STATEMENT FOR THE RECORD

by

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to the

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New Jersey Department of Environmental Protection

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Ms. Patterson and Ms. Rosenwinkel, thank you for the opportunity to appear before you today. I would also like to acknowledge Assistant Commissioner Wittenberg, who is in attendance.

My name is Dr. William Skaff. I am a Manager of Policy Development at the Nuclear Energy Institute. NEI establishes unified nuclear industry policy on regulatory, financial, technical, and legislative issues. NEI's members include all companies licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architectural/engineering firms, fuel fabrication facilities, materials licensees, and other organizations involved in the industry.

I was born and raised in New Jersey and did my undergraduate work at Rutgers University. As a youth, I vacationed at my grandparents' rooming house in Asbury Park. So, the Jersey shore has a personal significance for me.

My testimony draws from a study that I completed at NEI entitled *Water Use, Electric Power, and Nuclear Energy: A Holistic Approach to Environmental Stewardship*, which I would like to submit to the Department at this time for the record. This study is based on published research conducted by federal and state agencies, national laboratories, research institutes and organizations, and academia. The conclusion of this study is that a comprehensive approach to environmental preservation that takes into account all aspects of an ecosystem is necessary for accurate judgments and effective action.

Let me emphasize, at the outset, that there is a common misperception that cooling towers are more environmentally friendly than once-through cooling systems. Cooling towers are a good choice for certain ecosystems. I believe, however, that if people knew the facts, they would think twice about calling for a cooling tower retrofit at Barnegat Bay. My testimony will focus on three topics:

► first, once-through cooling systems are not harmful to aquatic life populations;
►second, cooling towers increase water consumption;
►and, third, cooling towers concentrate impurities in the waterbody.
►Then I will briefly mention several other environmental considerations regarding cooling tower retrofits.

I. Once-Through Cooling Systems Not Harmful to Aquatic Life Populations

Scientific studies conducted at thermoelectric power plant sites across the country—and reviewed by federal licensing and state permitting authorities—demonstrate that once-through cooling systems do not adversely impact the aquatic life populations of the waterbodies where they are located. This is so for two reasons. First, the individual mortality caused by cooling system impingement and entrainment is very small when compared to the overall population count. And, second, the highly prolific reproductive activity of aquatic life readily replaces the lost individuals.

NEI's study highlights three of these aquatic life studies at the sites of the Salem, Indian Point, and North Anna nuclear plants, all with once-through cooling systems. The North Anna results are typical. Impingement mortality ranges from .02 percent to 1.4 percent per year of aquatic species populations. Entrainment mortality ranges from .01 percent to 4 percent. Among the fish present at North Anna, a single female of one species spawns from 11,000 to 190,000 eggs annually, and the female of another species can produce from 211,000 to 540,000 eggs at two years of age. The study concludes that "overall, the abundance and quality of the fishery has remained healthy and balanced despite increased fishing pressure and shoreline development."

Since other waterbodies with once-through cooling system power plants have not experienced declines in aquatic life populations, holistic environmental management suggests that we look elsewhere for the root cause of Barnegat Bay's problem, and the real solution.

Professor Michael Kennish of Rutgers University, whose work is well-known to everyone here, finds the problem to be nutrient over-enrichment. In a study published in *Ecological Applications* in 2007, Dr. Kennish writes,

"Because [Barnegat Bay] is shallow, poorly flushed, and bordered by highly developed watershed areas, the estuary is particularly susceptible to the effects of nutrient loading. . . . No point source inputs of nutrients exist in the Barnegat Bay watershed. . . . Of greatest concern are nonpoint source nitrogen inputs that peak in waters of the northern estuary in closest proximity to the most heavily developed adjoining landmasses." (pp. 83-84)

The paper goes on to observe that most of the excess nutrients are entering the Bay in run-off containing fertilizer, among other substances, and the flow of the Bay is too weak to cleanse itself of this pollution. The low flushing rate and the inability to sufficiently dilute the nutrients can be compounded by water constraints and drought.

II. Cooling Towers Increase Water Consumption

Water use consists of two processes that can occur separately or in sequence: *withdrawal* and *consumption*. Water is *withdrawn* when it is removed from a water body. Withdrawn water is not necessarily lost water—it may be returned to its original source in a condition that complies with environmental law and regulations, as is currently the case with Oyster Creek. On the other hand, water is *consumed* when it ceases to exist as a liquid, that is, through evaporation.

Cooling towers on average consume *twice as much water* as once-through cooling systems. This is because cooling towers cool by evaporation of the water drawn from the waterbody, whereas a once-through cooling system cools using the colder temperature of the water from the waterbody.

In essence, cooling towers consume twice as much of the habitat of the aquatic life that they are supposed to be protecting. In terms of retrofitting Oyster Creek with cooling towers, the question becomes: If the Bay has a flushing problem, why double the plant's consumption of the Bay's water? A second question comes to mind: In view of the water constraints anticipated from the effects of climate change, why consume twice as much of this precious resource?

III. Cooling Towers Concentrate Impurities in the Waterbody

Because cooling towers cool through evaporation, they concentrate impurities present in the source water. These impurities are contained in the water that does not evaporate and falls to the bottom of the tower, known as "blowdown." Blowdown water is discharged from the cooling towers back into the waterbody.

In the hypothetical case of an Oyster Creek with cooling towers, the plant would be concentrating nutrients already in overabundance and putting them back into the Bay. In essence, the plant with cooling towers would be increasing the concentration of these nutrients, which is the real problem.

To summarize the implications of what I have said so far, Why replace a system that scientific studies show does not harm aquatic life populations with a system that reduces their habitat and concentrates impurities harmful to them at elevated levels? If the intent is to protect aquatic life, how can this be helpful? The inevitable conclusion is that cooling towers will not solve the Barnegat Bay problem, and may make it worse.

IV. Other Disadvantages of Cooling Tower Retrofits

Now I would like to turn to the other disadvantages of replacing a power plant's once-through cooling system with cooling towers, most of which have environmental implications.

Inefficiency. Cooling towers are less efficient than once-through systems. This energy penalty results in less electricity generated by the plant.

Air Emissions. In the case of a nuclear plant, which does not produce air emissions during operations, the reduced electricity output due to cooling tower inefficiency is replaced on the grid by fossil generation, resulting in increased air emissions. Renewables cannot replace baseload generation, because they are intermittent and variable during operations. Baseload generation must be steady and reliable for grid stability.

Air Quality. When power plants are located on bodies of salt water, cooling tower vapor will create a salt drift from saline droplets or particulate matter, which is harmful to plant life. This drift may violate U. S. Clean Air Act regulations. In fact, the New Jersey Department of Environmental Protection rejected the construction of cooling towers for a planned new unit at a site adjacent to Oyster Creek in 1980 because salt emissions—up to 282 pounds per hour—would violate New Jersey's Air Pollution Control Act.

Land Use/Habitat. The large footprint of a cooling tower eliminates wildlife habitat or land for human use.

Aesthetics. Cooling towers are of considerable size and can impair the recreational and scenic experience of lakes, rivers, and oceans. In addition, the vapor plume is visible and can cause fogging around the towers. A cooling tower at Oyster Creek would likely be in the typical range of 500 to 600 feet high.

Ms. Patterson, thank you again for the opportunity to testify. This completes my testimony.