Water Facts

Power Plant Cooling Water and Clean Water Act Section 316(b): The Need to Modernize U.S. Power Plants and Protect our Water Resources

The U.S. Environmental Protection Agency is in the process of issuing standards for the use of cooling water at existing U.S. power plants. A draft rule was issued on March 28, 2011. A final rule will be issued by July 27, 2012.

The country is long overdue for a clear, consistent national policy that protects waterways and helps move the nation toward cleaner, more modern and more efficient energy production by phasing out the environmentally destructive once-through cooling systems.

Without national standards, the EPA remains in violation of the Clean Water Act (CWA) and states continue to lack the political will, resources, and clout to impose use of better technologies on the power industry.

POWER PLANTS ARE AMONG THE NATION'S LARGEST WATER USERS

In 2005, cooling water withdrawals accounted for nearly 41 percent of all freshwater withdrawals and 49 percent of all water withdraws (fresh and saline) in the United States.[1]

With approximately 500 U.S. power plants plants still relying on the most antiquated and destructive type of cooling system known as once-through cooling, power plants are the largest water users in the country. Each of these plants can withdraw at least 50 million (and often more than a billion) gallons of cooling water per day using once-through cooling, but better options exist.

UNDERSTANDING VARIOUS TYPES OF COOLING SYSTEMS

Power plants now can use one of three basic types of cooling systems:

In a ***once-through cooling system***, water is withdrawn directly from a body of water, diverted through a condenser where it absorbs heat from the boiler steam, and then discharged back into the water at higher temperatures. Because once-through cooling systems do not recycle the cooling water, this leads to incredibly high water withdrawal per day.

In a ***closed-cycle recirculating cooling system***, the cooling water goes from the condenser to cooling towers, where the heat from the boiler steam dissipates through evaporation and convection. The cooling water is then recirculated through the condensers. Hundreds of U.S. power plants use closed-cycle cooling. This generally reduces water usage by about 95 percent when compared with once-through cooling.

Dry cooling systems run the boiler steam through radiator-like coils, where heat is transferred directly to the air by convection. Power plants equipped with dry cooling use virtually no water and therefore virtually eliminate fish kills.

Once-through cooling systems affect the full spectrum of organisms in the aquatic ecosystem at all life stages from tiny photosynthetic organisms to fish, shrimp, crabs, birds, and marine mammals, including threatened and endangered species.[2] They kill billions of fish and destabilizes aquatic populations.[3]

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Intake structures kill aquatic organisms by "entraining" them through plants' heat exchangers where they succumb to physical, thermal and toxic stresses and "impinging" them on intake screens (i.e., trapping them against the screens by the pressure of the intake flow), and the discharge of heated water from cooling systems may also harm wildlife.

Throughout the country, the toll on fisheries by power plants rivals—or even exceeds—that of the fishing industry.

- According to Delaware Riverkeeper, the Salem Nuclear Plant—the nation's largest user of cooling water—withdraws more than 3 billion gallons of water per day from Delaware Bay, and kills an estimated 3 billion fish per year;
- The Brayton Point power plant has been associated with an 87 percent reduction in finfish abundance in Mt. Hope Bay, Rhode Island;[4]
- Combined, the 19 California plants using once-through cooling technology suck in more than 15 billion gallons of sea water every day and kill an estimated 2.7 million fish and 19.4 billion larvae and other marine life—including two dozen sea lions and a dozen seals—annually.[5,6,7] For the 12 power plants in the Southern California Bight, impingement of recreational fish species is between 8 to 30 percent of the number of fish caught in the Bight.[8]
- The Bay Shore coal power plant in Ohio kills 46 million Lake Erie fish and sucks in another 2 billion larvae per year.[9]

THE CLEAN WATER ACT AND COOLING WATER

Section 316(b) of the Clean Water Act requires all power plants—new and old—to install the "best technology available" (BTA) for minimizing the adverse environmental impacts of cooling water intake structures. Congress included section 316(b) in the 1972 federal Clean Water Act, yet implementation of section 316(b) has been stalled for decades.

- In 1977, the EPA's first attempt at section 316(b) regulations was remanded by the Fourth Circuit due to procedural defects.[10] For more than 15 years, the EPA failed to propose any new cooling water intake regulations.
- In 1993, frustrated with the EPA's inaction and the resulting regulatory vacuum, numerous environmental groups sued the EPA in federal district court to compel issuance of the regulations required by section 316(b).[11]
- In 1995, environmental groups won a consent decree ordering the EPA to take final action with respect to section 316(b) regulations.[12]
- In December 2001, the EPA issued regulations for cooling water use at new facilities, identifying closed-cycle cooling as the "Best Technology Available."
- In July 2004, the EPA issued final regulations applying to existing power plants. Riverkeeper, NRDC and others sued over these rules for not complying with the protective mandates of 316(b). Environmental groups prevailed, and, as a result of that litigation, the EPA now is required to re-issue rules to require BTA for existing power plants.[13]

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BETTER TECHNOLOGIES AND SOLUTIONS ALREADY EXIST

Closed-cycle systems "reduce the amount of cooling water needed and in turn … directly reduce the number of aquatic organisms entrained in the cooling water intake structure" as well as impingement and other stresses on the ecosystem.[14] Virtually all of the gas-fired power plants and the majority of coal-fired plants built in the last 30 years have closed-cycle cooling.[15]

Recycling cooling water could lead to a 98 percent reduction in environmental damage caused by intake structures. Reducing entrainment and impingement does not just help save the lives of fish and other species now, but their survival can have an exponential benefit in restoring robust populations that may be currently in decline or on their less than acceptable population levels.

COSTS OF IMPROVING SYSTEMS ARE MINIMAL AND BENEFITS ARE NUMEROUS

Industry can reasonably incur costs associated with improving their systems. Even where costs are passed on to consumers, those costs may be only a few cents or a few dollars per month.

In Massachusetts, the Brayton Point power plant, which provides approximately 6 percent of New England's electricity and fought improvements for years, is now upgrading its plant at the modest long-term expense to ratepayers—less than the price of the postage stamp on a monthly electric bill.[16]

In Ohio, experts say using closed-cycle cooling at the Bay Shore power plant is the only cost-effective method to comply with sections 316(a) and (b).[17] Experts also conclude that the per year economic damage from fish mortality at that facility alone equals $29.7 million per year, with a net present value of a 20-year stream of these losses equal to $315.0 million, or $22.1 million more than the cost of the cooling towers.[18]

New York's power industry "could easily bear the additional cost of closed cycle cooling. In addition, a requirement for closed cycle cooling would cost power customers very little, would have no adverse impacts on reliability, and would improve air quality."[19]

Many energy companies reap enormous profits from their activities, and any upgrade costs should be viewed in comparison to net revenue.[20] Any potential impact to energy supply reliability can be accommodated by timing upgrades through a phased approach, instead of requiring compliance all at once across the industry.[21] The choice of whether to retrofit, repower or retire a unit (and let it be replaced by newer generation) is up to each operator. Yet cooling water decisions will not cause any significant adverse repercussions on the energy grid or economy.

ABSENCE OF NATIONAL STANDARDS CREATES UNCERTAINTY AND DELAYS PROTECTION OF WATERBODIES

In the absence of national regulations, cooling water standards have been relegated to *ad hoc* determination by individual permit writers, typically state agencies, exercising "best professional judgment." These site-specific proceedings, which typically involve a complex assessment of the local marine ecosystem and fishery population dynamics to determine technology requirements, impose a significant burden on local permitting agencies.

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Permit proceedings typically extend over many years—in some cases, more than a decade—despite the CWA's requirements that certain permits have a five-year limit and that BTA regulations be reviewed and, if appropriate, revised every five years. Industry, which has a critical strategic advantage in these complex proceedings because of its superior resources, has taken advantage of biological complexity and used delay tactics to avoid technology upgrades.

This case-by-case approach is guaranteed to mire the CWA permitting process in an endless cycle of paperwork and litigation that will leave waterbodies across the country unprotected. There are ways to structure a categorical rule to avoid unacceptable consequences, if any, of a "one-size-fits-all" rule without resorting to the unworkable extreme of a case-by-case regime.

THE EPA MUST ACT TO PROTECT OUR RIVERS, LAKES, AND OCEANS

The EPA must adopt stringent regulations that require the equivalent of the protection achieved by closed cycle cooling or better. Many older plants have been retrofitted and the more innovative plants have stopped relying on natural waterbodies altogether, using the effluent from wastewater treatment plants to eliminate the fish kills or dependence on drinking water supplies.[22] New plants can be designed to draw no water at all from rivers, lakes, or oceans.

[1] Kenny, J.F., et al., *Estimated use of water in the United States in 2005, U.S. Geological Survey Report*, Circular 1344 at 38 (2009).

[2] *Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities*, 69 Fed. Reg. 41,576, 41,586 (July 9, 2004).

[3] *Riverkeeper Inc. v. EPA*, 358 F.3d 174, 181 (2nd Cir. 2004).

[4] *69 Fed. Reg.* at 41,588.

[5] California State Water Resources Control Board, *Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling Final Substitute Environmental Document* (*"Final SED"*) (May 4, 2010).

[6] *Id.* at 32.

[7] *Taking Marine Mammals Incidental to Power Plant Operations in Central and Southern California*, 73 Fed. Reg. 9299 (Feb. 20 2008).

[8] *Final SED, supra,* at 35.

[9] Kinetrics, *Bay Shore Power Plant Cooling Water Intake Structure Information and I&E Sampling Data* (January 2008).

[10] *Appalachian Power Co. v. Train*, 566 F.2d 451, 458-59 (4th Cir. 1977).

[11] *Riverkeeper, Inc. v. Leavitt*, 93 Civ. 0314 (S.D.N.Y.).

[12] *Cronin v. Browner*, 90 F.Supp.2d 364, 368 (S.D.N.Y. 2000).

[13] *Riverkeeper Inc. v. EPA*, 475 F.3d 83(2nd Cir. 2007), *rev'd in part sub nom. Entergy Corp. v. Riverkeeper Inc.*, 129 S. Ct. 1498 (2009).

[14] 66 Fed. Reg. 65,256, 65,273 (December 18, 2001).

[15] 66 Fed. Reg. 28,853, 28,855-856 (May 25, 2001).

[16] *See, e.g.*, USEPA, *Brayton Point Station Information Sheet* (Oct. 2003).

[17] Tetratech, *Bay Shore Power Plant: Intake and Thermal Discharge NPDES Compliance Option Evaluation*, at A-1, A-2 (Feb. 2009).

[18] Gentner Consulting Group, *Economic Damages of Impingement and Entrainment of Fish, Fish Eggs, and Fish Larvae at the Bay Shore Power Plant*, at 23 (May, 2010).

[19] Robert McCullough, *The Economics of Closed Cycle Cooling in New York* (June 3, 2010).

[20] *Id.* at 2-3.

[21] *See, e.g., Final SED, supra*, at 123.

[22] *See, e.g.*, http://www.pseg.com/info/environment/ps_caring.jsp; *see also* http://www.aps.com/general_info/aboutAPS_18.html

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