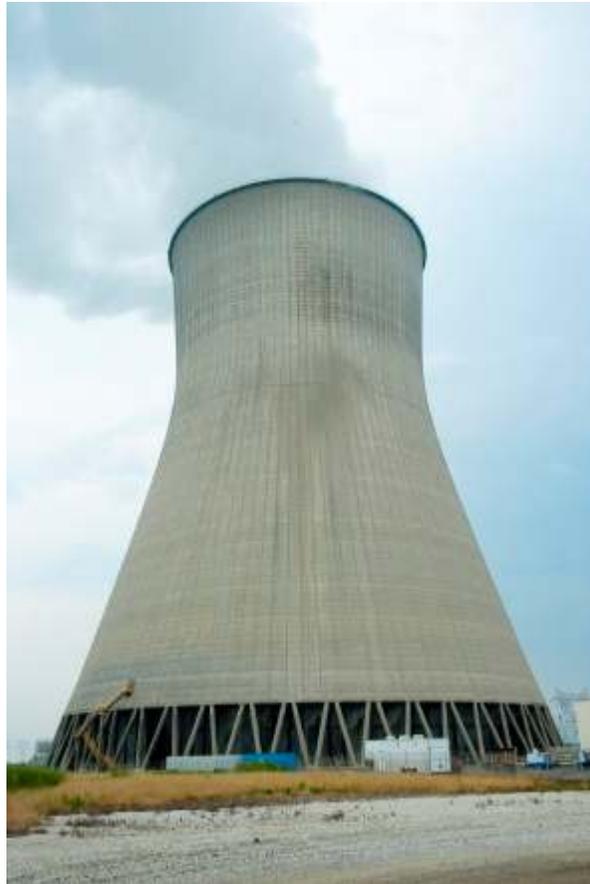


# Energy Matters

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## [Cooling the Waters, Taking the Heat](#)

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**By Roger Witherspoon**

In an unprecedented move, the environmental agencies of New Jersey and New York have begun forcing scores of their largest water users to either retrofit their plants with modern cooling systems which won't kill billions of fish annually or cease operating.

Environmental analysts in the two states have found that these facilities kill more than 20 billion juvenile and mature fish annually in New York and another nine billion in New Jersey. These operations have had a negative impact on a variety of fish, including the

endangered Atlantic Sturgeon which returns to the Hudson River to spawn and sea turtles in the Delaware River which were sucked into the cooling systems at the Salem Nuclear Generating Station.

Even more alarming is the finding by the National Marine Fisheries Service that the “once through cooling systems” are vacuuming up trillions of newly hatched fish – those under a half inches in length – and destroying them in their heat exchangers. The NMFS directly challenged the finding by the Nuclear Regulatory Commission that the damage to the aquatic environment is “moderate”, and asserted there is “strong evidence” that the decline in fish stocks along the entire northeast Atlantic seaboard is due more to the destruction of baby fish than to over fishing of adults.



The scale of the destruction can be seen in the NRC’s environmental assessment of the twin Indian Point nuclear plants in Buchanan, 30 miles north of Manhattan in the heart of the Hudson River tidal estuary. In determining that the overall impact on essential fish habitat is “small to moderate” the agency noted approvingly that new screens installed in front of the 40-foot-wide intake pipes in 1984 had reduced the destruction of baby fish between 1984 and 1991 by *187 Billion per year* to its present rate of *just 300 Billion* newly hatched fish.

“The NMFS does not reach all of the same conclusions as the NRC with respect to adverse effects that relicensing IP2 and IP3 would have on the fishery resources and their habitats,” Peter Colosi, the agency’s assistant northeast regional administrator, wrote in an acerbic analysis of the impacts of the Hudson River nuclear plants.

“Given the immense natural productive potential of the Hudson River Estuary,” Colosi continued, “and taking consideration the staggering numbers of organisms that are lost directly, indirectly, and cumulatively through continued operation of electric generating stations that continue to use once-through cooling technology in the Mid-Hudson, the NMFS suggests that the current Indian Point relicensing process is an appropriate and opportune time to apply the Clean Water Act.”

But the efforts by the two state environmental agencies to enforce the discharge provisions of the Clean Water Act have drawn fierce resistance from companies opposed to spending billions of dollars to change their money-saving practice of freely using public waterways. On

Thursday, Exelon Corp, operator of the nations' largest nuclear power fleet, made good on its longstanding threat to close the 636-Megawatt, Oyster Creek nuclear power plant rather than install a closed cycle system. In New York, Entergy Nuclear, which owns the Indian Point plants, has been spending millions of dollars on media campaigns and lobbying against what they claim is a politically motivated "fish vs. jobs" issue. Ironically, the NRC assessment states that the five year construction project would provide some 2,300 direct jobs, making it one of the region's largest employment projects.

The drive, by the New Jersey Department of Environmental Protection and the New York Department of Environmental Conservation, involves nine New Jersey plants at seven power company sites and more than 40 New York electric generating plants – including most of the region's nuclear power facilities – and large manufacturers such as cement makers and a 100-year-old Yonkers subsidiary of Dominoes Sugar.



New Jersey's efforts to force compliance involve four plant sites operated by PSEG – ranging from the twin reactors at the Salem Nuclear Generating Station, which use 3 billion gallons of water daily, to the Sewaren natural gas plant using 540 million gallons daily; as well as plants operated by Exelon, RC Cape May Holdings, and Conectiv.

New York has destructive plants throughout the state, but the biggest impacts are created by the gauntlet of power plants along the Long Island Sound and the lower Hudson River which kill fish by the trillions as they migrate up to 200 miles from the Atlantic Ocean to spawning sites along the Hudson River.

Because of the economic and political clout these types of firms possess, no other states have moved to force some 550 companies using similar "once through cooling systems" to comply with the dictates of the federal Clean Water Act. Indeed, the most destructive power plant in New York State is the coal and oil Northport Power Station in Suffolk County, along the north shore of Long Island Sound. That plant alone sucks more than 9.5 billion mature fish into its system annually, according to the state's DEC. And though this wholesale vacuuming of migrating fish has a negative impact on the important recreational and commercial fishing operations, County Executive Steve Levy refused several requests to discuss the subject.

Even the U.S. Environmental Protection Agency has continually ducked the issue, though their own analysis concluded that these plants collectively kill more than one trillion fish annually and disrupt their local aquatic ecosystems with their hot water discharges. On Nov. 22, the EPA settled a federal court suit brought by Riverkeeper and agreed to set regulations for the nation's power plants and manufacturers using once through cooling by the end of March, 2011.



“You cannot take the amount of fish, small fry, larvae and eggs that Indian Point does from the estuary without having a major effect on the ecological health of the Hudson River,” said Riverkeeper Director Paul Gallay. An analysis of the river’s stocks prepared in 2008, he said, “showed nine out of 13 of the most significant species of fish in the Hudson River are in significant decline. That details some of the potential ways Indian Point being contributes to this overwhelming decline in the health and numbers of these species.”

### **Wedge Wire Wars**

During the Bush Administration, the EPA sought to allow polluters such as the Salem Nuclear Generating Station in New Jersey’s Barnegat Bay and the Indian Point Energy Center on the Hudson River to continue killing billions of fish annually as long as they applied “mitigating” measures.

Those provisions were challenged in a federal suit in 2004 by a coalition of states, including New York and New Jersey; and environmental groups, including Hackensack, Hudson River and Delaware Riverkeeper, New York/New Jersey Baykeeper, and Scenic Hudson; and nuclear industry groups including Entergy Corp. and PSEG Nuclear.

But two federal courts – U.S. Circuit Court before then-Judge Sonia Sotomayor in 2004, and the 2<sup>nd</sup> Circuit Court of Appeals in 2006 – held that there was no substitute for complying with the Clean Water Act. The EPA, then headed by Stephen Johnson, declined to come up with new regulations and the Obama EPA – now headed by former NJ DEP Commissioner Lisa Jackson – has continually pushed back projected dates for issuing new draft regulations. Officials now say draft rules may be released by the end of the year.

Entergy’s current publicity campaign contends that closed cycle cooling systems are unnecessary and the problem with fish kills can be eliminated by installing more tight-mesh wedge wire screens. While that is the company’s public position, they have actually gone to

court to successfully prove that wedge wire screens are not designed for high-flow systems like nuclear power plants and should never be considered for nuclear plant use.

Entergy contended in a suit against the EPA filed in 2005 in the Second U.S Circuit Court of Appeals that wedge wire screens were designed for systems in still waters with flows of less than 100 million gallons daily – not the two to three billion gallons used daily by nuclear plants. At that time, Entergy argued that the EPA’s proposed rule allowing the use of wedge wire “rests in all respects on sales talk...discussions between EPA’s contractor and sales representatives from two companies that manufacture these screens.

“No law allows a key regulatory assumption to be based on a sales pitch by a randomly selected self-interested vendor.”

The environmental agencies of both states have rejected the use of wedge wire screens as ineffective.

“We didn’t really consider wedge wire,” said Susan Rosenwinkel, the project manager and principal environmental engineer for New Jersey’s DEP. “Our position is in order for the science to work wedge wire needs a freshwater environment, and a draw of less than 100 million gallons per day, and the intake velocity rate must be less than 0.5 feet per second. The velocity of water coming into the nuclear plants is about 1 foot per second and they use 2 billion gallons of water a day.”

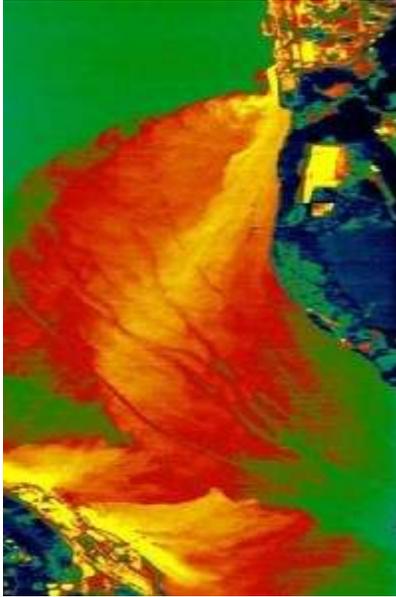
### **The Need to Chill**

Cooling systems are vital to power generation, particularly those of nuclear plants. In a nuclear plant operation there are a series of three heat exchanging loops of water. The first is water superheated to more than 700 degrees Fahrenheit within the reactor and cycled through thin metal tubes in a steam generator and then back into the reactor.

The second contains relatively uncontaminated water which flows over the metal tubes containing the reactor water and, through this contact, is heated to about 500 degrees Fahrenheit. It is kept liquid under pressure and then flows through pipes towards the giant turbines. There, the pressurized hot water is released and flashes to steam which blows over the 40-ton turbine blades and makes it spin. The spinning turbine runs the generator which makes electricity.

After the steam passes the turbine, it flows over a third loop of pipes containing cold water from the river, and that contact causes the steam to condense back to a liquid. It can then be

pumped back to the steam generator to repeat the process. The water in the third loop which was used to cool the steam is then dumped back into the river – but 30 degrees hotter than before. This thermal pollution forms a barrier which alters the aquatic balance, changes the habitat for fish, plants, and parasites, and causes fatal heat shock in billions of passing fish.



The heat dumped into the waterway is tremendous, particularly at nuclear sites. The thermal discharge at PSEG’s, coal powered, Mercer Generating Station in Hamilton, for example, dumps about 1.5 billion BTUs of heat into the waterway, according to company records. The nuclear power plants at Salem, however, dump about 30 billion BTUS of heat hourly into waterway. That is the equivalent of the heat which would be generated by exploding a nuclear bomb, the size of the bomb which destroyed Hiroshima, in the waters of Barnegat Bay every two hours, all day, every day.

It is for that reason that the states have required plants to go to closed cycle cooling systems.



“We don’t mandate a particular technology,” said Nancy Wittenberg, assistant commissioner

for New Jersey's climate and environmental management programs. "We just mandate a measure of production. Hope Creek nuclear plant has a cooling tower, while the two Salem nuclear plants do not.

"Whether they build a cooling tower or use another closed cycle system is their decision, as long as it meets our objectives.

There are a variety of systems, ranging from mechanical draft – which resembles a three story radiator and is used at the Vermont Yankee nuclear plant – to the massive cooling towers used at the Hope Creek plants. New York's DEP specifically recommends the mechanical draft type of system to retrofit on existing plants. Entergy's public contention that the DEC is ordering the installation of cooling towers at Indian Point is false.

Chuck Nieder, a biologist and head of the DEC Steam Electric Unit and author of the state's assessment, noted that while cooling towers are the most effective and would eliminate 98% to 100% of the fish mortality, the mechanical draft systems may be more cost effective for existing plants and would still reduce the mortality to an acceptable 95 percent level and are successfully used at the Nine Mile Point nuclear station.

In addition Nieder said an analysis of fiscal data provided by Entergy showed that cooling towers – the most expensive option – would cost \$1.5 billion to construct and operate over the 20 year life cycle, but that amounts to only 5.9% of Entergy's projected profit of \$24.5 billion and is not unreasonable.

Riverkeeper attorney Reed Super said "cooling towers are more expensive than the mechanical draft<sup>6</sup> and take a lot more land. If they were mandated state wide they would reduce fish kills by 100 percent, whereas the mechanical draft would eliminate only 95%

"There comes a point of diminishing returns, where you are spending a lot of money for that last 5%. The DEC is right to recommend that for brand new facilities, but just as correct to recommend mechanical draft for retrofitting existing ones."

In New Jersey, the DEP analysis found that The Salem nuclear plants are killing more than 3 billion fish annually. For the past 20 years, the company has developed and maintained an extensive wetlands restoration site designed to foster spawning of and safe development of Barnegat Bay aquatic life. But that program has been deemed ineffective by the state DEP and challenged on other grounds by the New Jersey Environmental Federation.



“The wetlands were taken over by invasive phragmites,” said Federation vice chair Jane Nogaki. “Restoring wetlands, while admirable, will not bring back the annual loss of fish that occurs year after year. We don’t think you can take three billion fish a year out of the system and not have an impact on the health of the estuary.”

“And in the process of restoring wetlands, PSEG has introduced over 22,000 pounds of the herbicide glyphosate into the estuary in an attempt to control the phragmites. They have been performing annual herbicide applications in Lower Alloways Creek wetlands for 15 years, and that is certainly not a sustainable effort.”

### **Dueling Federal Agencies**

The Nuclear Regulatory Commission is at odds with both state agencies. Their environmental assessment of Essential Fish Habitat for the Indian Point, Oyster Creek, and Salem nuclear plants found that the impacts were “moderate” and there were no environmental impediments to continuing the once-through operations for another 20 years.

“There is a cozy relationship between the NRC and the nuclear industry,” said New York Congressman Eliot Engel. “They always belittle very serious difficulties.”

According to the NRC, the difference between their assessment and that of the state environmental agencies and the National Marine Fisheries Service is that they are not really evaluating the same systems and impacts.

“When you talk about essential fish habitat we are not really talking about the animals,” said NRC biologist Dennis Logan. “You are talking about the habitat the fish live in. It is a separate and distinct question from looking at the fish populations themselves. Some species are adversely affected and some are not affected at all.”

“Essential fish habitat looks at the changes in the habitat. The fish stock that goes through, that came in as fish and died or were removed from the system by going through the power plant and are no longer available as food or recreation are another matter. It is not a direct

impact on the habitat.”

And Drew Stuyvenberg, the NRC’s environmental project manager and coordinator of assessments in the division of license renewal, said “a lot of those fish are anchovies, and there are a lot of anchovies in the Hudson River and they produce a lot of eggs. The standard we look at is whether the impacts are so great that the power plant could not remain operating as a choice for decision makers. The test is, are those impacts outside the impacts of other alternatives to licensing?”

But Colosi of the National Marine Fisheries Service was critical of the NRC’s approach which, he said, looked at a “variety of predominantly physical impacts that the NRC dismisses based upon prior experience at other nuclear plants.”

He contended that Stuyvenberg’s assessment that altered current patterns around the massive intake and discharge pipes “have not been found to be a problem at operating nuclear power plants” is wrong.

“Given the large volumes of water consumed at Indian Point each day and the relatively narrow configuration of the Hudson River, it seems plausible that under full operation, the plant could induce noticeable changes in the current regime or induce changes in the local erosion and accretion rates that have unintended adverse effects such as losses of submerged aquatic vegetation, chronic disturbances that discourage settlement of tiny prey items, and similar effects.

“Our regulations compel us to assume the worst case scenario, that the effluent is creating a barrier to migrating fishes and other unacceptable environmental conditions.”