2008

Amicus Brief of Economists Ackerman et al. in Entergy v. Riverkeepers

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Nos. 07-588, 07-589 & 07-597 (Consolidated)

In The
Supreme Court of the United States

ENTERGY CORP., *Petitioner,*

v.

ENVIRONMENTAL PROTECTION AGENCY, ET AL.,
Respondents.

PSEG FOSSIL LLC AND PSEG NUCLEAR LLC,
Petitioners,

v.

RIVERKEEPER, INC., ET AL., *Respondents.*

UTILITY WATER ACT GROUP, *Petitioner,*

v.

RIVERKEEPER, INC., ET AL., *Respondents.*

On Writs Of Certiorari To The United States Court Of Appeals For The Second Circuit

BRIEF OF ECONOMISTS FRANK ACKERMAN, NATHAN SIVERS BOYCE, PETER DORMAN, EBAN GOODSTEIN, RICHARD B. HOWARTH, PETER B. MEYER, JULIE A. NELSON, RICHARD B. NORGAARD, THOMAS MICHAEL POWER, KRISTEN SHEERAN, BENJAMIN K. SOVACOOL AND LYUBA ZARSKY AS *AMICI CURIAE* IN SUPPORT OF RESPONDENTS

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INTEREST OF THE *AMICI CURIAE*

Amici are professors and scholars who teach and write on economic theory and method, particularly with respect to natural resources and the environment. *Amici* have an interest in seeing that the Court is informed on the appropriate use of economic analysis in the implementation of § 316(b) of the Federal Water Pollution Control Act, 33 U.S.C. § 1326(b), commonly referred to as the Clean Water Act (CWA).

The end of this brief summarizes the *amici*'s qualifications and affiliations. *Amici* file this brief solely as individuals and not on behalf of the institutions with which they are affiliated.[1]

INTRODUCTION

This brief discusses the roles of various forms of economic analysis. Cost-benefit analysis (CBA) aims to identify allocatively efficient actions. Economists, however, have developed other forms of analysis for other purposes. Administrative agencies concerned about technology's economic availability have

[1] The parties have consented to the filing of this brief. No counsel for a party authored this brief in whole or in part, and no counsel or party made a monetary contribution intended to fund the preparation or submission of this brief. No person other than *amici*, their institutions, or their counsel made a monetary contribution to its preparation or submission.

employed economic models that compare costs, not to benefits, but to regulated firm's financial capabilities to predict whether regulated firms can afford the best technology. This brief discusses the relationship of financial, cost-benefit, and cost effectiveness analysis to EPA's task as an agent of the elected legislature carrying out the instructions issued in § 316(b) of the CWA, concerning the regulation of cooling water intake. *See E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 138 (1976) (describing the question before the Court as "what Congress intended for *these* regulations," not "what a court thinks . . . generally appropriate to the regulatory process") [emphasis in original].

STATEMENT OF THE CASE

Electricity generating plants often withdraw water from rivers, lakes, and other waterways in order to manage excess heat generated during their production processes. EPA estimates that cooling water intake kills over 3.4 billion fish and shellfish (expressed as "age 1 equivalents") by either trapping organisms against components of the cooling water intake structure or drawing them into the cooling water system itself. Pet.App.170a-172a (69 Fed. Reg. at 41,586).[2] These two mortality threats, referred to

[2] Citations to Pet.App. refer to the appendix filed in No. 07-588.

as "impingement" and "entrainment," affect not only the various fish and shellfish species for which EPA has been able to generate quantitative estimates, but also certain threatened and endangered species, such as sea turtles, Chinook salmon, and steelhead, as well as immeasurable quantities of phytoplankton and zooplankton that lie at the base of aquatic food chains. Moreover, impingement and entrainment are only the most obvious and measurable adverse effects of cooling water intake on aquatic ecosystems.

Cognizant of these kinds of informational difficulties, Congress in § 316(b) mandated that "the location, design, construction, and capacity of cooling water intake structures [must] reflect the best technology available for minimizing adverse environmental impact." 33 U.S.C. § 1326(b). In 1995, EPA agreed to a consent decree that required the agency to establish cooling water intake rules in multiple phases. *See Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 181 (2d Cir. 2004) (*Riverkeeper I*); *Riverkeeper, Inc. v. EPA*, 475 F.3d 83, 90 (2d Cir. 2007) (*Riverkeeper II*).

Phase I, involving new facilities, generally required facilities to achieve environmental performance standards based on what is known as "closed-cycle cooling technology," a process in which cooling water is recycled and only periodically replenished from neighboring waterways, rather than continuously withdrawn and discharged. Although environmentalists had argued on behalf of a more stringent "dry cooling technology," the Second Circuit accepted EPA's conclusion that the expense of this technology rendered it not reasonably available to industry. *See Riverkeeper I*, 358 F.3d at 195-96; *Riverkeeper II,* 475 F.3d at 99 n.11.

Phase II involved large *existing* power plants. EPA's final regulations for this phase set forth a complicated array of compliance options that were built around a set of impingement and entrainment performance standards. According to EPA's own analysis, the Phase II rules allowed many facilities to avoid water intake reductions altogether. *See* EPA, Economic and Benefits Analysis for the Final Section 316(b) Phase II Existing Facilities Rule, EPA-821-R-04-005, February 2004, at D1-1 (Final Rule EBA).[3] Even where the rules required reductions, they formally mandated no more than 80 and 60 percent reductions, respectively, in impingement and entrainment. *See* Pet.App.189a-190a (69 Fed. Reg. at 41,590); *Riverkeeper II*, 475 F.3d at 105-08. EPA identified no single technology as the best available technology and offered no specific rationale for these numbers. *See Riverkeeper II,* 475 F.3d at 106.

Notably, EPA declined to use closed-cycle cooling technology as the benchmark against which other proposed protection measures might be evaluated. Despite acknowledging that impingement and

[3] This document is available at http://www.epa.gov/waterscience/316b/phase2/econbenefits/final.htm (last visited September 29, 2008).

entrainment provide the "primary and distinct types of harmful impacts associated with the use of cooling water intake structures," Pet.App.226a (69 Fed. Reg. at 41,598), and that "closed-cycle, recirculating cooling towers . . . can reduce mortality from impingement by up to 98 percent and entrainment by up to 98 percent," Pet.App.239a-240a (69 Fed. Reg. at 41,601), EPA nevertheless adopted weaker standards.

The agency did so because it considered the cost of technologies in relation to the reductions in impingement mortality and entrainment achieved. Pet.App.250a (69 Fed. Reg. at 41,603). This efficiency-oriented approach had a significant effect on regulatory stringency: EPA estimated that 125 facilities would adopt no impingement and entrainment controls at all under the Phase II rules. *See* Final Rule EBA, *supra*, at D1-1. Moreover, rather than up to 98 percent reduction in impingement and entrainment, as attained by closed-cycle cooling technology, the agency estimated that most facilities would only achieve between 30.9-59.0 percent reduction in impingement and between 16.4-47.9 percent reduction in entrainment. *Id.* at C3-2.

The Second Circuit Court of Appeals remanded the Phase II regulations almost in their entirety. The basic defect of the rules, in the panel's view, was EPA's apparent decision to use CBA to identify the performance standard that could be attained by "the best technology available for minimizing adverse impact." According to the Second Circuit, such best availability technology (BAT) requirements necessitate a different implementation approach: Because "Congress itself [already has] defined the basic relationship between costs and benefits," EPA's responsibility is simply to identify the most environmentally protective technology available at a cost that can be "reasonably borne" by the regulated industry. *Riverkeeper II*, 475 F.3d at 99 (quoting *American Textile Mfrs. Inst., Inc. v. Donovan*, 452 U.S. 490, 509 (1981)).

On April 14, 2008, this Court granted certiorari to determine "whether Section 316(b) of the Clean Water Act, 33 U.S.C. 1326(b), authorizes the [EPA] to compare costs with benefits in determining the 'best technology available for minimizing adverse environmental impact' at cooling water intake structures." *See PSEG Fossil LLC v. Riverkeeper, Inc.*, 128 S. Ct. 1867, 1868 (2008).

SUMMARY OF ARGUMENT

Section 316(b) does not authorize CBA because the ratio of costs to benefits has no relevance to a decision about what constitutes the "best technology available for minimizing adverse environmental impacts." 33 U.S.C. § 1326(b). Determination of which technology *best* minimizes negative environmental impacts requires a comparative engineering evaluation of competing technologies' capacities to reduce environmental impacts. *See Train*, 430 U.S. at 131 (describing statutory provisions governing technology-based water pollution rules as requiring an assessment of available technology's "effectiveness"); *Alaska Dep't of Envtl. Conservation v. EPA*, 540 U.S. 461, 475-76 (2004) (discussing EPA's use of comparative "top-down" analysis to determine the "best available control technology" for air pollution). Under § 316(b), this engineering analysis focuses primarily on identifying technologies that minimize water intake that disrupt ecology and kill fish. Neither compliance cost nor its relationship to benefits is relevant to identification of the technology minimizing environmental impact.

Consideration of a technology's economic availability requires an economic analysis that compares compliance costs to the financial resources of regulated firms, rather than comparing these costs to environmental benefits. To the extent that a technology proves so costly that an industry cannot afford to purchase it, it might be considered unavailable. *See EPA v. National Crushed Stone Ass'n*, 449 U.S. 64, 74 (1980) (describing maximizing technology's use "within" an owner's "economic capability" as a site-specific application of the best available technology concept). The dollar value of water quality benefits, however, does not bear on whether a technology is available, as a technology's economic availability is solely a function of the relationship between costs and regulated firms' finances.

Economic analysis should serve the decisionmakers' legally appropriate goals. CBA focuses on decisions about whether an environmental program is economically desirable in the abstract, a task that Congress often reserves for its own determination. *See generally* David M. Driesen, *The Societal Cost of Environmental Regulation: Beyond Administrative Cost-Benefit Analysis,* 24 Ecology L. Q. 545, 605-13 (1997) (discussing CBA's compatibility with a general legislative power). Since the elected legislature already has concluded that clean water is worth the necessary costs, it may rationally have assigned EPA the more limited role of deciding which available technologies maximize environmental protection. *Cf. Alaska*, 540 U.S. at 485 n.12 (discussing similar Clean Air Act provisions); David M. Driesen, *Distributing the Costs of Environmental, Health, and Safety Protection: The Feasibility Principle, Cost-Benefit Analysis, and Regulatory Reform,* 32 B.C. Envtl. Aff. L. Rev. 1, 19-21 (2005) (*Feasibility Principle*) (discussing similar provisions).

Elected representatives chose a BAT approach in order to maximize ecological restoration subject only to a technological availability constraint. The availability constraint addresses distributional concerns about plant shutdowns leading to unemployment, not concerns about net benefits. While CBA in principle supports efforts to identify allocatively efficient pollution levels, financial models provide appropriate tools for predicting whether pollution control costs might lead to plant shutdowns, instead of the employment increases that pollution control expenditures often produce. *Cf.* Eban

Goodstein*, The Trade-Off Myth: Fact and Fiction About Jobs and the Environment* 20 (1999) (associating environmental regulation with a small net increase in employment); Richard Morgenstern et al., *Jobs Versus the Environment: An Industry-Level Perspective*, 43 J. Envtl. Econ. & Mgmt. 412, 413-14 (2002) (finding environmental regulation likely increased employment modestly in the plastics, petroleum, steel, and pulp and paper industries).

Elected representatives may choose a BAT construct over CBA because of concerns about the feasibility of correlating costs and benefits in the water pollution context. CBA requires correlation of monetized marginal water quality benefits with the marginal cost of technologies. Because any technology's effect on environmental quality varies with the quality of each relevant water body, water pollution control technology always yields important water quality benefits that cannot be quantified and vast uncertainties about those that can be. A BAT approach may be desirable precisely because it avoids the need to link environmental protection expenditures to marginal water quality benefits, as CBA demands.

ARGUMENT

I. COST-BENEFIT ANALYSIS IS A WELFARE ECONOMIC DECISION PROCEDURE

To understand why CBA has proven controversial in the environmental, health, and safety context – and to perceive why Congress might have eschewed EPA's use of it in § 316(b) – it is necessary to know more about CBA than its surface resemblance to "common sense" or "basic rationality."[4]

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[4] *See, e.g.,* Brief for the Federal Parties ("Federal Brief"), at 13 ("In everyday life, people routinely weight costs against benefits in deciding whether to do something."); Brief of Petitioner Utility Water Act Group ("UWAG Br."), at 28 (calling "irrational" any interpretation of § 316(b) that would prevent "translating . . . costs and benefits into economic terms for comparison"); UWAG Brief at 57 ("In the broadest sense, cost-benefit balancing is a fundamental tool of logical decisionmaking."); Brief of Petitioners Entergy Corp., PSEG Fossil LLC, and PSEG Nuclear, at 29 ("At a basic level, what respondents and the Second Circuit denigrate as 'cost-benefit analysis' is nothing more than common sense – the imperative of basic rationality that actions do more good than harm."); Brief of *Amici Curiae* The AEI Center for Regulatory and Market Studies and 33 Individual Economists in Support of Petitioners, at 5 ("[A]s a general principle, regulators cannot make rational decisions unless they are allowed to compare costs and benefits. . . .").

A. Cost-Benefit Analysis Aims to Identify Allocatively Efficient Regulation Based on Monetized Estimates of Policy Impacts on Human Well-Being

CBA serves as a tool for identifying allocatively efficient regulation, defined as regulation that generates costs equaling benefits at the margin. *See* Tom Tietenberg, *Environmental Economics and Policy* 25 (4th ed. 2004); 1 *Handbook of Environmental Economics: Environmental Degradation and Institutional Responses* 253-54 (Karl-Goran Maler & Jeffrey R. Vincent eds. 2003). In technical terms, CBA pursues Kaldor-Hicks, rather than Pareto, efficiency. The latter standard only approves projects that make at least one individual better off and no one worse off. The former standard approves projects so long as "losers" could, in theory, be compensated adequately from project gains to make them no worse off. *See* Joseph Persky, *Cost-Benefit Analysis and the Classical Creed*, 15 J. Econ. Perspectives 199, 201 (2001). What this means in plain terms is that CBA only seeks to promote value as such and does not compensate those who lose from the enhancement of efficiency. *See* Nicholas Kaldor, *Welfare Propositions of Economic and Inter-personal Comparisons of Utility*, 49 Econ. J. 549, 550 (1939).

In order to compare costs and benefits, CBA evaluates policy choices' diverse consequences according to a single numerical rubric. Accordingly, the framework asks regulators to predict, weight, and aggregate policy impacts in dollar terms. Once relevant policy impacts have been estimated and monetized in this manner, regulators can use CBA to select the point of marginal equivalence between social costs and benefits. Similarly, many economists and other commentators believe that application of CBA to a range of existing and proposed risk regulation programs can provide society with a basis for making efficient use of the entire regulatory budget that it devotes to risk prevention. *See generally* Stephen Breyer, *Breaking The Vicious Circle: Toward Effective Risk Regulation* (1993).

In theory, CBA values anticipated policy effects according to the monetary amount that affected individuals would be willing to pay if the effect under consideration were traded in an economic market. *See* Kenneth J. Arrow et al., *Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?*, 272 Science 221, 222 (1996). This willingness-to-pay approach to valuation makes the desirability of CBA's results contingent on the desirability of the underlying distribution of wealth and entitlements out of which valuations are being generated.

Once EPA identifies a technology capable of reducing environmental impacts, it can use market data to estimate facilities' compliance costs, which constitute the principle direct cost of regulation. Neither the consideration of cost nor this approach to its valuation is unique to CBA.

Valuation of regulatory benefits – consisting of averted harms such as human death and illness, species loss, or environmental degradation – poses greater challenges. EPA can often choose the best technologies for minimizing environmental impacts by simply comparing the percentage of effluent or water intake reduction of competing technologies. To do this, the agency does not need to know anything about the quality of adjacent waters.

To *quantify* and *monetize* the environmental benefits a technology might generate, however, EPA must consider the quality of adjacent waters and the myriad ecological impacts that effluent or water intake might have. These values and impacts will vary. For waters most in need of environmental improvement, the value of benefits may be less than for waters that require little protection. Water intake technologies may protect few fish in depleted fisheries (at least in the short run), but may generate high benefits estimates in waters with a thriving fishery.

CBA typically entails the monetization of quantified benefits based on individual willingness to pay. Existing markets will not provide reliable price information for such benefits. Accordingly, in the environmental context, the CBA practitioner must attempt to identify individual valuations of averted harms through indirect or hypothetical means. Even within the economics profession, much theoretical and methodological controversy has surrounded the development and use of such valuation techniques. *See, e.g.,* Amartya Sen, *The Discipline of Cost-Benefit*

Analysis, 29 J. Legal Stud. 931, 949 (2000) (strongly criticizing conventional willingness-to-pay measurement approaches).

B. By its Nature, Cost-Benefit Analysis Cannot Address Many Aspects of Law and Policy

CBA embraces welfare economic assumptions about how value is defined and measured. According to economic theory, willingness to pay reflects the strength of individual preferences for various goods. Use of a methodology based on estimates of private preferences for avoiding death, illness, and environmental degradation assumes that people's purchase decisions should determine value. *See* Bryan Norton, Robert Costanza, and Richard C. Bishop, *The Evolution of Preferences: Why 'Sovereign' Preferences May Not Lead to Sustainable Policies and What to Do About It*, 24 Ecol. Econ. 193 (1998). Thus, the weight assigned to matters as basic as the existence of a fish species or the death of a human being derives from individualistic market behavior.

This contrasts with a model of collective value choices, such as political choices that create individual rights or give special weight to matters deemed fundamentally important for reasons not rooted in welfare economics. *Cf.* Richard O. Zerbe, Jr., *Comment: Does Benefit Cost Analysis Stand Alone? Rights and Standing*, 10 J. Pol'y Analysis & Mgmt. 96, 96 n.2 (1991) (observing that when uncertainty over legal rights "extends beyond the margin, benefit cost analysis will be of little help"); James M. Buchanan, *Freedom in Constitutional Contract: Perspectives of a Political Economist* (1977); Laurence H. Tribe, *Ways Not to Think About Plastic Trees: New Foundations for Environmental Law*, 83 Yale L. J. 1315 (1974). This Court has implicitly held that Congress made such value choices in the Clean Air Act and the Endangered Species Act. *See TVA v. Hill*, 437 U.S. 153, 176-84 (1978) (recognizing that Congress decided to save each endangered species, no matter what the cost); *Whitman v. American Trucking Ass'ns*, *Inc.,* 531 U.S. 457, 465 (2001) (recognizing that Congress chose, in the Clean Air Act, to protect public health). In the CWA, this Court has likewise recognized that Congress chose to adopt an overarching goal of ecological restoration, *U.S. v. Riverside Bayview Homes*, 474 U.S. 121, 132-33 (1985) (describing the CWA as a "comprehensive legislative attempt 'to restore'" the waters' ecological integrity), which is served by subsidiary goals of zero discharge of pollutants and protection of fish, *see* 33 U.S.C. § 1251.

When such goals are recognized as politically- or normatively-imposed constraints, economic theory evaluates them under frameworks that are analytically distinct from conventional cost-benefit optimization. For instance, an extensive economic literature exists analyzing environmental and natural resource decisionmaking under "sustainability" or "safe minimum standard" constraints. *See, e.g.,* Alan Randall & Michael C. Farmer, *Benefits, Costs and the Safe Minimum Standard of Conservation*, *in The Handbook of Environmental Economics* 26 (Daniel Bromley ed. 1995); Richard B. Howarth, *Sustainability Under Uncertainty: A Deontological Approach*, 71 Land Econ. 417 (1995); Richard B. Norgaard & Richard B. Howarth, *Sustainability and Discounting the Future*, *in Ecological Economics: The Science and Management of Sustainability* 88 (Robert Costanza ed. 1991); Richard C. Bishop, *Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard*, 60 Am. J. Ag. Econ. 10 (1978).

Taking the ecological restoration goal seriously requires efforts on a variety of fronts when the immediate benefits produced are small. CBA, however, calls for scaling down efforts when resources are in serious trouble, because then individual actions produce small measurable marginal benefits. Furthermore, the ecological restoration goal requires confronting the complex, causally interrelated nature of ecosystems, which often frustrates attempts to manage for allocative efficiency. *See* Orrin H. Pilkey & Linda Pilkey Jarvis, *Useless Arithmetic* 6-7, 10-21 (2007) (explaining how reliance on widely used mathematical models to set sustainable catch levels led to a fisheries collapse). CBA, for instance, struggles to address catastrophic or non-linear potentialities, since CBA typically assumes a smooth continuous world in which median expectation values provide reasonably reliable decision criteria. Martin

Weitzman, *The Stern Review of the Economics of Climate Change*, 45 J. Econ. Lit. 703 (2007) (questioning the value of conventional CBA in the face of climate change's deep structural uncertainty and potentially extreme worst case consequences).

Even assuming complete and reliable information, CBA would not prove useful in all law and policy contexts. Any formal decisionmaking system such as CBA must – by its very nature – exclude from evaluation some relevant parameters of the decisions that the system aims to resolve. CBA may be appropriate in some circumstances, but it is not an alternative to foundational political choices like those found in the Constitution and, in some cases, in environmental law. It is imperative, therefore, to recognize that CBA cannot be "read into" all of a society's statutes or viewed as an all-purpose policy device. *Cf. Burnham v. Superior Court*, 495 U.S. 604, 626 (1990) (Scalia, J., plurality opinion) (criticizing "totality of the circumstances" and "freestanding 'reasonableness'" tests in the due process context and warning against "injecting them into the core of our American practice").

II. COST-BENEFIT ANALYSIS IS NOT RELEVANT TO IDENTIFICATION OF THE BEST TECHNOLOGY AVAILABLE FOR MINIMIZING ADVERSE ENVIRONMENTAL IMPACT

As Congress's agent, EPA must follow statutory instructions establishing policies for EPA rulemaking.

Therefore, when used to implement specific statutes, EPA's economic analysis must examine the factors that congressional policies make relevant, without considering factors irrelevant to its instructions. *See Donovan,* 452 U.S. at 507-12 (holding that cost-benefit analysis is not a relevant factor when a statute demands maximum feasible emission reductions); *Citizens to Preserve Overton Park v. Volpe,* 401 U.S. 402, 411-13 (1971) (holding that cost-benefit balancing was not among the relevant factors for determining whether it was "feasible" to route a highway around a park); *Union Electric Co. v. EPA*, 427 U.S. 246, 257-65 (1976) (holding that cost is not a relevant factor in EPA assessment of state implementation plans under the Clean Air Act). The relationship of costs to benefits is not among the factors relevant to determining the "best technology available for minimizing adverse environmental impact." 33 U.S.C. § 1326(b).

A. Engineering Analysis Identifies the "Best" Technology for Minimizing Adverse Environmental Impact

Identification of the "best technology . . . for minimizing environmental impacts" requires an engineering analysis of competing technologies' environmental performance characteristics. In the effluent reduction context, the "best" technologies generally minimize the amount of water pollution being discharged. *See Crushed Stone,* 449 U.S. at 74 (describing BAT as committing "the maximum resources economically possible to the" pollution elimination goal); *see also Alaska,* 540 U.S. at 489-90 n.13 (describing requirements for "best available control technology" as requiring "the technology that can *best reduce pollution* within practical constraints") (emphasis added). The focus on water intake in § 316(b) generally requires an inverse analysis focused on identifying technologies that minimize the amount of water taken from lakes, streams, and rivers to cool industrial facilities. As a rule, technologies minimizing water intake kill less fish and disrupt a water body's ecology less than technologies that use more water. *See Riverkeeper II*, 475 F.3d at 101 n.16 (noting EPA's general assumption that reductions in water flow proportionally reduce impingement and entrainment); *Riverkeeper I*, 358 F.3d at 194 ("EPA acknowledges that dry cooling" virtually eliminates water intake and "dramatically reduces impingement and entrainment").

The analysis of which technologies minimize adverse environmental impacts may take into account a broad range of impacts. EPA may, for example, take into account adverse air pollution impacts associated with water pollution technology. *See, e.g., Riverkeeper I,* 358 F.3d at 194-95 (allowing EPA to consider the air pollution associated with energy efficiency penalties for dry cooling technology as a basis for rejecting it); *Riverkeeper II*, 475 F.3d at 99 n.11 (describing its prior decision to uphold

EPA's rejection of dry cooling as based on its negative environmental effects and unbearable cost). The amount of economic cost a facility will incur to install a technology, such as an environmentally superior water intake system, has no bearing on the question of which technology minimizes adverse environmental impacts.

Market participants generally use the term "best" in conjunction with any technology to signify the highest quality item regardless of cost. *See generally Bailey v. U.S.*, 516 U.S. 137, 144-45 (1995) (holding that courts must give a term its ordinary meaning considering not just its "bare meaning," but also its "placement and purpose" in context). Thus, consumer discussions of whether a Blackberry or an I-Phone is the "best" cell phone or whether an Apple or a PC is the "best" computer focus on design and features, *i.e.* on figuring out which technology works best for its intended purpose. Similarly, advertisers use the term "best" as a signifier of high quality. *See, e.g.,* Bradley Johnson & Alice Z. Cuneo, *AT&T, Goodby Look to Ax mLife*, Advertising Age, July 14, 2003, at 1, 26 (contrasting advertisements focused on price with the claim that AT&T has the "best technology"); *Ad Spending of '100' Edges Upward, Advertising Age*, Sept. 28, 1988, at 36 (describing Bell Atlantic as having the "best technology" because its telecommunications capabilities are the "fastest, with the most interesting applications.").

Economists, however, sometimes use the term "best policy" as signifying a balance between cost and benefits. And, similarly, consumers sometimes use the term "best purchase" to signify a balance between costs and benefits. But the term "best technology," in ordinary parlance, means the best technology for its intended purpose – here minimizing (not just addressing) environmental impacts.

B. Economic Analysis Comparing Costs to Facilities' Economic Capabilities Evaluates a Technology's "Availability"

However, § 316(b) qualifies its demand that EPA formulate standards based upon the environmentally best technologies by insisting that the technologies be "available." 33 U.S.C. § 1326(b). A technology that is technically or economically infeasible may not be available. *See National Crushed Stone,* 449 U.S. at 75 (describing the best available technology provisions as requiring employment of the "best measures economically and technologically feasible"); Driesen, *Feasibility Principle*, *supra*, at 21 (describing BAT requirements as exemplars of the feasibility principle, which maximizes reductions except when doing so causes widespread plant shutdowns). Accordingly, EPA properly employs economic analysis to determine whether a technology is available.

Economic analysis focused on technological availability models the relationship of costs to regulated facility owners' economic capabilities. *See Alaska,* 540 U.S. at 498 (upholding EPA's rejection of a disproportionate cost argument, because a finding of economic infeasibility requires financial data, which the regulated firm withheld). This financial analysis of an industry, combined with an analysis of technical feasibility (whether the technology works properly for the industry as a whole), allows the agency to determine the limits of firms' capabilities. *See Donovan*, 452 U.S. at 508-09 (defining feasible regulation as that which is "capable of being done . . . "); *see, e.g., Riverkeeper I,* 358 F.2d at 195 (EPA found "dry cooling" technically infeasible for some facilities). Thus, in regulating water intake, EPA compared the costs of technologies reducing water intake to the revenues of the regulated facilities, Final Rule EBA, *supra,* at B2 (analyzing cost to revenue ratios at the firm and facility level); *Riverkeeper I,* 358 F.3d at 194 n.21 (discussing the percentage of revenue necessary to fund "dry cooling" technology), in order to evaluate whether environmentally desirable technologies were economically available to the industry, *see id.* at 195 (EPA found that dry cooling requirements for new facilities would discourage their construction); *Riverkeeper II,* 475 F.3d at 99 n.11 (characterizing *Riverkeeper I* approval of EPA's rejection of dry cooling as "ultimately" based on EPA finding dry cooling "too expensive for industry to reasonably bear" and air pollution impacts); *see also* Pet.App.272a-273a (69 Fed. Reg. at 41,608-09) (finding dry cooling unavailable for existing facilities because it "carries costs that would potentially cause significant closures."). If the cost of an environmentally valuable technology creates a long-term excess of cost over revenue, requiring that technology may lead to bankruptcy and/or the shutdown of facilities. *See Effluent Limitations for the Meat and Poultry Products Point Source Category*, 69 Fed. Reg. 54,476, 54,511, 54,514 (September 8, 2004) (closure comes from regulation producing "negative long-term earnings" at the facility or company level). A rule that shuts down a significant portion of an industry does not cause the technology to be employed, because it may not be economically available to the industry as a whole.[5]

Accordingly, in evaluating technological availability, EPA frequently uses economic models focused on industry finances. *See, e.g., National Wildlife Federation (NWF) v. EPA*, 286 F.3d 554, 565 (D.C. Cir. 2003) (discussing EPA's use of the Altman bankruptcy model); *Effluent Limitations for the Iron and Steel Manufacturing Source Category*, 67 Fed. Reg. 64,216, 64,244 (October 17, 2002) (*Iron & Steel*) (EPA selected Altman's Z model to evaluate bankruptcy possibilities after a review of corporate financial distress models in the economic literature).

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[5] Likewise, if the compliance cost associated with a technology required of new sources becomes so onerous that new facilities do not open, it might be correct to say that the technology is not "available" to new facilities. *See Effluent Limitations for the Industrial Laundries Point Source Category, Withdrawal of Proposed Rule*, 64 Fed. Reg. 45,072, 45,079 (August 18, 1999) (EPA conducts a " 'barrier-to-entry analysis' to determine whether . . . compliance costs would have prevented a new source from entering the market.").

Financial analysts and others use financial models to evaluate whether a projected cost increment might bankrupt firms and/or lead to facility closures. *See* Edward A. Altman & Edith Hotchkiss, *Corporate Financial Distress and Bankruptcy* 234-35 (2006) (discussing financial institutions' use of models to predict repayment risk). Such models may take into account earnings, assets, liabilities, and other factors relevant to predicting bankruptcy or closures. *See id.* at 241-43 (discussing model components).

Economists use a concept of price elasticity to analyze the question of when facility owners must bear costs imposed on them in order to avoid sales declines or, instead, will succeed in passing them on to customers. *See, e.g., Effluent Limitations for the Metal Products and Machinery Point Source Category Notice of Data Availability*, 67 Fed. Reg. 38,752, 38,769 (June 5, 2002) (*Metal Products*) (stating that EPA estimated the "cost elasticity of price."). For goods and services with few or no substitutes, consumer demand may remain steady even as prices rise. *See Effluent Limitations for the Transportation Equipment Cleaning Point Source Category*, 65 Fed. Reg. 49,666, 49,688 (August 14, 2000) (predicting that price increases would cause little decline in output in a sector offering an essential service). Industry competitiveness is also relevant to a firm's ability to pass on costs and, thus, EPA employs econometric models and analyzes market structure to estimate how much of projected regulatory cost facilities must actually pay. *See, e.g., Metal Products*, 67 Fed. Reg. at

38,768-69. Price rises reflecting regulatory costs, if significant and not shared by all relevant competitors, can cause a firm to lose market share, another possible route to bankruptcy. *Cf.* Adam B. Jaffe et al., *Environmental Regulation and the Competitiveness of U.S. Manufacturing, What Does the Evidence Tell Us?,* 33 J. Econ. Lit. 132, 157 (1995) (environmental regulation has little impact on U.S. competitiveness); *Pharmaceutical Manufacturing Category Effluent Limitations Final Rule*, 63 Fed. Reg. 50,388, 50,408 (September 21, 1998) (*Pharmaceutical Manufacturing*) (analyzing whether rule might encourage new facilities to locate outside the United States). In sum, financial models provide tools for evaluating the many economic factors associated with assessing a technology's economic availability to an industry. *See Metal Products*, 67 Fed. Reg. at 38,770-71 (discussing several different models).

This availability requirement has imposed significant restraints on the EPA's ability to require the best technologies. Courts have remanded rules to EPA when it failed to adequately consider affordability in cases where there might be a serious issue in that regard. *See, e.g., National Renderers Ass'n v. EPA*, 541 F.2d 1281, 1288-89 (8th Cir. 1976) (finding a water pollution rule arbitrary because EPA did not adequately consider whether costs would affect the economic viability of medium-sized facilities). And EPA has sometimes refused to require the best performing technology, when it determines that a rule based on that technology will close a large number of facilities. *See, e.g., id.* at 1288 & n.7 (noting that EPA exempted small facilities from its rule, because it predicted many of them would otherwise close); *NWF,* 286 F.3d at 565 (accepting EPA's conclusion that a particular technology is not achievable because requiring it would lead to bankruptcies).

Analysis of the relationship between costs and benefits does not reveal whether a technology is economically available. *See Pharmaceutical Manufacturing*, 63 Fed. Reg. at 50,403 (stating that the agency's economic analysis includes "the impacts of these rules" on firms and "*also*" a cost-benefit analysis) (emphasis added); *Effluent Limitations for the Industrial Laundries Point Source Category*, 64 Fed. Reg. 45,072, 45,078 (August 18, 1999) (describing evaluation of facility closures, firm failures, and cost-benefit analysis as separate components of its economic assessment); *Iron and Steel*, 67 Fed Reg. at 64,243 (describing an evaluation of "corporate financial distress" and cost-benefit analysis as separate components of a regulatory impact analysis). Instead, CBA shifts the focus from availability to a broad question about whether pollution control is desirable in a given instance, a question not mentioned in section 316(b). *See Riverkeeper II,* 475 F.3d at 98 n.10 (citing OMB Circular A-94, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs,* Appendix

A (1992)) (CBA is a method of assessing a policy's *desirability*) (emphasis added).

To see CBA's irrelevance to technological availability, consider a simplified example in which a firm generating $500,000 in annual revenue must employ an environmental technology requiring $1 million in additional annual cost. This cost produces $10 million in incremental annual monetized environmental benefits. Because annual cost exceeds annual revenue, this technology is not economically available to the firm, but requiring this technology would be economically efficient, because the overall benefits to society exceed the costs. Conversely, imagine that the same $1 million annual incremental expenditure occurs at a facility generating $1 billion in annual revenue, but generates only $1,000 in annual incremental benefits. In this case, the measure may be economically available to the facility, but a rule based on it would be economically inefficient (assuming that all environmental benefits have been accurately estimated and appropriately valued). In each case, conclusions about a technology's availability hinge on analysis of the firm's finances rather than on the relationship between costs and benefits. Financial analysis of costs' predicted impacts on regulated firms' operations in light of their economic capabilities provides useful information about a technology's economic availability. Monetization and quantification of benefits provides no information relevant to assessing a technology's economic availability.

Economic analysis of the question of whether a proposed rule will trigger plant shutdowns focuses upon the distribution, not the total amount, of costs. *Cf.* I A Legislative History of the Water Pollution Control Act Amendments of 1972 (Comm. Print 1973) (Leg. Hist.) at 156, 217, 352-53, 375, 452, 456-57, 467, 480, 513-15, 561, 564-65, 613, 656-58, 731-33, 735-36, 738, 743-45, 1128-29, 1143, 1157, 1173, 1215, 1286, 1353-55, 1358-61 (showing overwhelming Congressional focus on the job loss issue). A high cost imposed on a very profitable facility might lead to employment increases, as plant managers hire technicians to install and operate equipment reducing environmental impacts. *See* Goodstein, *supra,* at 171. Conversely, a relatively modest cost imposed on a marginal facility might lead to a shutdown, causing significant unemployment. Hence, economic models that compare costs to facilities' economic capabilities implicitly focus on cost distribution.

Not only does analysis of direct job losses require a form of analysis focused on cost distribution rather than aggregate costs and benefits, but the concern about job loss itself constitutes a distributional concern. *See* Driesen, *Feasibility Principle,* at 35-37. A complete loss of income constitutes a heavily concentrated cost for the worker losing a job, having a significant impact on the worker concerned. *See id.* at 37 (describing the impact). The same amount of cost producing widespread but modest price increases usually does not implicate Congressional concerns about immediate plant shutdowns. *See id.* at 35-36 (explaining why widely distributed costs tend to have insignificant impacts). Congressional focus on availability thus reflects political concern for costs' distribution, rather than maximization of net benefits.

Economic theory recognizes that cost-benefit analysis, because of its focus on economic efficiency, does not resolve distributional questions. *See* Jonathan Lesser, Daniel Dodds & Richard Zerbe, Jr., *Environmental Economics and Policy* 211 (1997) (recognizing the rationality of pursuit of "non-economic goals," such as equity); Arrow *et al.*, *supra,* at 221 (describing "concerns about fairness" as "important noneconomic factors that merit consideration"). Quantification and monetization of benefits does not help to analyze the distributional concerns implicated by the legislature's emphasis on technological availability.

C. Cost-Benefit Analysis Is Irrelevant to Cost Effectiveness Analysis

The Second Circuit held that EPA may consider "cost effectiveness" in crafting its standards. *Riverkeeper I,* 475 F.3d at 98 (Congress intended that EPA use cost effectiveness analysis in designing BAT standards). Cost effectiveness analysis identifies the cheapest means of achieving a predetermined goal. *Id.* at 98 n.10 (citing OMB Circular A-94) (describing cost effectiveness as a "systematic quantitative method for comparing the costs of alternative means of achieving the same . . . given objective."). Concerns about cost effectiveness motivate a very substantial economic literature on the form of regulation, and lie behind economists' support for pollution taxes and emissions trading. *See, e.g.,* Lesser, Dodds & Zerbe, Jr., *supra,* at 231-33; W.D. Montgomery, *Markets in Licenses and Efficient Pollution Control Programs,* 5 J. Econ. Theory 395 (1972).

The economic literature teaches that cost effectiveness analysis does not involve monetization or quantification of benefits and is therefore analytically distinct from CBA.[6] To carry out a cost effectiveness analysis, EPA must identify and compare the cost of several technologies or approaches capable of meeting its previously determined goal. Under § 316(b), this previously determined goal is the minimization of adverse environmental impacts from cooling water intake and it is pursued through evaluation of the environmental capabilities of various available technologies.

EPA may establish a performance standard based on the best available technology's capabilities, while

[6] *See, e.g.,* Scott Callan & Janet Thomas, *Environmental Economics & Management: Theory, Policy, and Applications* 170 (4th ed. 2007); Barry Field, *Environmental Economics: An Introduction* 13 (1994); Ahmed Hussen, *Principles Of Environmental Economics* 188 (2d ed. 2000); Lesser, Dodds & Zerbe, Jr., *supra*, at 230; Roger Perman, Yue Ma & James McGilvray, *Natural Resource and Environmental Economics* 222 (1996); Clifford Russell, *Applying Economics to the Environment* 117 (2001); Tietenberg, *supra,* at 48-50.

allowing facilities to use technologies other than the technology EPA identified as the best, including technologies invented after the rule's promulgation, to meet the standard. *See generally* Tietenberg, *supra*, at 48-49. This approach invites facility owners to carry out a cost effectiveness analysis to determine which technologies provide the cheapest means of achieving agency goals. Regulated firms usually have better information than EPA does about the marginal cost of employing various technologies at their own plants. This "information asymmetry" supports EPA's practice of allowing firms some flexibility in choosing technologies to meet EPA standards. *See generally* Sanford J. Grossman & Joseph E. Stiglitz, *On the Impossibility of Informationally Efficient Markets*, 70 Am. Econ. Rev. 393, 404 (1980) (discussing market implications of information asymmetry). But the ratio of costs to benefits has no bearing on whether a particular approach offers the cheapest way to meet a predetermined goal. *See* Clifford Russell, *Applying Economics to the Environment* 112-13 (2001) (describing cost-effectiveness as "an application of constrained optimization" that provides an alternative to CBA); Wallace E. Oates, *From Research to Policy: The Case of Environmental Economics*, 2000 U. Ill. L. Rev. 135, 135 (noting that standards under the CWA are to be set "with little regard to their economic implications").

The distinction between CBA and cost effectiveness analysis is especially important in a system of distributed political power, where one governmental body might wish to delegate only part of its authority to another. Whereas petitioners and their supporters analogize regulatory CBA to "everyday life" decisions such as the purchase of an automobile, Federal Brief at 13, the better analogy is to decisions in which authority, resources, expertise, and responsibility are spread among multiple parties. In such contexts, individuals might properly hesitate to confer authority on agents to seek overall efficiency.

For instance, a client might delegate decisions about how to litigate a case to an attorney, but reserve to itself the decision about when to settle in light of anticipated costs and benefits. Or a parent might offer to purchase the automobile of a teenage child's choosing, but still limit the extent to which the child could trade off safety for other factors like speed or styling. A rational policymaker might choose in these contexts *not* to delegate authority to seek overall efficiency, but instead to establish more specific policies to guide the agent's decisionmaking. *See* I Leg. Hist. at 518-19 & n.1 (showing Congressional consideration of CBA).

III. EPA'S COST-BENEFIT ANALYSIS ILLUSTRATES WHY CONGRESS MAY RATIONALLY HAVE REJECTED ITS USE IN § 316(B)

Although now generally cited as an unequivocal supporter of CBA, Professor Sunstein has argued both that "there is a large difference between CBA and standards of feasibility or achievability," and that the latter "might be preferred . . . on the ground that they greatly ease the agency's task, and in a way that makes people far better off on balance." Cass R. Sunstein, *Is Cost-Benefit Analysis for Everyone?*, 53 Admin. L. Rev. 299, 311 (2001). EPA's attempt to transform the feasibility standard of § 316(b) into a cost-benefit standard supports Professor Sunstein's claim.

A. Incomplete Information Made the Phase II Cost-Benefit Analysis Unreliable

In the Phase II rulemaking, EPA focused on "reductions in impingement and entrainment as a quick, certain, and consistent metric for determining performance." Pet.App.169a (69 Fed. Reg. at 41,586). Increased fish survival became the primary determining factor of the rulemaking because – at least for those fish that are commercially or recreationally valuable – that factor offered an ecological benefit that was readily quantifiable and monetizable.

As the agency acknowledged, however, the potential impact of cooling water intake structures is much broader and more complex than these quantified mortality effects. *See* EPA, Regional Analysis Document for the Final Section 316(b) Phase II Existing Facilities Rule, EPA-821-R-02-003, February 12, 2004, at A9-1 (Final Rule RS) (documenting numerous ways in which "the organisms lost to [impingement and entrainment] are critical to the continued functioning of the ecosystems of which they are a part" and in which those ecosystems provide valuable "ecological and public services").[7] Among these broader impacts was an unknown but nontrivial level of harm posed to threatened or endangered species. *See* Pet.App.173a-174a (69 Fed. Reg. at 41,587).

Such additional environmental impacts, however, received no monetary value in EPA's economic analysis. Indeed, as the agency candidly admitted, even its focus on impingement and entrainment losses was highly incomplete, as it only accounted for losses insofar as they impacted commercial and recreational fish harvests; hence, the agency "was not able to monetize benefits for 98.2% of the age-one equivalent losses of all commercial, recreational, and forage species for the section 316(b) Phase II regulation." Final Rule EBA, *supra,* at C3-2. *See also*

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[7] This document is available at http://www.epa.gov/waterscience/316b/phase2/casestudy/final.htm.

Pet.App.499a (69 Fed. Reg. at 41,661) ("The Agency's direct use valuation does not account for the benefits from the remaining 98.2% of the age 1 equivalent aquatic organisms estimated to be protected nationally under today's rule.").

In light of such incompleteness and uncertainty, the agency warned that "[t]o rely only on estimated use values would substantially undervalue the benefits of the final section 316(b) rule." Final Rule RS, *supra,* at A9-8. Elsewhere, the agency offered the sage advice that "[a] comparison of complete costs and incomplete benefits does not provide an accurate picture of net benefits to society," Final Rule EBA, *supra,* at D1-5, and that "there is a real possibility that ignoring non-use values could result in serious misallocation of resources," Pet.App.499a (69 Fed. Reg. at 41,660). Nevertheless, the agency ultimately appeared to give these unquantified benefits no weight in its conclusion about whether closed cycle cooling was acceptable. *See* Final Rule EBA, *supra,* at D1-4 (mentioning only monetized benefits).

With so many effects remaining off the balance sheet, regulators had little reason to be confident that the conclusions offered by CBA were welfare-maximizing. Instead, alternative, more stringent standards of environmental protection might have been preferable to the CBA-based approach, given the many non-quantified environmental benefits of cooling water intake reduction. *See* Frank Ackerman, Comments on

Proposed Rule (August 1, 2002) at 9 tbl. 2, J.A. at 296 (discussing additional ecological impacts).

B. As Traditionally Understood and Implemented, the Technology-Based Standard of § 316(b) Would Have Avoided Limitations of EPA's Cost-Benefit Analysis

Even within the terms of welfare economics, non-efficiency maximizing policy approaches such as technology-based standards may appear desirable when evaluated in real world policy contexts, where information is incomplete and uncertain, where administrative resources are limited, and where technology is dynamically impacted by law itself. *See, e.g.,* Daniel H. Cole & Peter Z. Grossman, *When is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 Wis. L. Rev. 887, 888-89 (observing that historical, technological, and institutional factors can occasionally render technology-based approaches "the most efficient means of achieving a society's environmental protection goals"); Juan-Pablo Montero, *Pollution Markets with Imperfectly Observed Emissions*, 36 RAND J. Econ. 645 (2005) (demonstrating that when regulators can accurately monitor abatement technology but not emissions and output levels, standard-based approaches may outperform alternatives under certain market conditions).

Such second-best considerations are at the heart of the CWA, given the great difficulty experienced attempting to identify and enforce standards prior to the 1972 amendments. *Cf.* J. H. Dales, *Pollution, Property & Prices: An Essay in Policy-making and Economics* 39 (1968) (a leading economist's statement, prior to the Act's passage, that an economist cannot say that one policy is superior to another because he "is quite unable to draw up a neat table showing all benefits and costs"). As is well recognized, Congress's general approach in the amendments was to circumvent the informational demands, scientific uncertainties, and valuation questions that had frustrated the task of basing standards for dischargers on the effect of pollution on water quality. *See EPA v. State Water Resources Control Board*, 426 U.S. 200, 202-03 (1976).

Because the language of § 316(b) closely resembles the language of the most stringent technology-based standards in the CWA, EPA should have focused simply on the affordability of increasingly efficacious environmental control technologies, recognizing that Congress itself already had determined that the benefits of cooling water intake regulation are sufficiently vast and difficult to quantify that only the "best" control technology will suffice. Instead, EPA essentially relived the failed pre-1972 experience under the CWA through its failed effort to complete a reliable CBA of the Phase II rulemaking.

In this respect, it is useful to recall that the stated goal of the CWA is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." 33 U.S.C. § 1251(a). The goal is *not* to view those waters as merely contingent resources, to be impaired or sacrificed at any moment for the promotion of an abstract and undifferentiated maximization of welfare.

Earlier, EPA seemed to recognize that allowing the degraded condition of a water body to reduce the level of legal protection that it receives – as the agency ultimately decided to allow through its CBA-based approach – would be inconsistent with the CWA's more dynamic, long-term goal of progressively restoring the ecological integrity of the nation's water bodies. *Cf.* Thomas O. McGarity, *Media-Quality, Technology, and Cost-Benefit Balancing Strategies for Health and Environmental Regulation*, 46 Law & Contemp. Probs. 159, 199 n.194 (1983) (quoting Senator Bayh as explaining that the technology-based standards of the CWA were intended to "force industry to do the best job it can do to clean up the nation's water and to keep making progress without incurring such massive costs that economic chaos would result"). When offering its proposed Phase II rule, for instance, EPA stated that, in addition to expressly quantified impacts, it was "concerned about the cumulative overall degradation of the aquatic environment as a consequence of . . . intakes located with or adjacent to an impaired waterbody." *See* 67 Fed. Reg. 17,122, 17,136 (April 9, 2002).

Conversely, a "comprehensive . . . attempt 'to restore'" the ecological integrity of waters, *Bayview Homes*, 474 U.S. at 132-33 (1985), through pollution controls, wetlands conservation, and other measures should increase fish populations, and therefore the value of the benefits of technology reducing water intake, over time. *See* EPA, Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule, EPA-821-R-02-001, February 2002, at C1-6, item 5.1[8] (acknowledging likely underestimation of benefits because current water quality has improved since the 20-year-old data relied upon was generated). Through its subtle shift from expressing concern over the impact of cooling water intake structures on impaired water bodies to using estimated impairment levels as an efficiency-oriented rationale for lowering levels of protection, EPA seemed to abandon the CWA's mandate to progressively restructure the economic and technological landscape that gives rise to any momentary depiction of costs and benefits.

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[8] This document is available at http://www.epa.gov/waterscience/316b/phase2/econbenefits/ (last visited September 30, 2008).

CONCLUSION

Regulators should use economic methods appropriate to the decision before them. CBA provides a tool for choosing allocatively efficient regulation. Other modes of economic analysis, however, fit a mandate to minimize environmental impacts within the limits of available technology.

Respectfully submitted,

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