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To: [Pam Lawrence](#); [Jennifer K. Schultz Ph.D.](#); [Drew Crane](#)
Cc: [Reed Super](#); [Joshua Berman](#)
Subject: More information on thermal discharge impacts from 316(b) regulated power plants
Date: Monday, November 25, 2013 6:32:55 AM
Attachments: [Legal Memo summarizing VY reports and legal issues.pdf](#)
[MBI Report re Upper Thermal Tolerance for Fish.pdf](#)
[VT Yankee Review of Fish Species Selected for Study.pdf](#)
[VT Yankee Review of Thermal Modeling.pdf](#)
[VT Yankee Temp Permit and Data Review HAI August 17 2012.pdf](#)
[VY General summary of the consultant reports, Aug 2012.pdf](#)

Hi Pam, Jenny and Drew,

As promised earlier, I have received information from colleagues about thermal plumes at various individual power plants that might interest you from a case study perspective as you pull together the BiOps.

Oyster Creek: There is a time lapse video of LANDSAT thermal imagery available showing the size of Oyster Creek's plume over the months of the year:

<http://vimeo.com/2604369>.

While interesting as a video, the more fundamental point is that LANDSAT imagery, which is readily available, can in some cases be used to monitor and assess plumes at power plants (won't work everywhere since LANDSAT pixels are 30 metres square, so you need a reasonably large waterbody. But for coastal powerplants, or those on major rivers or impoundments, this technique should work fine and can help you establish the extent of designated critical habitat (and essential fish habitat) affected).

Vermont Yankee: In 2012, the Connecticut River Watershed Council contracted with some outside biologists and hydrologists to complete some new analyses of the thermal plume data relied on by Entergy in permit proceedings related to thermal discharge from the Vermont Yankee nuclear generation station (which is now slated to go offline in a few years, I believe). I am attaching these. In a nutshell, these new analyses suggest problems with the thermal modeling performed by the power plant operator that likely are typical across the United States:

- Although the measurable plume extends through 55 miles of the river, the power company's modellers focus only on the first 0.5 miles, the most intense part of the plume. But there are multiple degree C isotherms that extend orders of magnitude farther than the analysis.
- The power company's analysis is based on a selected number of days of data totaling about 16% of the data they collected, meaning that 84% of the thermal data was never analyzed. That kind of cherry-picking is just too suspicious.
- In evaluating the impact of thermal pollution on fish, there were too few species considered and the list skewed toward warm-water species. CRWC asked biologists to develop an alternative set of thermal tolerance data and representative species for analysis. Considering the range of thermal tolerances of endangered species, this problem could quite significantly impair ESA analysis at individual facilities. It is yet another reason to be wary of any kind of site-specific ESA analysis
- The power plant's thermal analysis relies on formulas to compute discharge temperatures and ambient temperatures that are demonstrably incorrect and do not account for routine variations in river flow or plant operations. Of course, this plant (like all plants) can and should collect temperature data.

- Empirical proof of inadequacy: although the power plant's models conclude that Vermont Yankee should be in compliance with thermal discharge limits in its permit, "Actual river temperature data collected by Entergy itself and the U.S. Fish & Wildlife Service show temperature increases at the fish ladder and down river of the plant exceed the stated allowable temperature increases in the discharge permit for many days each year."

Again, what's interesting here is not just the story at Vermont Yankee, but the fact that these kinds of methodological flaws are easy to commit. And catching them is very hard because there are few cases where someone goes out to independently verify the quantity of thermal waste discharged or to check river temperatures against modeling results submitted by polluters. In short, there is every reason to think that what little data there is in the record before you on thermal discharge is an underestimate of the severity of the problem, and of how it affects listed species and their habitats.

Brayton Point: I also want to draw your attention to EPA's website, which contains the full record for the issuance of the Brayton Point NPDES permit:
<http://www.epa.gov/region1/braytonpoint/>.

Brayton Point is a coal fired power plant that was retrofitted to natural draft cooling towers. EPA Region 1's website contains the whole record, which I hope will be of interest to you. In a nutshell, EPA and the MA DEP "concluded that Brayton's large thermal discharge to, and cooling water withdrawal from, the Mount Hope Bay estuary have caused or contributed to significant adverse environmental impacts, including the collapse of the bay's fish stocks. Specifically, EPA believes that BPS's discharge of waste heat—approximately 42 trillion British thermal units (BTU) discharged annually—has adversely affected the important estuarine habitat in the bay. For example, BPS's thermal discharge alters the normal temperature profile of the bay so that water temperatures exceed preferred temperatures for various resident fish species. In addition, BPS's cooling water withdrawals of approximately 1 billion gallons per day from the bay result in the entrainment and impingement of trillions of marine organisms each year, including the eggs, larvae, juveniles, and adults of various fish species, such as winter flounder." (Response to 316(a) Comments, p. 1-2). Although EPA did not focus on endangered species, Mount Hope Bay is home to a variety of listed species, and they are as affected as the Bay's other residents. This is another source of data that EPA clearly should have submitted with the Biological Evaluation. Here again is the link to the permitting record on EPA Region 1's website:
<http://www.epa.gov/region1/braytonpoint/>

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