SUPREME COURT OF THE STATE OF NEW YORK
COUNTY OF ALBANY

In the Matter of

HUDSON RIVER SLOOP CLEARWATER, INC., et al.

Petitioners-Plaintiffs,

For a Judgment pursuant to Article 78 of the CPLR,

-against-

NEW YORK STATE PUBLIC SERVICE COMMISSION, along with KATHLEEN BURGESS in her official capacity as Secretary, AUDREY ZIBLEMAN in her official capacity as Chair, PATRICIA L. ACAMPORA, GREGG C. SAYRE, and DIANE X. BURMAN, in their official capacities as Commissioners,

Respondents-Defendants,

-and

CONSTELLATION ENERGY NUCLEAR GROUP, LLC, with Subsidiaries and affiliates EXELON GENERATION COMPANY, LLC, R.E. GINNA NUCLEAR POWER PLANT, LLC, NINE MILE POINT NUCLEAR STATION, LLC, ENTERGY NUCLEAR FITZPATRICK, LLC, ENTERGY NUCLEAR INDIAN POINT 2, LLC, and ENTERGY NUCLEAR INDIAN POINT 3, LLC,

Nominal Respondents-Defendants,

Index No. 07242-16

AFFIDAVIT OF DAVID A. LOCHBAUM

STATE OF Tennessee)
) ss:
COUNTY OF Hamilton)

David A. Lochbaum, being duly sworn, hereby deposes and, under penalties of perjury, states as follows:

1. I am David A. Lochbaum. I work for the Union of Concerned Scientists (a non-profit, public interest group) as the Director, Nuclear Safety Project out of the organization's Washington, DC offices.

2. I graduated in June 1979 with a bachelor of science degree in nuclear engineering from The University of Tennessee. I worked in the U.S. commercial nuclear power industry from June 1979 until fall 1996 when I joined the Union of Concerned Scientists. I have worked for them since then, except for the period between February 2009 and March 2010 when I worked for the U.S. Nuclear Regulatory Commission (NRC) as a reactor technology instructor at their training center where I provided initial and requalification training to NRC inspectors, reviewers, and managers.

3. I have been an expert witness in a 1996 civil action in the U.S. District Court for the Middle District of Pennsylvania regarding alleged damages caused by the March 1979 accident at Three Mile Island, in a 1998 proceeding before the NRC's Atomic Safety and Licensing Board (ASLB) regarding the proposed termination of the operating license for the Yankee Rowe nuclear plant, in a 1998 proceeding before the Indiana Utility Regulatory Commission regarding rate recovery during an extended outage of the two reactor at the Donald C. Cook nuclear plant, in a 1999 proceeding before the NRC's ASLB regarding the proposed reactivation of spent fuel pools at the

Shearon Harris nuclear plant, in a 1999 proceeding before the NRC's ASLB regarding the proposed replacement of storage racks in the spent fuel pool for the Millstone Unit 3 reactor to increase its storage capacity, in a 2000 proceeding before the Vermont Public Service Board regarding the proposed transfer of ownership of the Vermont Yankee nuclear plant, in a 2000 proceeding before the NRC's ASLB regarding the proposed transfer of the operating licenses for the Indian Point and FitzPatrick nuclear plants, in a 2008 proceeding before the NRC's ASLB regarding the proposed license renewal of the Pilgrim nuclear plant, and in a 2008 proceeding before the NRC regarding the proposed construction and operation of new reactors at the Shearon Harris nuclear plant.

4. I submit this Affidavit in support of Petitioners' effort, pursuant to Article 78 of the New York State Civil Practice Law and Rules and Declaratory Judgment challenge to rescind, annul, vacate, and set the Tier 3 orders issued by the New York State Public Service Commission dated August 1, 2016 and September 17, 2016 and the December 15, 2016 rehearing denial.

5. Nuclear power is neither emissions free nor "zero-emissions."

6. Nuclear power plants emissions include radiation, waste heat, and greenhouse gases.

7. Owners of operating nuclear power plants submit annual reports to the NRC describing the planned and unplanned releases of radioactivity in gaseous, liquid, and solid form.[1]

8. In September 2010, the Union of Concerned Scientists released my report "Regulatory Roulette: The NRC's Inconsistent Oversight of Radioactive Releases from

[1] The NRC's webpage https://www.nrc.gov/reactors/operating/ops-experience/tritium/plant-info.html provides links to the annual reports submitted since 2005. The NRC's Public Document Room enables earlier reports to be accessed.

Nuclear Power Plants."[2] This report described the federal regulations that permit nuclear plant owners to release radioactivity to the air and water, but only through controlled and monitored pathways. The total quantity of radioactivity released via these controlled and monitored pathways must be kept less than limits established to protect workers and the public.

9. In addition to these routine, permitted releases, virtually every nuclear plant has experienced leaks and spills where radioactive releases reached the environment through uncontrolled and unmonitored pathways. A January 2017 update by the NRC reports that 46 of the nation's 65 nuclear plants have experienced such leaks and spills.[3]

10. The routine, permitted emissions factor in dilution by mixing with rivers and lakes before radioactively contaminated water is used as a public drinking source. Leaks and spills through uncontrolled and unmonitored pathways can result in radioactive emissions not being attenuated before being encountered by workers and the public.

11. The 2013 report[4] submitted to the NRC by the owner of the Indian Point Energy Center in New York indicated that there were 269 batch gaseous releases of an average duration of 52.5 minutes from Indian Point Units 1 and 2 and an additional 101 batch gaseous releases of an average duration of 94.5 minutes from Indian Point Unit 3. The report indicated the gaseous releases from Indian Point Units 1 and 2 totaled 0.482 curies of fission & activation products, 13 curies of tritium, and 11 curies of Carbon-14.

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[2] Available online at http://www.ucsusa.org/nuclear-power/whos-responsible-nuclear-power-safety/regulatory-roulette#.WKxLhnkzXL8

[3] Nuclear Regulatory Commission fact sheet dated January 2017, "Leaks and Spills At U.S. Commerical Nuclear Power Plants." Available online at https://www.nrc.gov/docs/ML1703/ML17030A025.pdf

[4] Entergy Nuclear Northeast letter dated April 28, 2014, to the U.S. Nuclear Regulatory Commission, "2013 Annual Radioactive Effluent Release Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML14127A085

The report indicated the gaseous releases from Indian Point Unit 3 totaled 0.352 curies of fission & activation products, 13.3 curies of tritium, and 10 curies of Carbon-14.

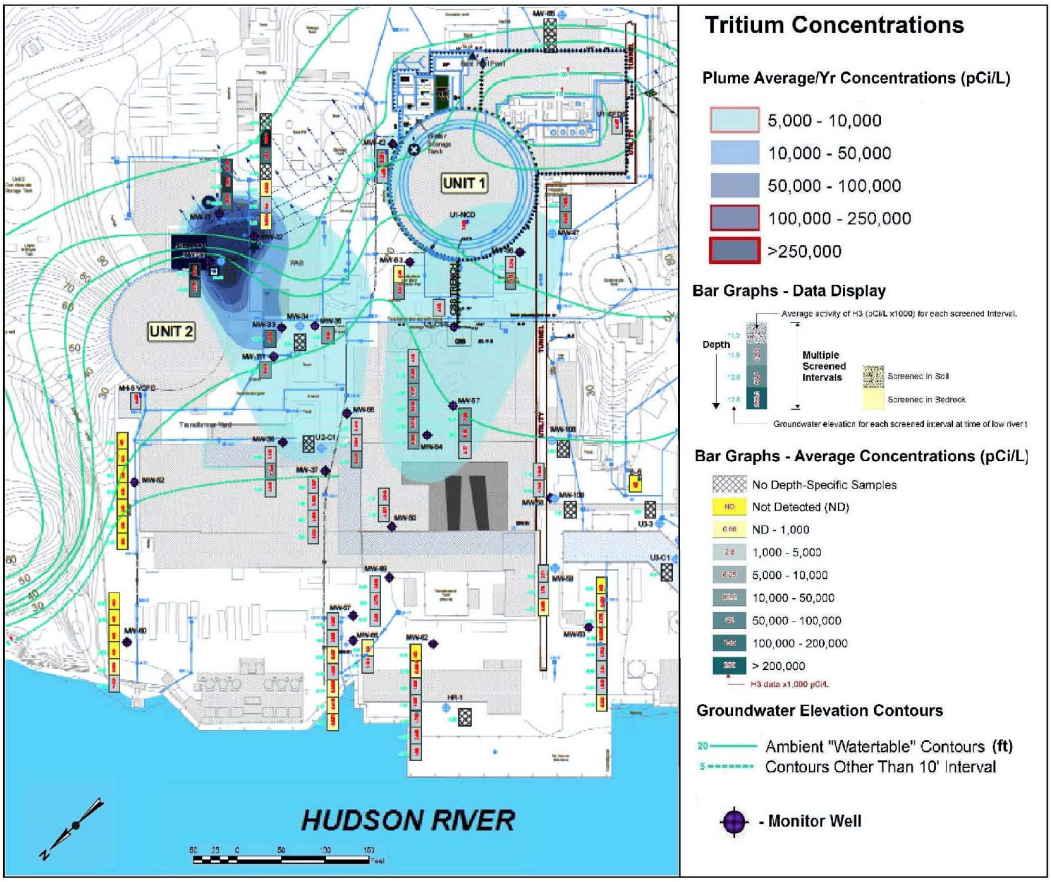
12. The 2013 report[5] submitted to the NRC by the owner of the Indian Point Energy Center indicated 55 batch liquid releases of an average duration of 105 minutes from Indian Point Units 1 and 2 and an additional 126 batch liquid releases of an average duration of 110 minutes from Indian Point Unit 3. The report indicated the liquid releases from Indian Point Units 1 and 2 totaled 0.0521 curies of fission & activation products and 1,310 curies of tritium. The report indicated the liquid releases from Indian Point Unit 3 totaled 0.0241 curies of fission & activation products and 735 curies of tritium.

13. In addition to the radioactively contaminated water emissions from the Indian Point Energy Center via monitored and controlled pathways, radioactively contaminated water has leaked into the soil and migrated to the groundwater and Hudson River. Figure 1 shows the estimated plumes of tritium leaking from Indian Point Unit 1 and 2 structures into the soil and flowing towards the Hudson River. The U.S. Environmental Protection Agency's drinking water limit for tritium contamination is 20,000 picocuries per liter.[6] Figure 1 shows some tritium concentration values to exceed 20,000 picocuries per liter, such as those near the Unit 2 fuel handling building, this water is not drinking water so the EPA limit has not been violated. But Figure 1 clearly illustrates the fact that there are emissions of radiation from Indian Point.

[5] Entergy Nuclear Northeast letter dated April 28, 2014, to the U.S. Nuclear Regulatory Commission, "2013 Annual Radioactive Effluent Release Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML14127A085

[6] https://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html

Figure 1: Tritium Plumes from Indian Point Units 1 and 2 as of the Fourth Quarter of 2014[7]



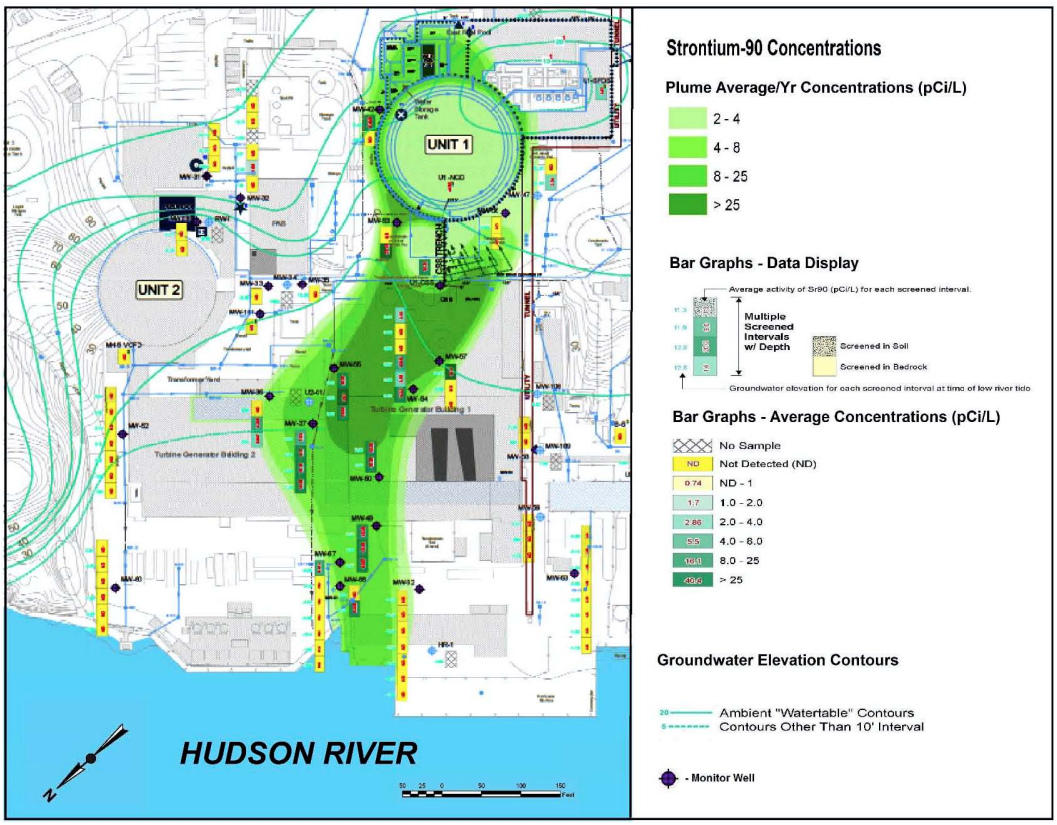
14. Figure 2 shows the estimated plumes of Stronium-90 leaking from Indian Point Unit 1 and 2 structures into the soil and flowing towards the Hudson River. The U.S. Environmental Protection Agency's drinking water limit for Strontium-90 contamination is 8 picocuries per liter.[8] Figure 2 shows some Strontium-90 concentration values to exceed 8 picocuries per liter, such as those between the Unit 1 containment

[7] U.S. Nuclear Regulatory Commission, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Generating Unit Nos. 2 and 3," December 2015. Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML15351A422

[8] https://www3.epa.gov/region9/water/drinking/files/dwsha_0607.pdf

building and the Hudson River, this water is not drinking water so the EPA limit has not been violated. But Figure 2 clearly illustrates the fact that there are emissions of radiation from Indian Point.

Figure 2: Strontium-90 Plumes from Indian Point Units 1 and 2 as of the Fourth Quarter of 2014[9]



15. The 2013 report[10] submitted to the NRC by the owner of the Indian Point Energy Center indicated 20,100 cubic feet of radioactively contaminated solids (e.g.,

[9] U.S. Nuclear Regulatory Commission, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Generating Unit Nos. 2 and 3," December 2015. Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML15351A422

[10] Entergy Nuclear Northeast letter dated April 28, 2014, to the U.S. Nuclear Regulatory Commission, "2013 Annual Radioactive Effluent Release Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML14127A085

resins, filters, evaporator bottoms and dry active waste) were transported offsite in 56 shipments from Indian Point Units 1 and 2. The 2013 report submitted to the NRC by the owner of the Indian Point Energy Center indicated 20,500 cubic feet of radioactively contaminated solids (e.g., resins, filters, evaporator bottoms and dry active waste) were transported offsite in 19 shipments from Indian Point Unit 3.

16. Paragraphs 11 through 15 cite typical reports about planned and unplanned emissions of radioactivity from Indian Point that conclusively show that this nuclear power plant is neither emissions free nor "zero-emissions" when it comes to radioactivity.

17. The 2015 report[11] submitted to the NRC by the owner of the R. E. Ginna nuclear plant in New York indicated there were 23 batch gaseous releases of an average duration of 21,900 minutes. The report indicated the gaseous emissions totaled 7.34 curies of fission & activation products, 171.8 curies of tritium, and 6.8 curies of Carbon-14.

18. The 2015 report[12] submitted to the NRC by the owner of the R. E. Ginna nuclear plant in New York indicated there were 89 batch liquid releases of an average duration of 180 minutes. The report indicated the gaseous emissions totaled 411.9 curies of tritium.

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[11] Exelon Generation letter dated May 12, 2016, to the U.S. Nuclear Regulatory Commission, "Annual Radioactive Effluent Release Report and Annual Radiological Environmental Operating Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML16145A506

[12] Exelon Generation letter dated May 12, 2016, to the U.S. Nuclear Regulatory Commission, "Annual Radioactive Effluent Release Report and Annual Radiological Environmental Operating Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML16145A506

19. The 2015 report[13] submitted to the NRC by the owner of the R. E. Ginna nuclear plant in New York indicated 43.63 cubic meters of radioactively contaminated solids (e.g., resins, filters, evaporator bottoms and dry active waste) were transported offsite in 9 shipments.

20. Paragraphs 17 through 19 cite typical reports about planned and unplanned emissions of radioactivity from R. E. Ginna that conclusively show that this nuclear power plant is neither emissions free nor "zero-emissions" when it comes to radioactivity.

21. On July 18, 1991, the NRC announced[14] it proposed a $137,500 fine on the owner of the James A. FitzPatrick nuclear plant in New York for the unplanned and unmonitored release of radioactive gases to the atmosphere from the liquid waste concentrator. Rainfall deposited some of the radioactivity into the plant's storm drain system which carried it into Lake Ontario. According to the NRC's press release about the fine, "the NRC staff alleges that the levels released to Lake Ontario were as high as 65 times the maximum permissible concentration," conclusively showing that this nuclear power plant is neither emissions free nor "zero-emissions" when it comes to radioactivity.

22. U.S. nuclear power plants currently use light water reactors that are approximately 33 percent efficient. For every three units of thermal energy produced by the reactor core, about one unit of electrical energy is sent out to the offsite power grid

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[13] Exelon Generation letter dated May 12, 2016, to the U.S. Nuclear Regulatory Commission, "Annual Radioactive Effluent Release Report and Annual Radiological Environmental Operating Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML16145A506

[14] U.S. Nuclear Regulatory Commission press release dated July 18, 1991, "NRC Staff Proposed to Fine New York Power Authority $137,500 for Alleged Violations at its FitzPatrick Nuclear Power Plant." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML003702044

and about three units of energy are discharged to the environment as waste heat. Nuclear power plants use once-through cooling (e.g., water drawn from a nearby lake, river, or ocean and returned to that source warmed by the waste heat) or closed-cycle cooling (e.g., water circulated through a cooling tower to minimize water drawn from and released back to the nearby body of water.)

23. The September 2001 report[15] submitted to the New York State Department of Environmental Conservation by the owner of the Nine Mile Point nuclear plant in New York indicated that the maximum difference between the water taken in by Unit 1 and discharged back from Unit 1 was 31°F, within the 35°F maximum allowed by the permit. The report indicated the maximum temperature of the water discharged from Unit 1 was 104°F, below the 115°F maximum allowed by the permit. This typical report about thermal discharges from Nine Mile Point conclusively shows that this nuclear power plant is neither emissions free nor "zero-emissions" when it comes to thermal pollution.

24. The September 2006 report[16] submitted to the New York State Department of Environmental Conservation by the owner of the James A. FitzPatrick nuclear plant in New York indicated that the maximum difference between the water taken in and discharged back was 28.9°F, below the 32.4°F maximum allowed by the permit. The report indicated the maximum temperature of the water discharged was 93.7°F, below the 112°F maximum allowed by the permit. This typical report about thermal discharges

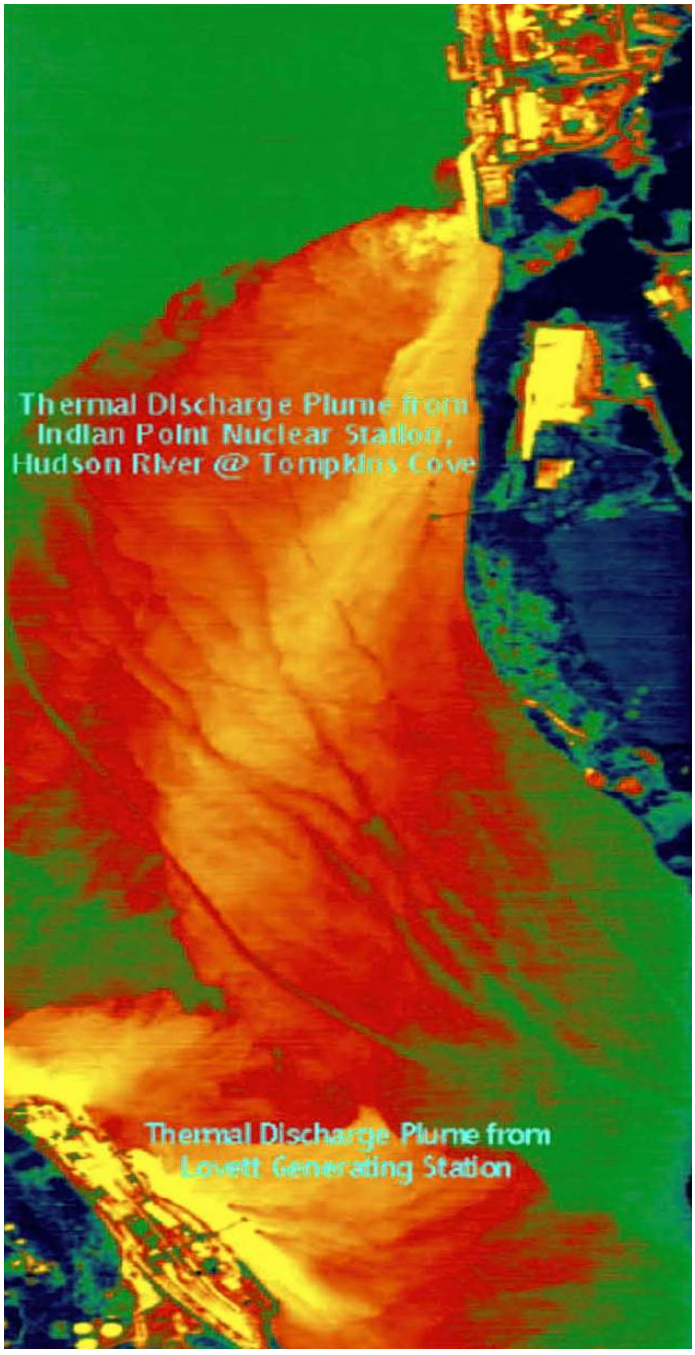
[15] Niagara Mohawk letter dated October 25, 2001, to the New York State Department of Environmental Conservation, "Nine Mile Point Nuclear Station State Pollutant Discharge Elimination System Permit No. NY 0001015 September 2001 Discharge Monitoring Report." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML020160321

[16] Entergy Nuclear Northeast letter dated October 20, 2006, to the New York State Department of Environmental Conservation, "James A. FitzPatrick Nuclear Power Plant SPDES Reooirt Facility ID #NY0020109." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML063630311

from FitzPatrick conclusively shows that this nuclear power plant is neither emissions free nor “zero-emissions” when it comes to thermal pollution.

25. The Final Environmental Impact Statement prepared by the New York State Department of Environmental Conservation to support renewal of State Pollutant Discharge Elimination System permits for power plants along the Hudson River examined the effect of warmed water discharged by Indian Point Unit 3 into the river. Figure 3 shows the thermal plumes from that study. This report and Figure 3 conclusively show that Indian Point is neither emissions free nor “zero-emissions” when it comes to thermal pollution.

Figure 3: Thermal Discharge Plumes from Indian Point Unit 3 and the Downstream Lovett Generating Station[17]



[17] New York State Department of Environmental Conservation Final Environmental Impact Statement dated June 25, 2003. Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML073090416

26. A review[18] of 103 studies of the estimated greenhouse gas emissions from nuclear power plants over their life cycles reported the estimates ranged from 1.4 grams of carbon dioxide equivalent per kilowatt hour (g CO_2e/kWh) to 288 g CO_2e/kWh with a mean of 66 g CO_2e/kWh.

27. The review of 103 studies of greenhouse gas emissions from nuclear power plants over their life cycles additionally provided information about greenhouse gas emissions from various energy sources. Figure 4 from the review shows that while some energy sources release more greenhouse gases than nuclear power, many energy sources release less greenhouse gases.

[18] Paper by Benjamin K. Sovacool accepted April 21, 2008, "Valuing the greenhouse gas emissions from nuclear power: A critical survey." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML100601133

Figure 4: Greenhouse Gases Emitted by Electricity Producers[19]

Lifecycle estimates for electricity generators[a]

Technology	Capacity/configuration/fuel	Estimate (gCO_2e/kWh)
Wind	2.5 MW, offshore	9
Hydroelectric	3.1 MW, reservoir	10
Wind	1.5 MW, onshore	10
Biogas	Anaerobic digestion	11
Hydroelectric	300 kW, run-of-river	13
Solar thermal	80 MW, parabolic trough	13
Biomass	Forest wood Co-combustion with hard coal	14
Biomass	Forest wood steam turbine	22
Biomass	Short rotation forestry Co-combustion with hard coal	23
Biomass	FOREST WOOD reciprocating engine	27
Biomass	Waste wood steam turbine	31
Solar PV	Polycrystalline silicone	32
Biomass	Short rotation forestry steam turbine	35
Geothermal	80 MW, hot dry rock	38
Biomass	Short rotation forestry reciprocating engine	41
Nuclear	Various reactor types	66
Natural gas	Various combined cycle turbines	443
Fuel cell	Hydrogen from gas reforming	664
Diesel	Various generator and turbine types	778
Heavy oil	Various generator and turbine types	778
Coal	Various generator types with scrubbing	960
Coal	Various generator types without scrubbing	1050

[a] Wind, hydroelectric, biogas, solar thermal, biomass, and geothermal, estimates taken from Pehnt (2006). Diesel, heavy oil, coal with scrubbing, coal without scrubbing, natural gas, and fuel cell estimates taken and Gagnon et al. (2002). Solar PV estimates taken from Fthenakis et al. (2008). Nuclear is taken from this study. Estimates have been rounded to the nearest whole number.

28. As part of its application for the renewal of the reactor operating licenses, the owner of the Indian Point Energy Center provided the NRC with information on the

[19] Paper by Benjamin K. Sovacool accepted April 21, 2008, "Valuing the greenhouse gas emissions from nuclear power: A critical survey." Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML100601133

greenhouse gas emissions from the plant. Figure 5 contains the owner's data as reported by the NRC.

Figure 5: Estimated Greenhouse Gas Emissions From Indian Point 2009-2013[20]

Estimated Greenhouse Gas Emissions from Operations at IP2 and IP3

Year	Combustion Related Sources (CO_{2eq} (MT/year))[(a)]	Worker Vehicles (CO_{2eq} (MT/year))	Electrical Equipment Related Sources (CO_{2eq} (MT/year))[(b)]	Total (CO_{2eq} (MT/year))[(c)]
2009	330	4,470	1,250	6,050
2010	750	4,470	3,740	8,960
2011	360	4,470	1,250	6,080
2012	290	4,470	6,230	10,990
2013	490	4,470	N/A	4,960

[(a)] Sources include diesel generators, pumps, boilers, and gas turbines. Emissions estimated based on annual fuel usage.

[(b)] Represents emissions of sulfur hexafluoride used in electrical equipment. Entergy does not track pounds of sulfur hexafluoride added to electrical equipment. Emission values were estimated based on the number of sulfur hexafluoride canisters (115 pounds per canister) utilized, assuming the entire canister represents GHG emissions. No data are available for 2013.

[(c)] Total emissions from combustion sources, worker vehicles, and electrical equipment.

29. Paragraphs 26 through 28 conclusively show that nuclear power is neither emissions free nor "zero-emissions" when it comes to greenhouse gases.

30. On December 3, 1998, the National Advertising Division (NAD) of the Council of Better Business Bureaus, Inc. announced[21] the conclusions from its investigation of a complaint filed by the Natural Resources Defense Council (NRDC) against ads placed by the Nuclear Energy Institute (NEI), the nuclear industry's trade group, in the *New York Times*, *Washington Post*, *New Republic*, and other publications. NRDC contended that the ads may deceive consumers about the actual environmental impact of nuclear power. The NAD concluded:

[20] U.S. Nuclear Regulatory Commission, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 38, Regarding Indian Point Generating Unit Nos. 2 and 3," December 2015. Available online at https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML15351A422

[21] Letter dated December 3, 1998, from Peter C. Marinello, Senior Advertising Review Specialist, National Advertising Division, to Katherine Kennedy, Natural Resources Defense Council, "Advertising for Nuclear Energy."

a. "NAD determined that consumers can reasonably interpret the claim to mean that electricity generated by nuclear power is produced without any negative impact on the environment. The record, however, does not support this interpretation of the claim."

b. "NAD recommends that the advertiser refrain from using overly broad claims that nuclear energy is 'Environmentally Clean' or produces electricity 'without polluting the environment.'"

c. "NAD concluded that it is inaccurate to make an unqualified claim that nuclear electricity does not 'pollute the air.'"

d. "NAD was not persuaded by NEI's arguments that, because nuclear power plants comply with federal and state regulations regarding the acceptable levels for thermal discharge, that nuclear power plants can make an unqualified claim that 'nuclear energy generates electricity without polluting the water.'"

31. The NAD investigation conclusively shows that labeling nuclear energy as emissions free or "zero-emissions" is not supported by the evidence and therefore is clearly deceptive.

David A. Lochbaum

Sworn to before me this

6 day of March 2017

Notary Public

DEAYN MCCLELLAN
STATE OF TENNESSEE NOTARY PUBLIC
HAMILTON COUNTY