indian Point Closed-Cycle Cooling System Retrofit Evaluation Report* (December 13, 2013)
 - **Entergy Ex. 310:** Enercon Services Inc., *Analysis of Closed-Loop Cooling Salinity Levels Indian Point Units 2 & 3* (November 2010)
- Prefiled Direct Testimony of John R. Young, Ph.D. (February 28, 2014)
 - **Entergy Ex. 185B:** ASA, Inc., *Biological Input to Benefits Analysis of the Cylindrical Wedgewire Screen Alternative for Indian Point Energy Center* (March 29, 2013)
- Prefiled Direct Testimony of Marc J. Lawlor (February 28, 2014)
 - **Entergy Ex. 296:** TRC Environmental Corporation, New York State Environmental Quality Review Act: Entergy Response Document To the Tetra Tech Report and the Powers Engineering Report In Support of the Draft SEIS for a State Pollutant Discharge Elimination System (SPDES) Permit (No. NY-0004472) (December 13, 2013)
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- **Entergy Ex. 296C:** Kevin M. Young, Esq. and Elizabeth M. Morss, Esq., Young/Sommer LLC, *Analysis of Municipal and County Permitting for Closed-Cycle Cooling System Retrofit at Indian Point* (December 13, 2013)
- **Entergy Ex. 296D:** NERA Economic Consulting, *Benefits and Costs of Cylindrical Wedgewire Screens and Cooling Towers at IPEC* (December 13, 2013)
- **Entergy Ex. 296E:** NERA Economic Consulting, *Impacts to the New York State Electricity System if Indian Point Energy Center Were Not Available* (December 2013)
- **Entergy Ex. 296F:** Laura C. Green, Ph.D., D.A.B.T., CDM Smith, *Legionnaire’s Disease Risk* (December 13, 2013)
- **Entergy Ex. 296G:** Puckorius & Associates, Inc., *Water Treatment for Cooling Towers* (December 13, 2013)
- **Entergy Ex. 296H:** TRC Environmental Corporation, *Table C-4: Proposed ClearSky™ Cooling Tower Operational Noise – CadnaA Model Output* (December 13, 2013)
- **Entergy Ex. 296I:** TRC Environmental Corporation, *Table 3.5-5: ClearSky™ Cooling Towers – Operational Noise Levels and Increases Over Existing Conditions (dBA)* (December 13, 2013)
- **Entergy Ex. 311:** TRC Environmental Corporation, *Cooling Tower Impact Analysis for the Indian Point Energy Center* (September 1, 2009)
- **Entergy Ex. 370:** AKRF, Inc., *Flora and Terrestrial Fauna Habitat and Communities in the Vicinity of IPEC (Coastal Zone Consistency)* (December 2012)
- Prefiled Direct Testimony of Yan Kishinevsky, P.E. (April 30, 2014)
- Prefiled Direct Testimony Richard T. Clubb, P.E. (April 30, 2014)
- Prefiled Rebuttal Testimony of Sam Beaver (March 28, 2014)
- Prefiled Rebuttal Testimony of John R. Young, Ph.D. (March 28, 2014)
- Prefiled Rebuttal Testimony of Marc J. Lawlor, Ph.D. (March 28, 2014)
- Prefiled Direct Testimony Matthew W. Allen (February 28, 2014)
- Prefiled Rebuttal Testimony of Matthew W. Allen (March 28, 2014)

Prefiled Testimony of NYSDEC Witnesses

- Prefiled Direct Testimony of Eduardo Ortiz De Zarate (February 28, 2014)
- Prefiled Direct Testimony of Tim Havey (February 28, 2014)

Additional Documents

- **Entergy Ex. 7:** Enercon Services, Inc., *Engineering Feasibility and Costs of Conversion of Indian Point Units 2 and 3 to a Closed-loop Condenser Cooling Water Configuration* (February 12, 2010)
 - **Entergy Ex. 7A:** Enercon Services, Inc., *Economic and Environmental Impacts Associated With Conversion of Indian Point Units 2 and 3 to a Closed-Loop Condenser Cooling Water Configuration* (2003)
 - **Entergy Ex. 7B:** Enercon Services, Inc., *Post Modification Site Rendering and Conceptual Drawings*
 - **Entergy Ex. 7C:** Enercon Services, Inc., *Subsurface Radiological Considerations Related to Construction of Closed-Loop Cooling at Indian Point Energy Center Units 2 and 3*
 - **Entergy Ex. 7D:** Enercon Services, Inc., *Closed-Loop Performance*
 - **Entergy Ex. 7E:** Enercon Services, Inc., *Electrical Distribution Model Output Reports*
 - **Entergy Ex. 7F:** Enercon Services, Inc., *Feasibility Evaluation of Relocating the Algonquin Gas Transmission Pipelines*
 - **Entergy Ex. 7G:** Enercon Services, Inc., *Precision Blasting and Rock Removal*
 - **Entergy Ex. 7H:** Enercon Services, Inc., *Cultural/Historic Considerations for Cooling Tower Feasibility*
 - **Entergy Ex. 7I:** Enercon Services, Inc., *Construction Schedule*
 - **Entergy Ex. 7J:** Enercon Services, Inc., *Capital Cost Evaluation*
- **Entergy Ex. 315:** Cooling Technology Institute, *Legionellosis: Guideline: Best Practices for Control of Legionella* (July 2008)
- **Entergy Ex. 321:** Cooling Technology Institute, *Cooling Tower Emissions Quantification using the Cooling Technology Institute Test Code ATC-140* (February 2003)
- **Entergy Ex. 328:** Cooling Technology Institute, J. Gill and Y. Lin, *A Synergistic Combination of Advanced Separation and Chemical Scale Inhibitor Technologies for Efficient Use of Impaired Water in Cooling Towers* (2010)
- **Entergy Ex. 331:** Cooling Technology Institute, R. Cunningham, *What is the Best Water Treatment Program for my Tower?* (Cooling Technology Institute, February 2010)
- **Entergy Ex. 332:** Cooling Technology Institute, K. Mortensen and F. Michell, *Film Fill Fouling: Updated Methods, Results and Predictions* (February 2012)
- **Entergy Ex. 346:** *June 11, 2010 memorandum from John Shunda and Kelly Meadows, Tetra Tech, to Paul Shriner and Jan Matuszko, USEPA re: cooling tower noise, plume and drift abatement costs*
- **Entergy Ex. 348:** *Excerpt: Background, Tetra Tech, Glenwood Main Power Station*

- **Entergy Ex. 355:** *Excerpt: Background, Tetra Tech, Northport Generating Station* (March 18, 2010)
- **Entergy Ex. 358:** Cooling Technology Institute, *AEP's Experience with Polyester FRP Structure Cooling Towers* (2011)
- **Entergy Ex. 360:** Cooling Technology Institute, *A Systematic Review of Biocides used in Cooling Towers for the Prevention and Control of Legionella spp Contamination* (February 2009)
- **Entergy Ex. 403:** Cooling Technology Institute, J. Missimer, D. Wheeler, and K. Hennon, *The Relationship Between SP and HGBIK Drift Measurement Results – New Data Creates a Need for Second Look* (1998)
- **Entergy Ex. 417:** NYSDEC, 6 NYCRR Parts 242 and 200 Regulatory Impact Statement, <http://www.dec.ny.gov/regulations/94833.html> (accessed April 2, 2014).
- **Entergy Ex. 425:** Regional Greenhouse Gas Initiative, Memorandum of Understanding (2005)
- **Entergy Ex. 433:** NYSDEC, *Network Plan Part 13 – CO, NOx, Pb, PM, SO2, Ozone*, <http://www.dec.ny.gov/chemical/54359.html> (accessed April 2, 2014)
- **Entergy Ex. 442:** Cooling Technology Institute, *Best Practices for Minimizing Drift Loss in a Cooling Tower* (February 2012)
- **Entergy Ex. 444:** Cooling Technology Institute, *Isokinetic Drift Test Code* (July 2011)
- **Entergy Ex. 476:** EPA, *Primary National Ambient Air Quality Standards for Nitrogen Dioxide: Final Rule*, 75 Fed. Reg. 26 (February 9, 2010)
- **Entergy Ex. 484:** New York City Department of Health and Mental Hygiene, *Air Pollution and the Health of New Yorkers: The Impact of Fine Particles and Ozone*
- **Entergy Ex. 483:** NYSDEC, *About Ozone*, <http://www.dec.ny.gov/chemical/8400.html> (April 6, 2014).
- **Entergy Ex. 521:** EIA, *Henry Hub Natural Gas Spot Price*, <http://www.eia.gov/dnav/ng/hist/rngwhhdM.htm> (April 16, 2014)
- **Riverkeeper Ex. 109:** Synapse, *Indian Point Energy Center: Effects of the Implementation of Closed-Cycle Cooling on New York Emissions and Reliability* (February 28, 2014)
- **Riverkeeper Ex. 165:** New York Energy Highway Taskforce, *New York State Energy Highway Blueprint Update* (April 2013)
- **AAEA Ex. 1:** African American Environmentalist Association, *Fish Eggs Versus Asthmatic Children in Harlem* (February 2014)
- *Final Environmental Impact Statement, New York State Pollutant Discharge Elimination Systems Permits for the Roseton 1 & 2, Bowline 1 & 2, and Indian Point 2 & 3 Steam Electric Generating Stations* (June 25, 2003)

- *Matter of Entergy Nuclear Indian Point 2, LLC & Entergy Nuclear Indian Point 3, LLC (SPDES)*, Interim Decision (August 13, 2008)
- NYSDEC, *Department Staff Offer of Proof on Permanent Forced Outages/Seasonal Protective Outages* (November 12, 2013)
- Entergy, *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* (July 11, 2014)
- *Matter of Entergy Nuclear Indian Point 2, LLC & Entergy Nuclear Indian Point 3, LLC (SPDES)*, Hearing Transcript, pp. 7285-7287, 7291-92, 7324-25, 7317, 7319, 7320-22, 7327-28, 7330, 7343, 7662-7663, 8353, 8410, 8717-18, 8739, 8753, 8788, 8790-8791, 8793-8797, 8817-8818, 8956, 9591-9598, 9615, 9627-28, 9640-42, 9792-94 (April 7, 8, 10, 11, 14, 16, 17, 2014)
- Lin et al., *Health Impact in New York City During the Northeastern Blackout of 2003*, Public Health Reports, 126(3):384-393 (2011)
- Beatty et al., *Blackout of 2003: Public Health Effects and Emergency Response*, Public Health Reports, 121(1):36-44 (2006)
- Email from Mark Lucas, Esq. to the Honorable Maria Villa et al., dated February 21, 2014

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