IV. CWA § 316(b)-Based Cooling Water Intake Limits

Response #: IV.1-44	**Document #**: 1218

1. Comment

The permittee disagreed with EPA's view that CWA § 316(b) authorizes EPA to regulate the volume and rate (velocity) of cooling water flow taken in through the cooling water intake structure. The permittee stated that § 316(b) authorizes EPA to regulate the "location, design, construction, and capacity" of "cooling water intake structures," not changes in flow or other operational parameters. The permittee stated that EPA "may not, through creative misreading of a single word ("capacity"), assert regulatory control over other aspects of plant operations where Congress chose not to grant such authority." In support of its claim, the permittee cited its own comments and the Utility Water Action Group's (UWAG) comments on the Phase II § 316(b) proposed rule.

Response

As a preliminary matter, EPA is not required to respond to comments on the proposed § 316(b) rulemaking that are cited by the permittee. This is especially the case where the permittee has referred only generally to these other comments and has not provided any specific references. See *NRDC* v. *EPA*, 863 F.2d 1420, fn. 7 (9th Cir. 1988) (upholding EPA's decision not to consider comments pertaining to national rulemaking because "requiring each EPA Region to consider all the comments relating to the national rulemaking in each BPJ permit would impose an unreasonable burden on the agency."); *Mount Diablo Hosp.* v. *Shalala*, 3 F. 3d 1226 (9th Cir. 1993) ("there is no obligation to make reference in the agency explanation to all the specific issues raised in comments. The agency's explanation must simply enable a reviewing court to see what major issues of policy were ventilated by the informal proceedings and why the agency reacted to them the way it did") (citing *South Carolina ex rel. Tindal* v. *Block*, 717 F.2d 874, 886 (4th Cir. 1983) (internal citations and quotations omitted), cert. denied, 465 U.S. 1080, 79 L. Ed. 2d 764, 104 S. Ct.1444 (1984)). EPA has, nonetheless, reviewed the comments submitted by BPS and UWAG on the proposed § 316(b) rulemaking and responded below to those points that are relevant to the interpretation of the term "capacity" as used in CWA § 316(b).

EPA disagrees with the permittee's assertion that CWA § 316(b) does not authorize EPA to regulate a CWIS's rate of flow. As explained in § 7.2.8d of the July 22, 2002, Permit Determinations Document, EPA has long interpreted the term "capacity" in § 316(b) to refer to the volume of cooling water drawn through the intake. The velocity of the water drawn into the plant may also be considered under this factor. See July 22, 2002, Permit Determinations Document, § 7.2.8d. EPA's interpretation is based upon the commonly understood meaning of the term "capacity," the legislative history of the CWA Amendments of 1972, the definition of the term in EPA's proposed regulations under CWA § 316(b) from 1976, and opinions issued both by the Administrator and the General Counsel of EPA. See *id*.

In addition, in the preamble to EPA's final rule for cooling water intake structures at new facilities (66 FR 65256, December 18, 2001, codified at 40 CFR Part 125, Subpart I), EPA discussed its authority under section 316(b) of the CWA to regulate the "capacity" of a cooling water intake structure, including its rate of intake. Specifically, EPA stated that

> "[r]educing the cooling water intake structure's capacity is one of the most effective means of reducing entrainment (and impingement). Capacity includes the **volume of water** that can be withdrawn through a cooling water intake structure over a period of time. Limiting the volume of the water withdrawn from a waterbody typically reduces the

> number of aquatic organisms in that waterbody that otherwise would be entrained." 66 FR at 65273 (emphasis added).

The permittee's claim that "capacity" refers only to the intake structure itself—i.e., the velocity at the intake—and not to the volume of water withdrawn makes little sense, as the capacity of a CWIS (**including** the velocity at the intake) necessarily affects the amount of water it can take in. In any event, EPA's long-standing interpretation of the statute is certainly reasonable.

The permittee's claim (in comments on the proposed § 316(b) rule) that EPA cites references from legislative history that have nothing to do with the § 316(b) debate is incorrect. As discussed in the July 22, 2002, Permit Determinations Document, in *Decision of the General Counsel No. 41*, at 200-01, EPA's General Counsel explained the bases for his conclusion that "capacity" as used in CWA § 316(b) refers to the volume of cooling water drawn through the intake. In addition to language from the decision cited in § 7.2.8d of the July 22, 2002, Permit Determinations Document, EPA's General Counsel cited extensively to the Legislative History of § 316(b), stating:

> In the course of debating the conference report of the Act on October 4, 1972, the Senate was well aware of the dangers posed to aquatic life by the withdrawal of large volumes of water through cooling water intake structures [footnote omitted]. In response to concerns voiced by Senator Buckley that the Act would prevent the effective regulation of this problem, Senator Muskie, the Chairman of the Senate Conference Committee, stated that EPA had authority under the Act to regulate the withdrawal of cooling water so as to minimize adverse environmental aspects.

Decision of the General Counsel No. 41 (In re Brunswick Steam Electric Plant), 200–201 (June 1, 1976) (citing Senate Com. on Pub. Works. A Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Session, at 197–198 (1973)). Furthermore, in a footnote, the General Counsel noted that:

> [d]uring debate, Senator Buckley cited—with approval—two newspaper articles which reported a decision of the Atomic Energy Commission (AEC) to require Consolidated Edison Company to install a closed cycle cooling system at its nuclear power plants at Indian Point on the Hudson River. The articles pointed out that plants withdrew massive amounts of water from the River and, as a result, also withdrew thousands of aquatic organisms each minute. In order to minimize this adverse environmental impact, the articles noted that the AEC had ordered Consolidated Edison Company to stop removing such large volumes of water from the River and to install cooling towers in order to do so.

Id. (citing Senate Com. on Pub. Works, A Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Session, at 196–197 [1973]).

EPA has also long disagreed with the assertion, made by UWAG in its comments on EPA's recently proposed § 316(b) regulations, that "capacity" should refer **only** to the velocity of withdrawal at the intake. As EPA's General Counsel explained in *Decision of the General Counsel No. 41*:

> ... it does not make sense to define the term "capacity" in terms of the physical size of the inlet opening of the intake structure as urged by [the permittee]. First, as noted by [the permittee], the size of the inlet determines only the velocity of the water withdrawn, not the volume. Although velocity (and volume) is an important factor in the impingement of larger fish, velocity is not important with respect to the entrainment of smaller organisms.

> Rather, the volume withdrawn is the principal determinant of entrainment damage which is the major adverse environmental effect associated with most cooling intake structures.

Id. (citing 41 FR 17388 (April 26, 1976) (Final CWA § 316(b) regulations later withdrawn by EPA after remand by Federal court on procedural grounds)).

EPA also disagrees with the claim, presented by UWAG in its comments on the recently proposed § 316(b) regulations, that the CWA's preservation of State authority over the use of their water resources indicates that Congress did not intend EPA to regulate the use of cooling water flow or volume (citing CWA § 101(b), (g), 33 U.S.C. § 1251(b), (g)). This argument ignores the plain requirements of § 316(b), as well as the legislative history of the provision and EPA's longstanding interpretation of it. Furthermore, this argument posits a conflict between § 316(b) and State authority under § 101(b) and (g) where none exists.

EPA has discussed above why the language of § 316(b) and its legislative history, consistent with EPA's longstanding interpretation of the statute, indicate that the volume of water withdrawn through cooling water intake structures may be regulated by EPA under § 316(b). That discussion will not be repeated here. It is also evident that there is no conflict with State authority over water resources as a result of EPA's interpretation. EPA's interpretation of § 316(b) no more creates a conflict with this State authority than do the unassailable interpretations of the CWA that recognize EPA authority to regulate discharges of pollutants. Indeed, EPA's interpretation of § 316(b) **furthers** State authority to manage water resources: by limiting the volume of water withdrawn by a cooling water intake structure, EPA would cause more water, unadulterated by pollution, and more of the living organisms that inhabit that water to remain in the waterbody subject to State decisions regarding water use than if EPA took the position that it had no authority to regulate cooling water withdrawal volumes. This is because when a power plant withdraws water through its cooling water intake structure, some of that water evaporates to the air, the water is heated and typically has chemicals added to it, and much of the marine life in the water is killed or injured. In other words, by limiting the amount of water a power plant takes through a cooling water intake structure, EPA would, if anything, tend to support, rather than interfere with, a State's ability to allocate water use. (In any event, certainly no such conflict between Federal and State authority exists here with respect to BPS and both Massachusetts and Rhode Island support the permit's § 316(b) limits.)

Moreover, EPA believes that its interpretation of § 316(b)—which enables the Agency to try to minimize the adverse environmental impacts of cooling water intake structures, as Congress clearly wanted EPA to do—is fully consistent with the overarching statutory purposes expressed in CWA § 101. As discussed in § 7.2.1 of the July 22, 2002, Permit Determinations Document, CWA § 316(b), like other provisions of the statute, should be construed with Congress' ambitious overarching statutory purposes in mind: i.e., to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and to attain "water quality which provides for the protection and propagation of fish, shellfish, and wildlife." 33 U.S.C. § 1251(a), (a)(2). EPA's reading of § 316(b) is consistent with these goals, whereas the contrary interpretation offered by UWAG would cut against these goals.

2. Comment

The permittee stated that to ensure decisional consistency and fairness, Region 1 should not finalize this permit until EPA headquarters finalizes the pending § 316(b) rulemaking. The permittee stated that EPA headquarters has expressed an intention to codify "its historic rejection of closed-cycle cooling as BTA for existing power plants and allow existing plants choices among technologies and mitigation measures." The permittee stated that if EPA issues the permit now and requires closed-cycle cooling, BPS will be forever deprived of the opportunity to pursue the options afforded by the new regulations—a result that is disfavored by the courts. Citing *NRDC* v. *EPA*, 863 F.2d 1420, 1427 (9th Cir. 1988) and language from EPA's 1984 NPDES rulemaking (49 Fed. Reg. 37,998, 38,019, 38,020), the permittee asserted that

guidelines should be applied equally to all dischargers and not penalize or create a competitive disadvantage for companies that had received a BPJ permit before guidelines promulgation**.**

Response
EPA disagrees with the permittee's position. EPA explained its views on this point in the July 22, 2002, Permit Determinations Document and in letters to the permittee and other documents in the Administrative Record, which EPA hereby incorporates by reference into these responses to comments. These materials include §§ 7.2.3 and 7.2.4 of EPA's July 22, 2002, Permit Determinations Document and AR 3021, 3022, 3023, 3024, 3025, 3027, and 3080. EPA notes that it has been issuing BPJ permits under § 316(b) for decades and numerous power plants utilize wet mechanical draft cooling towers for closed-cycle cooling.

3. Comment
The permittee stated that the pending § 316(b) rule "would codify EPA's prior practice" and that Region 1 is therefore "not free to single-handedly overrule prior precedent and establish closed-cycle cooling as the new baseline for all existing facilities." The permittee questioned whether Region 1 could distinguish this case on its facts, since "the preferred alternative identified in the Headquarters draft rule would clearly apply to BPS." The permittee stated that in light of this pending national rule and "principles of decisional consistency," it questioned EPA's ability to justify imposition of closed-cycle cooling as required by "40 CFR 125(c)(2)(i)"**.** The permittee stated that while it is "aware that the proposed rule states that it is not intended to be binding, this does not necessarily decide the issue." The permittee stated that EPA's ability to justify imposition of closed-cycle cooling on BPS and "principles of decisional consistency" were in serious doubt as a matter of law.

Response
EPA disagrees with this comment. EPA explained its views on this point in the July 22, 2002, Permit Determinations Document and in letters to the permittee and other documents in the Administrative Record, which EPA hereby incorporates by reference into these responses to comments. These materials include §§ 7.2.3 and 7.2.4 of EPA's July 22, 2002, Permit Determinations Document and AR 3021, 3022, 3023, 3024, 3025, 3027, and 3080. Furthermore, EPA has not purported to set a "new baseline for all existing facilities." EPA has engaged in a case-by-case, BPJ application of CWA § 316(b) to BPS consistent with the law and applicable precedent.

In addition, the permittee's regulatory citation does not support its argument. Assuming the permittee intended to refer in its comment to 40 CFR § 125.3(c)(2)—since there is no "40 CFR 125(c)(2)(i)" as referenced by the permittee—that section applies to technology-based **effluent** limits, not to BTA determinations for cooling water intake structures under § 316(b) of the Act.

4. Comment
The permittee stated that in many respects, the analyses Region 1 must do to determine BTA overlap with the analyses it must do to determine BAT. Therefore, the permittee stated, it incorporated by reference its critique of Region 1's technological assessment and cost calculations into its comments on the 316(b) aspect of the Draft Permit.

Response
EPA agrees that the analyses necessary to determine BTA overlap in many respects with the analyses necessary to determine BAT. Therefore, EPA has cross-referenced a number of responses that are germane to both. There are, however, important distinctions between the BTA and BAT analyses. In addition, satisfaction of the § 316(a) burden does not necessarily mean intake requirements under § 316(b) have also been met. EPA explained the interaction between CWA §§ 316(b) and 316(a) analyses

in § 7.2.6 of the July 22, 2002, Permit Determinations Document. See also EPA's response to comments on the BAT standard.

5. Comment

The permittee stated that EPA has disregarded its obligation under "40 CFR § 125(c)(2)(i)" to consider, in addition to the specific circumstances of each individual case, the appropriate national standard for the industrial class to which the individual facility belongs in making BTA determinations. The permittee stated that there is no legal or biological support for demanding that an existing facility be retrofitted with closed-cycle cooling towers in order to meet the BTA requirement. The permittee further stated that the results of EPA's application of the BTA standard over the past 30 years have been "uniform," demonstrating consistent rejection of closed-cycle cooling as too costly and unjustified in light of the potential environmental benefits (citing, e.g., *In Re Florida Power Corporation, Crystal River Power Plant*, at p. 7 (U.S. EPA Region 4, September 1, 1988)). The permittee also stated that EPA Headquarters has instructed the regional offices to consider past permitting decisions in making BTA determinations (citing Dec. 28, 2000, memo from Michael Cook to Regional Directors). Therefore, the permittee stated, EPA bears a heavy burden to justify its decision to impose closed-cycle cooling in this case (citing *Motor Vehicle Manuf. Ass'n* v. *State Farm*, 463 U.S. 29, 41-42 (1983); *Massachusetts Dep't of Education* v. *U.S. Dep't of Education*, 837 F. 2d 536, 544-45 (1st Cir. 1988)).

Response

EPA disagrees. First, the permittee's regulatory citation does not support its argument. Assuming the permittee intended to refer in its comment to 40 CFR § 125.3(c)(2)—since there is no "40 CFR 125(c)(2)(i)" as referenced by the permittee—that section applies to technology-based **effluent** limits, not to BTA determinations for cooling water intake structures under § 316(b) of the Act. Second, as explained in EPA's July 22, 2002, Permit Determinations Document, EPA has not yet promulgated regulations specifying national technology guidelines for CWISs at existing facilities. In the absence of such regulations, EPA has been applying, and continues to apply, CWA § 316(b) on a case-by-case, BPJ basis. See July 22, 2002, Permit Determinations Document, §§ 7.2.4, 7.2.5; AR 2026. Accordingly, EPA has thoroughly considered the circumstances of this case and has explained the bases for its BTA determination in Chapter 7 of the July 22, 2002, Permit Determinations Document. This is consistent with Agency directives and past permit decisions.

EPA agrees with the petitioner that the Agency should consider past permitting decisions in making BTA determinations. See July 22, 2002, Permit Determinations Document, § 7.2.4. The Agency believes, however, that its analysis and decision are consistent with EPA's past case-by-case, BPJ approach to developing CWA § 316(b) limits for individual permits. It must be understood that under a case-by-case analysis, while the same standards are applied, the details of the analysis and the final resolutions could differ for different cases based on the different facts of each case. This is the essence of case-by-case, BPJ analysis. See, e.g., *Hudson Riverkeeper Fund, Inc.* v. *Orange and Rockland Utilities, Inc.*, 835 F. Supp. 160, 166 (S.D.N.Y. 1993) (noting that plants existing within view of one another on the same river could potentially be issued permits with "markedly different" BTA requirements under the case-by-case application of CWA § 316(b)); *American Petroleum Institute* v. *Environmental Protection Agency*, 787 F. 2d 965, 969 (5th Cir. 1986) (stating that "[w]here EPA has not promulgated applicable technology-based effluent limitations guidelines, the permits must incorporate, on a case-by-case method, 'such conditions as the Administrator determines are necessary to carry out the provisions of the Act'" (citing 33 U.S.C. § 1342(a)(1))). EPA's determination in the present case is consistent with this long-standing interpretation of the BTA standard under CWA § 316(b).

Beyond the fact of case-by-case analysis, EPA does not agree that the results of its application of the BTA standard over the past 30 years have been "uniform" in rejecting closed-cycle cooling. In fact, EPA has never rejected closed-cycle cooling as potentially representing BTA for some facilities. Indeed, in the past

EPA has established NPDES permit limits that would have required facilities to retrofit to closed-cycle cooling. For example, EPA issued a permit in 1974 to the Carolina Power & Light Co. ("CP&L") establishing CWIS flow limits that would have required CP&L to retrofit the Brunswick power plant with a closed-cycle cooling system. *In the Matter of Carolina Power and Light Company (Brunswick Steam Electric Plant - Units 1 and 2) (National Pollutant Discharge Elimination System Permit No. NC 0007064)* (Decision by EPA Region 4) (November 7, 1977). (AR 3111). See also James R. May, *The Quick and the Dead: Fish Entrainment, Entrapment, and the Implementation and Application of Section 316(b) of the Clean Water Act*, 20 VT. L. REV. 373, 408 (1995). Closed-cycle cooling was expected to reduce the environmental impacts of the plant by 96 percent, see *Id.* at 412, and the cooling towers were projected to cost $106 million. See *Id.* at n. 229. The utility appealed, and EPA Region 4 responded by issuing an Initial Decision in 1977 which upheld the permit and would have forced CP&L to retrofit its existing once-through system with closed-cycle cooling. See *Id.* at 408. On further appeal in 1978, the EPA Administrator remanded the Initial Decision to the Region on procedural grounds. See *Id.* at 412 (citing *In re Carolina Power & Light Co.*, Appeal No. 77-19, 1978 EPA App LEXIS 4, at 2-3 (EPA Feb. 20, 1978)). In response, the Regional Administrator for Region 4 simply reconfirmed his earlier decision. See *Id.* at 413. Then in 1980, the dispute was settled under a new Regional Administrator, resolving the dispute without requiring the installation of cooling towers. See *Id.* EPA did not, however, invalidate its earlier analysis or reject the possibility of cooling towers being BTA in some other case. Cf. *Consolidated Edison Co. of N.Y., Inc.* v. *New York State Dep't of Envtl. Conservation*, 726 F. Supp. 1404, 1406 (S.D.N.Y. 1989) (Draft Permits issued by EPA in 1975 to three utilities established thermal discharge limits that would require retrofits to closed-cycle cooling towers, though settlement of a permit appeal did not result in the installation of cooling towers).

In the case of the Crystal River power plant, it appears that a similar path was followed. AR 2143 (*In Re Florida Power Corporation, Crystal River Power Plant*, U.S. EPA Region 4 (September 1, 1988)). In a 1974 Draft Permit, it appears the Region required closed-cycle cooling ("offstream cooling"), pending acceptance of a subsequent § 316(a) variance request. *Id.* at p. 2. After a hearing and further study, EPA finally determined that **in that case** the cost of installing cooling towers would be wholly disproportionate to the benefits. *Id.* at p. 7. The final determination ultimately required seasonal flow reductions and various environmental mitigation efforts. *Id.* at p. 8. This was a determination for that specific facility and did not suggest that closed-cycle cooling could not represent BTA for some other plant.

In addition, EPA provided a detailed analysis of its interpretation of CWA §316(b) in *In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2)*, 10 ERC 1257 (NPDES Permit Application No. NH 0020338, Case No. 76-7; June 10, 1977). See July 22, 2002, Permit Determinations Document, § 7.2.5e. Although the EPA Administrator ultimately did not require the Seabrook Station to retrofit to closed-cycle cooling, the language of the *Seabrook* decision indicates that EPA embraced closed-cycle cooling as an option under CWA § 316(b). Indeed, the Administrator points to the possibility of requiring closed-cycle cooling under CWA § 316(b) to emphasize the importance of reading the wholly disproportionate cost test into CWA § 316(b) determinations. "Otherwise," the Administrator noted, "the effect would be to require cooling towers at every plant that could afford to install them, regardless of whether any significant degree of entrainment or entrapment was anticipated." *Id.* at 1261.

EPA believes it is clear from these past permitting decisions that EPA has **not** rejected closed-cycle cooling as an "available" technology and potentially the BTA for some facilities under CWA § 316(b), any more than EPA has mandated closed-cycle cooling for all facilities. EPA has, instead, left the determination to a case-by-case analysis.

Finally, EPA disagrees with the permittee's assertion that the Agency bears a heavy burden to justify its CWIS flow limits in this case. In support of its assertion, the permittee cites two judicial cases that are not

on point. In *Motor Vehicle Manuf. Ass'n* v. *State Farm*, the petitioners challenged the National Highway Traffic Safety Administration's rescission of a rule as arbitrary and capricious because the agency had not adequately explained the rescission. See 463 U.S. 29(1983). The Supreme Court remanded the matter for further agency consideration, holding that under the Administrative Procedure Act, "an agency changing its course by rescinding a rule is obligated to supply a reasoned analysis for the change...." *Id*. at 42. The present case does not concern the establishment or rescission of a rule nor a change in course by the Agency. Rather, at issue here is EPA's application of § 316(b) on a case-by-case BPJ basis in the **absence of** governing regulations. Such an application of § 316(b) is entirely consistent with EPA's past practices. See July 22, 2002, Permit Determinations Document, §§ 7.2.4, 7.2.5. In *Massachusetts Dep't of Education* v. *U.S. Dep't of Education*, the petitioner challenged an order issued by the Department of Education as contrary to an earlier decision by the Education Appeals Board. See 837 F.2d.536 (1st Cir. 1988). The First Circuit recognized that "when an agency fills a quasi-judicial role, it builds a body of precedent which it cannot thereafter lightly disregard." *Id*. at 544. The court affirmed the agency's order, however, finding that the agency had appropriately distinguished the earlier EAB decision and that its interpretation of the statutory language was supportable. See *id*. at 545-46. This case is inapposite to the present situation. Again, as discussed in the July 22, 2002, Permit Determinations Document, EPA's application of the BTA standard in the present case is clearly consistent with the Agency's longstanding interpretation of § 316(b), and the resulting BTA determination in this particular case is justified by the case-specific analyses EPA has carried out. See *Id.*

From a biological standpoint, BPS annually entrains and impinges large quantities of fish and invertebrate eggs, larvae, juveniles, and adults. It was not possible to put these substantial losses in context for most species. However, EPA derived an estimate of the population of winter flounder in Mount Hope Bay and compared plant impingement and entrainment losses to this estimate. This calculation showed that a substantial percentage of the winter flounder population of Mount Hope Bay was being lost to the intake structure at BPS. This is occurring at a time when the winter flounder population in Mount Hope Bay is at a historical low point as are the other species also subjected to large entrainment losses. Closed-cycle cooling would not completely eliminate the impact of the facility's intake but would substantially reduce it and potentially allow for recovery of the balanced, indigenous community in Mount Hope Bay.

6. Comment

The permittee stated that Region 1 has "plainly failed" to justify the necessity or achievability of closed-cycle cooling and that "EPA is not entitled to invent new biological, economic or legal analyses when it is dissatisfied with the results that the traditional methods yield." The permittee stated that Region 1 is also not entitled "to recycle scientific methods that EPA itself has, in other proceedings, rejected as lacking in validity in hopes that the inconsistency will not be noticed." The permittee further stated that even Region 1's own application of "accepted methods" demonstrates that a retrofit to closed-cycle cooling cannot be justified.

Response

As explained in § 7.7.4 of the July 22, 2002, Permit Determinations Document, EPA has determined that CWIS **capacity limitations** based on the Closed-Cycle Entire Station option are necessary to reflect BTA for minimizing adverse environmental impacts. Accordingly, EPA imposed a performance standard for CWIS flow which BPS may meet in any manner it chooses. See July 22, 2002, Permit Determinations Document, §§ 7.7.2, 7.7.4. In addition, EPA has determined that closed-cycle cooling is an "available" technology at BPS under § 316(b), meaning it is both technologically feasible and economically practicable. See July 22, 2002, Permit Determinations Document, Chapter 7.

The permittee asserted that EPA cannot "invent" new biological, economic, or legal analyses to support its determinations because it is "dissatisfied with the results that the traditional methods yield." Yet, EPA has not done so in this case. It is unclear what "traditional methods" or "invented methods" the permittee

is referring to. There are no express legal requirements governing EPA's selection of scientific or economic methods in applying § 316(b). Furthermore, EPA's analyses for this permit are reasonable and appropriate. Indeed, they are far more detailed than those conducted for other individual § 316(b) permits. EPA's approaches for this permit are closer to the types of detailed analyses that the permittee demands than other less sophisticated analyses undertaken for past permits. Courts have upheld EPA's choice of scientific models and calculation methodologies where the Agency's selection bears a "rational relationship" to the characteristics of the data to which it is applied. See *Nat'l Wildlife Fed'n* v. *EPA*, 286 F.3d 554, 565 (D.C. Cir. 2002) ("We may reject an agency's choice of a scientific model 'only when the model bears no rational relationship to the characteristics of the data to which it is applied.' ") (quoting *Appalachian Power Co.* v. *EPA*, 135 F.3d 791, 802 (D.C. Cir. 1998) [citing *Am. Iron & Steel Inst.* v. *EPA*, 115 F.3d 979, 1005 (D.C. Cir. 1997)); *Chem. Mfrs. Ass'n* v. *EPA*, 28 F.3d 1259, 1265 (D.C. Cir. 1994)); cf. *Am. Forest & Paper Ass'n, Inc.*, 294 F.3d 113, 121 (D.C. Cir. 2002) (applying "rational relationship" standard and upholding EPA's reasoned preference for one methodology of calculating safe exposure levels over alternative methodology).

In addition, to the extent the permittee's general assertion that EPA has "invented" new methods of analysis is in reference to EPA's evaluation of benefits (see July 22, 2002, Permit Determinations Document, § 7.6.3b), EPA did not invent new methods. EPA's per-person analysis, as previously explained, was a benefits transfer assessment based on a past analysis in the literature. The HRC analysis was not used to value benefits **per se**, and it was derived, as previously explained, from the Habitat Equivalency Approach used in natural resource damages cases. Furthermore, EPA made improvements to its benefits analyses in response to comments, and these, too, are consistent with concepts from the literature (i.e., they were not "invented" by EPA just for this permit). Moreover, even if the approaches had been developed by EPA for this permit, that does not by itself render them unacceptable if they have been shown to be reasonable and appropriate for use in this context. Finally, contrary to the permittee's suggestion, the approaches EPA has used here have not been rejected by EPA in other proceedings.

In addition, contrary to the permittee's assertion, EPA's analysis in the July 22, 2002, Permit Determinations Document demonstrates that a retrofit to closed-cycle cooling is feasible at BPS. See July 22, 2002, Permit Determinations Document, Chapter 7.

EPA has responded in more detail to the permittee's specific challenges to EPA's biological, economic, and legal analyses elsewhere in this document.

7. Comment

The permittee stated that Region 1's decision to require closed-cycle cooling on all four units at BPS and to impose a thermal discharge limit of 1.7 TBtus is not justified by its decision document or by the Administrative Record. The permittee stated that Region 1 does not "even attempt to explain how its imposition of closed-cycle cooling is either consistent with prior precedent or a reasoned departure from it." The permittee further stated that Region 1 failed to present a "reasoned response" to the analyses submitted by BPS, had determined the outcome of this matter before BPS even submitted its demonstration, and demonstrated an "unwillingness" to use the best available evidence and to accept the answers that "sound science" requires. The result, the permittee stated, is a Draft Permit that would impose unprecedented costs on BPS "without any compelling evidence that those costs will make any meaningful difference to the environment."

Response

EPA disagrees. EPA has explained in detail the bases for its determinations in the July 22, 2002, Permit Determinations Document, elsewhere in this response to comments, and in other documents that are part of the Administrative Record. As discussed elsewhere, the Agency's decision in this case-by-case, BPJ permit determination is not a departure from past precedent.

Furthermore, EPA has not prejudged the results of this permit. EPA has been working on these issues since 1997, when the two MOAs were agreed to by the permittee and the regulatory agencies. The existing permit expired in 1998. EPA has been working with the permittee and others to evaluate these issues objectively and clearly has not rushed this permit out precipitously or without careful study. Moreover, as noted in a March 18, 2003, EPA memorandum (AR 3022), EPA has held off on issuing the permit, despite the permittee's delays in submitting necessary information, in order to thoroughly consider information submitted late by the permittee. For example, despite the fact that a permit application was due from BPS in January 1998, the permittee did not submit its complete CWA §§ 316(a) and (b) demonstration documents until December 2001. Although the prior owners of BPS, the New England Power Company (NEPCO), had submitted a permit application in January 1998, this application did not fully address the CWA §§ 316(a) and (b) issues. Indeed, NEPCO had indicated that it would be seeking a State water quality standards mixing zone-based permit for the thermal discharges, but it was not until much later that PG&E-NEG shifted to requesting thermal discharge limits based on a CWA § 316(a) variance. In addition, EPA had to make repeated requests to try to obtain certain information from the permittee that the Agency believed would help it develop the best possible permit. Nevertheless, the Agency did not expedite issuance of the Draft Permit by disregarding the permittee's late variance request or by refusing to review the belated § 316(a) and (b) demonstration documents or other delayed submissions of information. EPA believes the time taken has been necessary to allow for careful information gathering, analysis, and consideration of all the relevant issues. Had the Agency predetermined the requirements in this permit, it would not have allowed for these repeated delays or engage in such prolonged study.

8. Comment

The permittee stated that it is not appropriate to consider the use of a technology at a new power plant as justifying its use at an existing power plant. The permittee stated that "[a]s EPA has recognized in its promulgation of 316(b) regulations, existing sources face numerous constraints in retrofitting technology and the appropriate technology for a new source is unlikely to be the same as the technology that is appropriate for an existing source" (citing 67 FR 17,123, 17,155 (April 9, 2002)).

Response

EPA's determination that retrofitting closed-cycle cooling constitutes BTA at BPS under CWA §316(b) does not depend solely upon the use of closed-cycle cooling at new power plants. Rather, as discussed in § 7.2.5 of EPA's July 22, 2002, Permit Determinations Document, EPA's CWA § 316(b) determination was based upon consideration of (1) the best-performing CWISs at **existing** power plants, which are these that have undergone cooling system retrofits, and (2) the feasibility of a retrofit to closed-cycle cooling at BPS given the particular facts of the BPS situation. EPA has identified a number of existing fossil fuel-burning power plants that have undergone technological retrofits from open-cycle to closed-cycle cooling systems using wet mechanical draft cooling towers. These plants have achieved the best performance in terms of minimizing adverse environmental impacts from their CWISs. See 67 FR 17,123, 17,155 (April 9, 2002). As discussed elsewhere in these responses to comments, since issuance of the Draft Permit, EPA has also learned of additional existing power plants that either have retrofitted or are planning to retrofit from open-cycle to closed-cycle cooling. In addition, as explained in Chapter 7 of the July 22, 2002, Permit Determinations Document and elsewhere in this document, EPA's site-specific analysis has demonstrated that a retrofit from once-through to closed-cycle cooling is both technologically feasible and economically practicable at BPS. The Agency does not believe any significant comments have been submitted that undermine this conclusion.

Second, while EPA has acknowledged in the preamble to the proposed § 316(b) Phase II regulations that existing sources face numerous constraints in retrofitting technology, these general constraints are not determinative in any particular case. The question for this permit is what BPS **in particular** is capable of

achieving. EPA has considered the issues related to retrofitting closed-cycle cooling at existing facilities and has determined that such a retrofit is practicable at BPS. As discussed throughout Chapter 7 of EPA's July 22, 2002, Permit Determinations Document, in the absence of regulations specifying national technology guidelines for existing CWISs, EPA has been applying and continues to apply CWA § 316(b) on a case-by-case, BPJ basis. EPA headquarters has stated that the Agency retains the discretion to adopt approaches on a case-by-case basis that differ from applicable guidance where appropriate and that any decisions on a particular facility should be based on the requirements of § 316(b). See July 22, 2002, Permit Determinations Document, § 7.2.4. See also *Hudson Riverkeeper Fund, Inc.* v. *Orange and Rockland Utilities, Inc.*, 835 F. Supp. 160, 166 (S.D.N.Y. 1993) (noting that plants existing within view of one another on the same river may be issued permits with "markedly different" BTA requirements under CWA § 316(b)); *American Petroleum Institute* v. *Environmental Protection Agency,* 787 F. 2d 965, 969 (5th Cir. 1986) (stating that "[w]here EPA has not promulgated applicable technology-based effluent limitations guidelines, the permits must incorporate, on a case-by-case method, 'such conditions as the Administrator determines are necessary to carry out the provisions of the Act'" (citing 33 U.S.C. § 1342(a)(1))).

Moreover, the proposed § 316(b) Phase II rule is not a promulgated rule. Rather, it is a **proposal** upon which EPA is currently making changes. The preamble to the proposed rule explicitly states that it is **not** to be used as guidance. Even if it were to be used as guidance, EPA would retain the reasonable discretion to adopt a contrary approach based on the particular facts in this case, in order to carry out the requirements of CWA § 316(b). This is because guidance does not have the force of law, as the permittee has pointed out in its comments.

9. Comment

The permittee stated that it does not believe that any level of impact, no matter how small, constitutes adverse environmental impact. Rather, the permittee stated, adverse impact "should be determined on the basis of significant, population-level effects on affected species." (The permittee cites to its comments to EPA headquarters on the proposed § 316(b) regulations in support of this comment.)

Response

As discussed elsewhere in this document, EPA is not required to respond to comments on the proposed 316(b) rulemaking that are cited by the permittee. EPA has, nonetheless, reviewed the comments submitted by BPS on the proposed § 316(b) rulemaking and responded in the discussion below to those points that are relevant to the definition of "adverse environmental impact."

In § 7.2.5c of EPA's July 22, 2002, Permit Determination Document, the Agency clearly explains how it interprets the term "adverse environmental impact (AEI)," the basis for this interpretation, and its reasons for rejecting the permittee's proposal to limit adverse environmental impact only to cases of demonstrated "significant, population-level effects." While the statute does not define "adverse environmental impact," EPA's interpretation is reasonable and is consistent with the legislative history and past Agency interpretations and guidance. In a 1977 guidance document, EPA stated that it was critical to evaluate the "magnitude of any adverse impact" and that "[t]he magnitude of an adverse impact should be estimated both in terms of short term and long term impact" with reference to the following factors: (1) "absolute damage," (2) "percentage damage," (3) absolute and percentage damage to any endangered species, (4) absolute and percentage damage to any "critical aquatic organism," (5) absolute and percentage damage to commercially valuable and/or sport fisheries yield, and (6) "whether the impact would endanger (jeopardize) the protection and propagation of a balanced population of shellfish and fish in and on the body of water from which the cooling water is withdrawn (long-term impact)." The article cited by the permittee also notes that EPA has indicated that even losses from entrainment or impingement of **individual organisms** by themselves constitutes an adverse environmental impact. See [Permits Division, Office of Water Enforcement, EPA, Guidance for Evaluating the Adverse Impact of Cooling Water Intake

Structures on the Aquatic Environment: § 316(b), P.L. 92-500 (1977) (Draft); Deborah G. Nagle & James T. Morgan, A Draft Regulatory Framework for Analyzing Potential Adverse Environmental Impacts from Cooling Water Intake Structures 1 (undated) (EPA predecisional position paper issued during CWA § 316(b) Phase II rulemaking)). Thus, the guidance document indicates that in assessing the magnitude of the adverse effect, EPA is to consider both the number of individual organisms killed or injured (i.e., "absolute damage") and the percentage of the overall population of species that are damaged (i.e., "percentage damage"). It is also clear that "percentage damage" should be considered at levels below that which would cause the complete collapse of the population. In other words, consideration of "percentage damage" is not limited to cases of 100 percent damage.

EPA Region I has also acknowledged that there may be some **de minimis** threshold level of impacts below which the Agency will not consider adverse environmental impact to have occurred. The impacts in this case, however, are far beyond any concept of **de minimis** effects. EPA also has never set a standard that would ignore impacts beneath the level of "substantial harm to populations of biota." See July 22, 2002, Permit Determinations Document, § 7.2.5c. Instead, EPA has interpreted the § 316(b) technology standard to require minimization of adverse environmental impacts, whether or not they are "significant," as long as the wholly disproportionate cost test is satisfied. See July 22, 2002, Permit Determinations Document, §§ 7.2.5c, 7.2.5d. In any event, the impacts in this case clearly **are** significant.

Moreover, the permittee's additional assertion that "significant population effects" must be "demonstrated" in order for AEI to exist also has no support in the statutory language, the legislative history, case law, or EPA guidance. See *Id.* Such a limitation would contravene the purpose of § 316(b) by authorizing EPA to regulate CWISs only where substantial damage had already been caused. This is also clearly incorrect in light of both the purpose of CWA § 316(b) and EPA guidance documents discussing the need to assess **potential** future entrainment and impingement effects, whether from new or existing facilities. See *Id.* at fn. 16. Once again, however, EPA believes that the data show that significant population effects are occurring as a result of the cooling water intake.

In the context of case-by-case, BPJ permitting, adverse environmental impact should be assessed on a case-by-case basis, taking into account the facts related to the ecosystem and natural resources in question. See July 22, 2002, Permit Determinations Document, § 7.2.5c. The appropriate technology for "minimizing" these adverse impacts is determined based on an assessment of the "available" technologies and whether the cost of attaining these additional reductions would be wholly disproportionate to the benefits. See July 22, 2002, Permit Determinations Document, § 7.2.5d.

EPA disagrees with the permittee's assertion (in comments on the proposed § 316(b) rule) that a requirement of population-level impacts under § 316(b) may be derived from the interaction between §§ 316(a) and (b). The assertion contradicts the plain language of the two provisions and has no support in the legislative history, case law, or EPA guidance. As discussed in § 7.2.6 of the July 22, 2002, Permit Determinations Document, CWA § 316(a) addresses thermal **discharges**, while CWA § 316(b) addresses the adverse environmental impacts of the operation of CWISs. As EPA stated in the preamble to the 1976 Proposed Final CWA 316(b) Regulations, "[t]he concerns of the two sections are different and the legal standards by which compliance with their requirements is to be judged are similarly distinct." 41 Fed. Reg. 17389 (April 26, 1976) (Final CWA § 316(b) regulations later withdrawn by EPA after remand by Federal court on procedural). That is, CWA § 316(b) BTA requirements are not excused even if the adverse environmental impacts from the CWIS would not be so severe as to preclude the protection and propagation of the source waterbody's balanced indigenous population of fish, shellfish, and wildlife. Under the wholly disproportionate cost test, however, the less serious the adverse impacts, the less significant the costs that would be justified to reduce those impacts. See July 22, 2002, Permit Determinations Document, § 7.2.6.

10. Comment
The permittee stated that EPA's evaluation of the technological options contains numerous errors. Specifically, the permittee stated, EPA ignored detailed information concerning the impacts of various technologies and chose to rely on "speculative and unsupported statements to evaluate the possible impacts of the different technologies." The permittee stated that EPA's "conclusory rejection of the aesthetic and safety impacts of the thermal plume" and noise impacts of cooling towers are "uninformed" and "demonstrably incorrect."

Response
EPA did not ignore information concerning the potential environmental impacts of the various technological options (e.g., cooling towers) for meeting new CWA § 316(b) standards. EPA's consideration of these issues was neither "speculative", "unsupported", nor conclusory. It was also was neither "uninformed" nor "demonstrably incorrect." EPA's analysis was based on appropriate research, empirical observations, and consideration of the permittee's CWA § 316(b) Demonstration Document (December 2001). In addition, EPA has carefully considered the comments submitted on these issues by the permittee and others, such as the Town of Somerset. In response to these comments, EPA has conducted analyses on these issues, such as potential noise impacts and potential cooling tower vapor plumes. EPA's responses to comments on these issues, including our updated analyses, are presented in more detail elsewhere in this document. The Agency continues to conclude that these issues can be properly managed and controlled. Moreover, EPA concludes that the permittee has overstated the potential adverse effects of cooling towers in its submissions.

11. Comment
The permittee disagreed with EPA's statement that the closed-cycle entire station option is the only option under which the entrainment and impingement of organisms by the plant's cooling water intake structure would not interfere with satisfaction of Massachusetts and Rhode Island water quality standards. The permittee also stated that EPA identifies no prior case in which compliance with State water quality standards has been considered a requirement under § 316(b) and that EPA "misstates the role of 'affected State's water quality standards."

Response
EPA has concluded that a NPDES permit's requirements pertaining to CWISs under CWA § 316(b) must not only comply with EPA technology standard determinations but also with any more stringent, applicable State legal requirements, including water quality standards. See CWA §§ 401, 301(b)(1)(C); 40 CFR § 122.44(d)(5). The Agency's legal analysis of this issue is presented elsewhere in this document and will not be repeated here. EPA notes, however, that the Region's conclusion on this point is also consistent with EPA's legal interpretation evidenced in 40 CFR § 125.84(e) of the Phase I CWA § 316(b) regulations. EPA also acknowledges that some small changes probably could be made without running afoul of State water quality standards but has concluded that any **significant** increase to intake flow would be inconsistent with both Massachusetts' and Rhode Island's water quality standards and therefore unacceptable. The Agency believes its conclusions are supported by the CWA § 401(a)(1) certification letter from the Commonwealth of Massachusetts, dated September 24, 2003 and the letter from the State of Rhode Island under CWA § 401(a)(2) (AR 3013), dated September 18, 2002.

In addition, as discussed in more detail elsewhere in this document and in § 5.2 of EPA's July 22, 2002, Permit Determinations Document, EPA has properly interpreted and applied the requirements of CWA § 401(a)(2) in the context of this permit. This provision authorizes a "downstream affected state" to object to a NPDES permit based on its effect on the State's water quality standards. The State is not, however, given either a certification role or veto authority over that permit. Nevertheless, the statute plainly dictates that EPA must "condition such license or permit in such manner as may be necessary to insure compliance with applicable water quality requirements [in the downstream affected state]." CWA §

401(a)(2). See also 40 CFR § 122.44(d)(4) (NPDES permits must include conditions that "[c]onform to applicable water quality requirements under § 401(a)(2) of CWA when the discharge affects a State other than the certifying State").

Economic Considerations:

12. Comment
The permittee commented that EPA has improperly assessed the benefits and costs of the CWA § 316(b)-based permit limitations included in the Draft Permit, while certain other commenters have supported EPA's assessment of the costs and benefits or argued that the Agency underestimated the benefits.

Response
A. Introduction

EPA disagrees with the permittee. The Agency believes that in developing the CWA § 316(b)-based limitations for the Draft Permit, it conducted a reasonable and appropriate assessment and consideration of the estimated benefits and costs of these permit limits, and that it properly applied the "wholly disproportionate cost test" applicable under § 316(b). EPA's evaluation of these issues is set forth in substantial detail in Chapter 7 of EPA's CWA NPDES Permit Determinations for Thermal Discharge and Cooling Water Intake from BPS in Somerset, MA (July 22, 2002) (EPA's July 22, 2002, Permit Determinations Document) and various supporting documents from the administrative record.

Although EPA believes its consideration of benefits and costs under CWA § 316(b) was more than adequate, the Agency has made certain improvements to its analysis in response to the public comments EPA received on the Draft Permit. The Agency's updated consideration of benefit and cost issues is discussed both here and in other responses to comments included in this document, as well as in a series of independent analyses presented in memoranda by EPA's expert consultants. These memoranda have, in turn, been independently reviewed by EPA, and the Agency is adopting them and incorporating them herein by reference.

As explained elsewhere, cost and benefit estimation and the weighing of costs against benefits are **not** proper considerations in setting permit limitations under CWA § 316(a) or in ensuring compliance with State water quality standards. Furthermore, as also explained elsewhere, under CWA §§ 301 and 304, cost-benefit balancing is not required in setting BAT limitations for effluent discharges, such as thermal discharges, though costs must be considered.

Under CWA § 316(b), however, some consideration and balancing of benefits and costs **is** required under EPA's interpretation of the statute. In § 7.2.5e of EPA's July 22, 2002, Permit Determinations Document, EPA explained how these considerations apply under CWA § 316(b).

B. Economic Practicability

EPA indicated in § 7.2.5e of its July 22, 2002, Permit Determinations Document that cost should initially be considered from the standpoint of economic practicability. EPA has undertaken such a consideration and concluded, as discussed elsewhere in this document and at § 7.7.4b of EPA's July 22, 2002, Permit Determinations Document, that the costs of complying with the CWA § 316(b)-based requirements of the permit **are** economically practicable for BPS. Indeed, no significant comment was provided to the contrary during the public comment period. While a range of views was expressed over the ramifications that any shutdown of BPS might have—these include the significant financial concerns that were expressed by Town of Somerset officials in this regard—no significant comments were provided indicating that the costs of complying with the permit's CWA § 316(b) requirements (even assuming the company's cost estimates) were economically impracticable for BPS.

EPA has revisited the issue of economic practicability for the Final Permit in light of both our revised cost estimates and the permittee's revised cost estimates included in its comments on the Draft Permit. On the basis of this review, EPA continues to conclude that the costs of compliance are economically practicable for BPS. Part of the support for EPA's conclusions on this issue is found in the memorandum from Michael Fisher, Abt Associates, Inc., to Mark Stein, Damien Houlihan, EPA Region 1; Shari Goodwin, Tetra Tech, Inc., "Financial Impact of Closed Cycle System Installation at BPS" (August 12, 2003) (the "August 12, 2003, Financial Impact Report")[1];

C. Consideration of Benefits and Costs—The Wholly Disproportionate Cost Test

EPA also explained in § 7.2.5e of the July 22, 2002, Permit Determinations Document that the costs and benefits of complying with BTA-based requirements under CWA § 316(b) must be assessed in order to apply the "wholly disproportionate cost test" as interpreted by the Agency. Thus, EPA will base cooling water intake permit limits on the capabilities of the BTA for minimizing (i.e., reducing as much as possible) adverse environmental impacts (such as entrainment and impingement impacts), except where the costs would be "wholly disproportionate" to the benefits of doing so, in which case the limits would be made accordingly less stringent.

EPA has long been clear that, consistent with the plain language of the statute, § 316(b) does not require that a precise or detailed cost-benefit analysis be prepared or considered. In adopting the wholly disproportionate cost-to-benefits test, EPA only interpreted the statute to authorize "some consideration" of costs. In the preamble to the Final CWA § 316(b) regulations issued in 1976, EPA stated the following:

> No comparison of monetary costs with the social benefits of minimizing adverse environmental impacts, much less a formal, quantified "cost-benefit" assessment, is required by the terms of Act. The statute directs the Agency to insure that enumerated aspects of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. Once such adverse effects have been identified (or, in the case of new structures, predicted) then the effort must be to select the most effective means of minimizing (i.e., "reducing to the smallest possible amount or degree") those adverse effects.... The brief legislative history of § 316(b) states that the term "best technology available" contemplates the best technology available commercially at an economically practicable cost. As with the statute, this language does not require a formal or informal "cost-benefit" assessment. Rather, the term "available commercially at an economically practicable cost" reflects a Congressional concern that the application of "best technology available" should not impose an impracticable and unbearable economic burden on the operation of any plant subject to § 316(b).

[1] **Please note:** While this memorandum is part of EPA's administrative record, it is not presently included in the publicly available record because some of the analysis contained therein relies on information that the permittee has designated as CBI, and EPA's initial (and current) view is that some of this CBI could possibly be revealed if this memorandum were publicly released. The Agency can, of course, release this memorandum to the permittee if it is requested, since the memorandum involves the permittee's claimed CBI. If other members of the public ask to review the memorandum, the Agency will reevaluate whether it believes the CBI might be revealed by the memorandum and, if the Agency concludes it would not be, EPA would release the document after following the required procedures. Otherwise, the Agency would release the memorandum after redacting any portions that might reveal the CBI or trying to otherwise share the contents of the memorandum in a manner that would not reveal any claimed CBI. Beyond that, any party could request a copy of the memorandum pursuant to the FOIA, at which point EPA would follow the applicable legal procedures regarding claimed CBI and FOIA requests. See 40 CFR Part 2, Subpart B.

41 Fed. Reg. 17388 (April 26, 1976) (Final CWA § 316[b] regulations later withdrawn by EPA after remand by federal court on procedural grounds). In a subsequent permit appeal decision, the Administrator of EPA explained:

> ... the Agency's position, that cost-benefit analysis is not required under § 316(b), is correct. Section 316(b) provides flatly that cooling water intakes shall "reflect the best technology available for minimizing adverse environmental impact." Unlike §§ 301 and 304 [related to effluent discharges], § 316(b) determines what the benefits to be achieved are and directs the Agency to require use of "best technology available" to achieve them. There is nothing in § 316(b) indicating that a cost-benefit analysis should be done, whereas with regard to "best practicable control technology currently available" ... Congress added express qualifiers to the law indicating a requirement for cost-benefit analysis. Indeed, but for one bit of legislative history [citation to Representative Clausen's above-quoted remarks omitted], there would be no indication that Congress intended costs to be considered under § 316(b) at all. I find, therefore, that insofar as the RA's decision may have implied the requirement of a cost-benefit analysis under § 316(b), it was incorrect.
>
> However, the RA may have meant only that some consideration ought to be given to costs in determining the degree of minimization to be required. I agree that this is so—otherwise the effect would be to require cooling towers at every plant that could afford to install them, regardless of whether any significant degree or entrainment or entrapment was anticipated. I do not believe that it is reasonable to interpret § 316(b) as requiring the use of technology whose cost is wholly disproportionate to the environmental benefit to be gained.

In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), 10 ERC 1257, 1261 (NPDES Permit Application No. NH 0020338, Case No. 76-7; June 17, 1977) (Decision of the Administrator). In *Seacoast Anti-Pollution League* v. *Costle*, 597 F.2d 306, 311 (1st Cir., 1979), the First Circuit Court of Appeals noted EPA's application of the "wholly disproportionate cost" test with approval.[2]

Thus, EPA's present conclusion that no strict, formal, or precise cost-benefit analysis is required to support the development of CWA § 316(b) permit limits for the BPS NPDES permit is legally sound and consistent with Agency precedent. Nothing in the CWA, its legislative history, EPA regulations, or case law suggests otherwise. Nevertheless, based on EPA's statutory interpretation discussed above, the Agency must give "some consideration" to costs in determining whether the cost of BTA for minimizing adverse environmental impacts from a cooling water intake structure is wholly disproportionate to its benefits.

No statutory or regulatory provisions or guidance memoranda direct exactly how to apply this test under CWA § 316(b). Thus, the Agency has discretion to apply it in a rational manner. While the application of this test should be reasonably consistent across different cases, there is also room for reasonable variation between the analyses conducted in different cases given that the test is not strictly formulated and is applied on a case-by-case basis. Further, some variation is likely given that many factors are potentially

[2] In *Decision of the General Counsel No. 63 (In re Central Hudson Gas and Electric Corp.)* (July 29, 1977), p. 382, EPA's General Counsel reiterated EPA's "wholly disproportionate cost" test, citing to the *Seabrook* decision and underscoring that "this test is a limited one, for the Administrator ... rejected the notion that a full cost-benefit analysis is required under § 316(b)."

relevant, but different ones may be applicable to different cases. Differences in available data and other factors also may alter what constitutes a reasonable analysis in different cases.

For **general** guidance in applying the wholly disproportionate cost test for the Draft Permit, EPA looked, by analogy, to the Agency's application of the identically phrased test in the development of Best Practicable Treatment (BPT) effluent discharge limitations. EPA continues to believe this is a sensible and reasonable approach. The legislative history and case law both make clear that under the BPT "wholly disproportionate cost" test, cost-benefit balancing is to be of a "limited" nature and cost is not to be considered a factor of "primary" or "paramount" importance. If this is the case for developing BPT standards, where a degree of cost-benefit balancing **is** expressly required by the statute, see 33 U.S.C. § 1314(b)(1)(B), then costs should also not be a primary or paramount factor in applying the "wholly disproportionate cost" test under § 316(b), which does not even mention cost considerations. The courts have also stated that when applying the BPT "wholly disproportionate cost" test, EPA's balancing of costs and benefits "is a relatively subsidiary task and need not be precise" and that a reasonable estimate of costs and benefits is sufficient. *Eli Lilly and Company* v. *Costle*, 598 F.2d 638, 656-57 (1st Cir., 1979). See also *Weyerhaeuser Company* v. *Costle*, 590 F.2d 1011, 1049 (D.C. Cir., 1978). The courts have also upheld an "overall" cost-benefit comparison and rejected arguments that EPA must do an "incremental" cost-benefit analysis, *Weyerhaeuser*, 590 F.2d at 1047-48, n. 55, or a "knee of the curve" analysis. *Chemical Manuf. Ass'n* v. *U.S. EPA*, 870 F.2d 177, 203-07 (5th Cir., 1989).

As the courts have noted, one of the reasons that Congress did not require a more precise form of economic analysis in setting effluent discharge standards under the CWA is the impossibility of fully quantifying all the environmental benefits to be obtained from making technological improvements to reduce pollutant discharges. See, e.g., *Pacific Fisheries*, 615 F.2d at 809; *Appalachian Power Company* v. *Train*, 545 F.2d 1351, 1361 (4th Cir., 1977); *American Iron and Steel Institute* v. *EPA*, 526 F.2d 1027, 1075 (3d Cir., 1975). It is equally impossible to fully quantify economically all the benefits of minimizing the adverse environmental impacts of cooling water intake structures, and, therefore, it is similarly appropriate not to require a precise cost-benefit analysis when setting limits under CWA § 316(b). See also EPA's July 22, 2002, Permit Determinations Document, § 7.6.3a.

The courts have also been clear that in developing national standards under the BPT "wholly disproportionate cost" test, environmental controls might be required that would cause some "economic dislocation" and even plant closures to achieve the stated environmental objective. Thus, application of the "wholly disproportionate cost" test under the BPT standards confirms that application of the similar test under § 316(b) could potentially countenance significant economic impacts to a facility—at least up to the point of economic impracticability—if the costs would not be wholly disproportionate to the benefits.

Finally, the courts have also been clear in the context of BPT standards that EPA has broad discretion in deciding exactly how to evaluate benefits and costs and in determining the point at which costs become "wholly disproportionate" to benefits. See, e.g., *Chemical Manuf.*, 870 F.2d at 207 ("'The selection of the point of diminishing returns is a matter for agency determination.'" [citation omitted]); *Eli Lilly*, 598 F.2d at 656–57; *American Iron & Steel Institute* v. *EPA*, 568 F.2d 284, 297 (3d Cir. 1977). The courts have ruled that they should defer to EPA's decisions applying the wholly disproportionate test unless they are "not reasonable" or are "arbitrary and capricious." *Chemical Manuf.*, 870 F.2d at 206, 207. See also *Association of Pacific Fisheries* v. *EPA*, 615 F. 2d 794, 809 (9th Cir. 1980) (court review should ensure that decision is the "product of reasoned decision-making, adequately supported by information available to the Agency"). The notion that EPA would have significant discretion within the bounds of reasoned decision-making to weigh the benefits and costs and determine when the wholly disproportionate cost test has been violated is consistent with the principle that the numeric results of these types of economic analyses should **not** be regarded as strictly determinative or the sole determinants of policy decisions to

the exclusion of other relevant factors. See, generally, Kenneth J. Arrow, et. al., "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" in *Economics of the Environment: Selected Readings* (Robert N. Stavins, Ed., 4th ed. 2000), p. 321–23; *Guidelines for Preparing Economic Analyses*, United States EPA (EPA 240-R-00-003) (September 2000), § 10.4.[3]

These principles apply equally to the application and review of the application of the wholly disproportionate cost test under CWA § 316(b).

D. Assessment of Benefits and Costs

Above, EPA discusses the role of benefit and cost considerations in applying CWA § 316(b) and, specifically, the "wholly disproportionate cost" (to benefits) test. Below, the Agency discusses its benefit and cost estimates, as well as the estimates presented in the permittee's comments. Further below, EPA discusses its conclusions regarding application of the wholly disproportionate cost test. Benefits are discussed before costs, although the order of discussion is unimportant.

Initially, it is important to remember that the cost and benefit estimates developed by EPA **and** the permittee are just that, **estimates**. They unavoidably involve predictions, assumptions, and modeling analyses related to uncertain facts and future conditions and the inter-relationships between these uncertainties. On the cost side of the equation, for example, estimates of efficiency and auxiliary energy losses, as well as avoided load loss gains, depend on many uncertain factors, such as future energy prices. On the benefit side, for example, monetized estimates leave out any value for many likely benefits of intake improvements, such as reduced harms to invertebrates and associated improvements related to thermal discharge reductions. Moreover, they also rely on benefits transfer approaches (i.e., utilizing results from studies in other cases) to support an estimate of nonuse values in the present case.

The CWA does not, of course, require a precise assessment of benefits and costs under § 316(b) for this permit development. Uncertainties in this realm are unavoidable given the nature of the reasonably available data and methods. That being said,EPA has undertaken a more than reasonable effort to assess the benefits and costs for this permit. The Agency looked at the costs and benefits from a number of different perspectives using sound methods and producing reasonable estimates and explained these analyses in substantial detail. Indeed, EPA may have engaged in a more detailed, sophisticated assessment of benefits and costs than EPA has ever undertaken for the § 316(b) conditions for an individual NPDES permit. This work has been difficult, time-consuming, and expensive. These

[3] On several occasions, the permittee has cited EPA's *Guidelines for Preparing Economic Analyses*, United States EPA (EPA 240-R-00-003) (September 2000) and stated that the analysis supporting the Region's permit is inconsistent with the Guidelines, arguing or implying that the analysis is, therefore, unacceptable. There are several points to be made in response to these arguments. First, the Guidelines are a guidance document that does not create binding legal requirements on the Agency that are enforceable by third parties against the Agency or **vice versa**. See *Id.* at Title Page ("Notice: ... This document is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. The Agency may decide to follow the guidance provided in this document, or to act at variance with the guidance based on its analysis of the specific facts present."). Second, the Guidelines were prepared for use by the Agency in connection with the development of regulations and Agency policies, not individual permits. See *Id.* at Preface, p. i. Third, the Region believes that its analyses **are**, in fact, consistent with the Guidelines. Moreover, the Guidelines expressly state that they "do not provide a rigid blueprint or a 'cook-book' for all policy assessments ... [and that t]he most productive and illuminating approaches for particular situations will depend on a variety of case-specific factors and will require professional judgment to apply." *Id.* at p. 2. The Guidelines also recognize that the choices made on how to approach the economic analysis issues in a given situation will necessarily be influenced by factors such as the nature of the issues present, the relevant statutory requirements, the availability of data, the cost and time needed to obtain data, and the need for expedition in taking regulatory actions. *Id.* at pp. 3, 5 (n. 2), 59, 64.

unfortunate by-products of more sophisticated analysis are, of course, compounded to some extent by the fact that complex analyses tend to prompt more complex comments which, in turn, take more time to consider and address. EPA has been mindful of the expenditure of public resources required to undertake this work, as well as the fact that this NPDES permit is long overdue (the current permit "expired" in July 1998) and the power plant continues to damage the ecosystem of Mount Hope Bay in the meantime. Nevertheless, EPA believes that the issues raised by this permit are extremely significant for the public and its natural resources as well as for the permittee. Therefore, the Agency has taken the time needed to conduct an analysis that is more than reasonable and appropriate under the applicable legal framework.

EPA would not necessarily repeat an analysis of this depth and detail for many other permits, but EPA thinks it appropriate for the Agency to tailor the scope and type of analyses undertaken for case-by-case § 316(b) permit determinations to match the importance and type of issues presented. The analysis the Agency conducted here was warranted by the facts of the case.

1. Benefits Assessments

There are three principal types of measures for assessing the environmental benefits of a regulatory action that will produce environmental improvements: quantitative/non-monetary, qualitative, and monetary. Each is valid, depending on the applicable legal requirements, as long as one understands what the measure does and does not represent, and what its limitations are.[4] EPA has tried to look at benefits from all three perspectives in developing CWA § 316(b) limits on a case-by-case basis for the BPS NPDES permit.

When setting technology standards-based effluent guidelines, EPA, consistent with CWA requirements, considers both costs and nonmonetary quantitative and qualitative measures of benefits, such as pounds of pollutants removed from an industry's waste stream. See *Chemical Manuf.*, 870 F. 2d at 207; *Weyerhauser*, 590 F. 2d at 1047. Under the requirements of Executive Order 12866 pertaining to regulation and policy development, EPA also considers benefits from both monetary and qualitative standpoints.

When it comes to applying CWA § 316(b)'s wholly disproportionate cost test for an individual permit development, neither statute, regulation, nor guidance memorandum dictates how benefits should be assessed. For the Draft Permit, EPA reviewed a number of past Agency decisions under § 316(b) for any relevant guidance. At the same time, the Agency recognized that there is room for reasonable variation between the analyses conducted in different cases given that the test is not strictly prescribed, is intended to be applied on a case-by-case basis, and different facts, issues, and data in different cases may reasonably prompt different analyses. In response to comments by the permittee expressing concern over whether the analysis for the BPS permit varies from other analyses, EPA has looked again at past decisions, while continuing to recognize that complete analytical uniformity is not necessarily required. From this review, EPA has not found any cases in which the Agency estimated monetized benefits when applying the wholly disproportionate cost test in the development of CWA § 316(b)-based permit limitations.

In the *Seabrook* case, mentioned above, it does not appear that EPA monetized estimated benefits. In the permit appeal decision, the Administrator ruled:

> ... the Agency's position, that cost-benefit analysis is not required under § 316(b), is correct. § 316(b) provides flatly that cooling water intakes shall 'reflect the best

[4] See, e.g., *Economic Guidelines*, § 10.4 (benefits that can be quantified but not monetized or only qualitatively assessed are often present).

> technology available for minimizing adverse environmental impact.' Unlike §§ 301 and 304 [related to effluent discharges], § 316(b) determines what the benefits to be achieved are and directs the Agency to require use of "best technology available" to achieve them.... [T]he RA may have meant only that some consideration ought to be given to costs in determining the degree of minimization to be required. I agree that this is so—otherwise the effect would be to require cooling towers at every plant that could afford to install them, regardless of whether any significant degree of entrainment or entrapment was anticipated. I do not believe that it is reasonable to interpret § 316(b) as requiring the use of technology whose cost is wholly disproportionate to the environmental benefit to be gained.

In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2), 10 ERC 1257, 1261 (NPDES Permit Application No. NH 0020338, Case No. 76-7; June 17, 1977) (Decision of the Administrator). This discussion seems to indicate that consideration of benefits could focus solely on the amount of entrainment or impingement (i.e., "entrapment") reduction benefits that an option would achieve to determine if the option's costs would be wholly disproportionate to its benefits. Consistent with that, EPA apparently reached the common sense conclusion that where the facility was going to spend a lot of money to move the intake out of an estuary to an off-shore location, and where the environmental benefits of two alternative off-shore locations were similar but the cost of one option was substantially more than the other option, the cost of moving to the more expensive site would be wholly disproportionate to the benefits of doing so. The assessment of the benefits was based on the biological analysis and was either qualitative or quantitative/non-monetary in nature. See *In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2) National Pollutant Discharge Elimination System permit* (Application No. NH 0020338, Case No. 76-7; August 4, 1978) (Administrator's Decision on Remand), 1 E.A.D. 455, 1978 WL 21140 (EPA), at p. 21. See also *Seacoast Anti-Pollution League* v. *Costle*, 597 F.2d 306 (1st Cir., 1979).

In *Decision of the General Counsel No. 63 (In re Central Hudson Gas and Electric Corp.)* (July 29, 1977), EPA's General Counsel stated that:

> ... EPA must ultimately demonstrate that the present value of the cumulative annual cost of modifications to cooling water intake structures is not wholly out of proportion to the magnitude of the estimated environmental gains (including attainment of the objectives of the Act and § 316(b)) to be derived from the modifications.

This formulation clearly does not direct that benefits be monetized. Instead, it specifies that when assessing benefits consideration be given to the objectives of § 316(b) and the CWA generally. The objectives of the Act include restoring and maintaining the physical and biological integrity of the nation's waters; achieving, wherever attainable, water quality that provides for the protection and propagation of fish, shellfish and wildlife; and providing for recreation, in and on the water. See 33 U.S.C. §§ 1251(a) and (a)(2). The objective of § 316(b) is to use the BTA to minimize the adverse environmental effects of cooling water intake structures, which include entrainment and impingement. As with *Seabrook*, this discussion suggests that the consideration of benefits should focus on biological/environmental considerations, which could involve qualitative and quantitative/nonmonetary measures.

A similar approach was taken in the initial permit appeal decision of *In the Matter of Carolina Power and Light Company (Brunswick Steam Electric Plant, Units 1 and 2)* (National Pollutant Discharge Elimination System Permit No. NC 0007064) (Decision by EPA Region IV) (November 7, 1977). (AR 3111) In this case, EPA Region 4 concluded that BTA for the facility was to reduce cooling water intake structure capacity based on the capability of adding cooling towers and that the cost of doing so was "not

wholly disproportionate to a 96 percent reduction in the severe adverse environmental impacts of the plant." *Id.* at p. 69. The adverse impacts assessed by the Region included significant entrainment and impingement damage. *Id.* at pp. 33–44. Again, this was a quantitative/nonmonetary and qualitative assessment of benefits.[5]

In the case of *In the Matter of Florida Power Corporation, Crystal River Power Plant, Units 1, 2 and 3, Citrus County, Florida* (Findings and Determinations Pursuant to 33 U.S.C. § 1326; NPDES Permit No. FL 0000159) (September 1, 1988) (AR 2143), EPA also applied the wholly disproportionate cost test under CWA § 316(b). Here Region 4 seems to have engaged in a nonmonetized quantitative and qualitative assessment of benefits. We have found no indication that monetized benefits estimates were prepared. The Region concluded that the power plant's intake was causing "significant adverse biological effects." *Id.* at pp. 5–7. The region issued a Draft Permit requiring capacity reductions that would have been consistent with the use of closed-cycle cooling towers. *Id.* at p. 6 (¶ 3). For its Final Permit, however, the Region concluded that "installation of cooling towers would reduce entrainment damage by about 85 percent, however, the increased cost (about $150 million more that [sic] the system proposed by FPC) is considered wholly disproportionate to the environmental benefits to be derived." *Id.* at p. 7 (¶ 6). The Region's decision document provides no mention of or reference to any further assessment of benefits. In the end, due to the lack of other practicable technological approaches for minimizing adverse impacts to an acceptable level, the Region concluded that the degree of minimization achievable by a seasonal flow reduction regime in together with operation of a fish hatchery would constitute adequate minimization under CWA § 316(b).

Therefore, on the basis of Agency precedent alone, a monetized estimate of benefits for applying CWA § 316(b)'s wholly disproportionate cost test to an individual case-by-case permit development is **not** required. Still, EPA does not think it was unreasonable or inappropriate for the Region to make efforts to develop monetized benefits estimates as **part** of its evaluation, despite the fact that they unavoidably cannot capture all relevant benefits. First, there is nothing that legally precludes consideration of monetized benefits estimates as long as they are used appropriately in conjunction with other considerations. Second, EPA did use the monetized estimates reasonably in combination with other considerations, such as our nonmonetized quantitative and qualitative benefits assessments. EPA did not use the monetized assessment as the sole factor determining the result of the wholly disproportionate cost test. Third, monetized estimates, if they can be reasonably developed, are clearly **not irrelevant** to consideration of benefits.

EPA has therefore estimated benefits using nonmonetized quantitative and qualitative considerations as well as monetized measurements. EPA also developed and considered a number of different benefits estimation methodologies, including estimates prepared by other parties, such as the permittee. This is consistent with the broad discretion left to the Agency by the applicable statute and regulations in the application of the wholly disproportionate cost test under CWA § 316(b). EPA also believes it is

[5] EPA notes that the permittee appealed the Region's decision in Brunswick to the Administrator, who remanded the matter to the Region on grounds other than the economic review. Moreover, the permit appeal was later settled and did not ultimately require flow reductions leading to the installation of cooling towers. The resolution instead involved, among other things, installation of fine mesh screens and seasonal flow reductions. See James R. May, *The Quick and the Dead: Fish Entrainment, Entrapment, and the Implementation and Application of Section 316(b) of the Clean Water Act*, 20 Vt. L. Rev. 373, 411–14 (1995) (extensive discussion of history of the Brunswick permit appeal).

reasonable and appropriate given the uncertainties inherent in all of these methods and the nature of the wholly disproportionate cost test.[6]

EPA's approach is also consistent with natural resource economics theory, as was discussed in §§ 7.6.3b and 7.6.3a of EPA's July 22, 2002, Permit Determinations Document, and as has been noted by various commenters.[7] Even many economists who favor developing monetized estimates of the benefits of protecting "environmental services" in order to support cost-benefit analysis or other economic analyses in environmental regulation also recognize its limitations. These economists caution that precise monetization of environmental benefits is not always possible, that uncertainties should be acknowledged, that the numeric results of these analyses should **not** be regarded as strictly determinative of the policy decisions at hand to the exclusion of other factors, and that "care should be taken to assure that quantitative factors do not dominate important qualitative factors in decision-making."[8] Kenneth J. Arrow, et. al., "Is There a Role for Benefit-Cost Analysis in Environmental, Health, and Safety Regulation?" in *Economics of the Environment: Selected Readings* (Robert N. Stavins, Ed., 4th Ed. 2000), p. 321–23. As previously noted, Congress and the courts have also expressly recognized that all environmental benefits cannot be monetized or otherwise quantified.

a. Quantitative, Nonmonetized Benefits

As was discussed in detail in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document, the magnitude of the adverse environmental impacts from current operations of the BPS cooling water intake structures is severe. Vast numbers of individual organisms—literally trillions of organisms, including billions of fish eggs, fish larvae, and adult and juvenile fish—are being killed or injured annually as a result of entrainment and impingement at BPS. BPS is also clearly taking substantial percentages of the Mount Hope Bay adult populations of a number of fish species (e.g., winter flounder, tautog, hogchoker). Moreover, the overall assemblage of fish species has collapsed in Mount Hope Bay. The balanced indigenous community of fish that should exist in Mount Hope Bay has been severely compromised. EPA believes that BPS's take of organisms through its cooling water intake structure has contributed to the fishery collapse and is helping to prevent or inhibit a recovery despite steps being taken by the public to promote such a recovery, including fishing restrictions and water pollution reductions.

The capacity limits proposed in the new NPDES permit for BPS require a reduction in cooling water withdrawals from Mount Hope Bay of approximately 96 percent. As was discussed in EPA's July 22, 2002, Permit Determinations Document, the Agency can generally assume that this will result in a 96 percent reduction in entrainment and impingement of marine organisms by the BPS cooling water intake. (This assumption of proportionality of flow reduction to entrainment and impingement reductions is typically used in the field and provides a reasonable estimate.) This is a very substantial reduction in adverse environmental impact. The alternative intake flow limits proposed by the permittee would achieve only approximately a 33 percent reduction in flow and entrainment and impingement. Thus, EPA's proposed permit limits achieve far greater reduction of adverse environmental impacts than the

[6] See also *Economic Guidelines*, at p. 65 (recommends that consideration be given to "using more than one method to estimate benefits" because different methods allow comparisons of different measures of value, different methods may address different subsets of total value, and "some components of the total value of benefits may not be amenable to valuation and will need to be described in other terms when presenting the analytic results").

[7] See also *Economic Guidelines*, at pp. 69, 175, 178.

[8] Not all economists favor the use of classic cost-benefit analysis to drive the development of environmental regulation. See *§ 7.6.3b, n. 56, of EPA's July 22, 2002, Permit Determinations Document*.

limits proposed by the permittee and will thus better achieve the CWA objective of "minimizing adverse environmental impact" than the permitee's proposed limits.

b. Nonmonetized Qualitative Consideration of Benefits

The limitations of our methods and data preclude us from monetizing (or otherwise quantifying) the full ecological benefits of reduced cooling water intake volumes and associated reductions in entrainment and impingement of marine organisms. These limits are discussed in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document and the benefits estimate analyses by EPA's consultants that the Agency has incorporated herein by reference. Therefore, it is appropriate to consider ecological benefits from a qualitative perspective as well.[9]

EPA presented its qualitative assessment of the benefits of the permit's CWA § 316(b)-based permit limits in § 7.6.3a of EPA's July 22, 2002, Permit Determinations Document. That analysis will not be repeated here, but EPA notes that the Agency concluded and continues to conclude that when considered outside of a strictly monetary framework, the public benefits of implementing the Closed-Cycle Entire Station option are highly significant. The other options, including the alternative limits proposed by the permittee, also offer benefits in this regard, but the degree of significance declines as the amount of entrainment/impingement allowed to continue increases and the corresponding chance that the improvements will be sufficient to facilitate a recovery of the collapsed Mount Hope Bay fishery is diminished. From this perspective, EPA believes the alternative limits proposed by the permittee offer far fewer benefits than would be realized by the permit limits proposed by EPA.

A number of commenters expressly or implicitly indicated their agreement with EPA's qualitative assessment of the benefits of the permit's limits. No comments provided any significant challenge to the appropriateness of undertaking this qualitative assessment. Furthermore, there were no significant comments questioning the assessment of the great importance from a qualitative standpoint of achieving the environmental restoration of the waters and fishery of Mount Hope Bay.

The permittee did, however, question that the permit's limits would actually achieve the environmental benefits cited by EPA. Contradictorily, the permittee also questioned EPA's determination that other less stringent options (presumably including the intake limits proposed by the permittee) would **not** achieve those goals. These comments were presented at page 27 of the "Table of Additional Detailed Comments" that was included as Attachment 4 to the permittee's comments on the Draft Permit (AR 1218). These comments question the reasonableness of EPA's biological analyses rather than the theoretical soundness of considering environmental benefits from a qualitative standpoint. EPA has addressed the biological analysis issues in detail in other responses to comments.

EPA notes here, however, that it continues to conclude that the intake limits included in the BPS permit, in conjunction with the permit's thermal discharge restrictions and other environmental improvements, such as the strong fishing restrictions that are currently in place, will provide an opportunity for the Mount Hope Bay fishery to recover. EPA further believes that it is reasonable to expect such a recovery to occur under those circumstances. The Agency also continues to conclude that significantly less stringent permit limits, such as those proposed by the permittee, are likely to prevent, delay, or otherwise significantly interfere with or impede such a fishery recovery. In this regard, EPA also concludes that the benefits that would be achieved under the permittee's proposed limits are likely to be materially lower than indicated by the simple proportional difference in reductions in flow and entrainment and

[9] See Citations in § 7.6.3a of EPA's July 22, 2002, Permit Determinations Document. See also *Economic Guidelines*, at pp. 66, 176–178.

impingement between the permittee's and EPA's proposed limits. EPA has concluded that the permittee's proposed limits are not likely to meet the threshold reductions in flow and entrainment and impingement that are needed to support fishery recovery and, thus, may achieve no material benefit with respect to this important public policy objective.

EPA recognizes that there is unavoidable uncertainty regarding exactly what is needed to allow the fishery to recover and that even the BTA-based intake flow limits proposed by EPA, which allow a 56 MGD withdrawal of water from Mount Hope Bay, will entail continued adverse environmental effects from entrainment and impingement. EPA has explained, however, that the limits it has proposed appear to be consistent with BTA and will require a substantial reduction in entrainment and impingement, as well as from thermal discharges. Moreover, EPA has explained why it concludes that these limits should allow a recovery of the Mount Hope Bay fishery, while any significantly less stringent limitations are unlikely to do so. Furthermore, regardless of the ultimate recovery of the fishery, it is indisputable that EPA's permit limits will achieve far greater reductions in entrainment and impingement than the permit limits proposed by the permittee (approximately 96 percent vs. approximately 33 percent) and, thus, will achieve substantially greater benefits in a qualitative sense. As stated in § 7.6.3a of EPA's July 22, 2002, Permit Determinations Document:

> Looked at outside of a strictly monetary framework, EPA believes that the public benefits of implementing the Closed-Cycle Entire Station option are highly significant. The benefits of the other options also have some significance but the degree of significance declines as the amount of entrainment/impingement allowed to continue increases and the corresponding chance that the improvements will be sufficient to facilitate a recovery of the collapsed Mount Hope Bay fishery is diminished.

EPA deems this view reasonable and continues to hold it.

The permittee also commented (page 27 of the "Table of Additional Detailed Comments" included as Attachment 4 to the permittee's comments on the Draft Permit (AR 1218)) that the factors that EPA pointed to in supporting its qualitative consideration of the benefits of the new cooling water intake permit limits create no specific obligations for BPS under CWA § 316(b) and that BPS's obligations related to cooling water intake structures are determined solely by CWA § 316(b). Moreover, the permittee argues that the fact that fishing restrictions and water pollution control improvements have been undertaken by others does not create any obligation on BPS to undertake any improvements on its part because its obligations are determined solely by CWA § 316(b). In response, EPA ponits out that the Agency has determined the cooling water intake structure limitations applicable to BPS based on CWA § 316(b).[10] Under EPA's interpretation of this provision, however, the Agency is to apply a wholly disproportionate cost test requiring some consideration of benefits and costs. In considering benefits from a qualitative standpoint, EPA has looked to other public actions and statements of policy as indicators of the qualitative importance of the environmental improvements at issue. EPA did not point to these matters as if they created a legal requirement for the specific intake reductions by the permittee. They simply informed the Agency's qualitative assessment of benefits under CWA § 316(b).

c. Monetized Benefits Assessments

For the Draft Permit, EPA developed and considered a number of different approaches to estimating monetized benefits of the environmental improvements that would be provided by more stringent cooling

[10] As is discussed elsewhere, these limitations are also supported by the application of water quality standards as per CWA §§ 301(b)(1)(C) and 401(a)(1) and 401(a)(2).

water intake permit limits under CWA § 316(b). EPA considered analyses prepared by EPA as well as those prepared by other interested parties. The Agency evaluated both use and nonuse values. EPA also presented an HRC analysis that did not directly estimate the benefits of cooling water intake improvements but that did provide relevant information for EPA to consider in assessing costs and benefits because it estimated what it would cost the public to replace the fish lost to the cooling water intake through environmental restoration measures (rather than CWIS improvements). Moreover, EPA explained the details of the methods being used and discussed their limitations. This analysis is presented in § 7.6 of EPA's July 22, 2002, Permit Determinations Document and will not be repeated here.

Having considered the comments received on the Draft Permit, EPA continues to believe that its monetized analyses were reasonable and appropriate in the context of developing CWA § 316(b) limits for an individual NPDES permit. Indeed, EPA does not believe that is was necessarily required to prepare any monetized assessments at all. EPA's responses to comments on its specific benefits analyses are covered in detail elsewhere in this document and in a series of memoranda prepared by the Agency's expert consultants. EPA worked with the consultants on the development of these memoranda, and independently reviewed them, and decided to incorporate them by reference into these responses to comments. As a result, the Agency will not repeat the details of the memoranda here.

In addition, after consideration of the public comments, EPA concluded that there were certain improvements it could make to its benefits assessments for the permit and consequently prepared some revised analyses. These are also presented in memoranda by the Agency's expert contractors. Again, EPA worked with the contractors on the development of these memoranda, independently reviewed them, and decided to incorporate them by reference into these responses to comments. As a result, the Agency will not repeat the details of the memoranda here. Instead, the Agency will only briefly discuss certain aspects of the memoranda here and present their overall conclusions.

i. Use Values (Commercial and Recreational)

EPA presented monetized commercial and recreational use value estimates for the Draft Permit at § 7.6.3b of the July 22, 2002, Permit Determinations Document. These were presented as part of what EPA referred to as "the benefits transfer" analysis. (Using this label was a poor choice in retrospect since the phrase "benefits transfer" refers more generically to a type of analysis that EPA also used for assessing nonuse values, as will be discussed below.) This analysis yielded relatively low commercial and recreational use values. In response to comments pointing to various changes that should be made or errors that should be corrected, EPA made certain improvements to these assessments. The commercial and recreational use values by themselves remain relatively low.

The commercial use values are largely discussed in the following memoranda:

a. Memorandum from Liz Strange, et al., Stratus Consulting, Inc., to Phil Colarusso, EPA-New England, "Responses to Comments on EPA-New England's July 22, 2002, Determination on the New Draft NPDES Permit for the BPS, Somerset, MA" (September 16, 2003) (the "September 16, 2003, Stratus Memorandum") and

b. Memorandum from Elena Besedin, Abt Associates, Inc., to Mark Stein and Phil Colarusso, U.S. Environmental Protection Agency Region 1, "Potential Effects of Revised I&E Estimates Submitted by Stratus Consulting on September 16, 2003, on the Estimated Benefits of Installation of Cooling Towers at BPS" (September 18, 2003) (the "September 18, 2003, Abt Memorandum on Revised I&E and Benefits Estimates").

Various improvements were made to the commercial use analyses based on the permittee's comments (e.g., using discounting concepts to reflect the estimated timing of benefits realization). These are

discussed in detail in the referenced memoranda. The revised estimate of annual monetized commercial use benefits from the environmental improvements required by the new § 316(b) permit limits are approximately $15,359 (2002$), undiscounted. The discounted annual commercial fishery benefits losses are $11,728 and $8,105 per year, discounted respectively at 3 and 7 percent. EPA accepts the idea that it is reasonable to use discounting in this analysis and concludes that 3 percent is the more appropriate discount factor for this analysis. Therefore, the most appropriate commercial use value estimate from these figures is $11,728 per year.

The recreational use values are largely discussed in the following memoranda:

a. Memorandum from Svetlana Semenova, Elena Besedin, Michael Fisher, Abt Associates, Inc., to Mark Stein and Phil Colarusso, EPA-New England, "Response to Comments on Assessment of Recreational Fishing Benefits Presented in EPA Region 1's July 22, 2002, Draft Determination on the NPDES Permit for BPS, Somerset, MA" (October 2, 2003) (the "October 2, 2003, Response to Comments on Recreational Fishing Benefits"); and

b. September 19, 2003, Abt Memorandum on Revised I&E and Benefits Estimates (referenced above).

Various improvements were made to the recreational use analyses based on the permittee's comments (e.g., using discounting concepts to reflect the estimated timing of benefits realization). These are discussed in detail in the referenced memoranda. The one change to be mentioned in slightly more detail here is that (also in response to comments from the permittee) EPA re-estimated its recreational use benefits estimate using a so-called Random Utility Model. Specifically, EPA used a Random Utility Model developed by the National Marine Fisheries Service (NMFS) (Hicks, Steinback, Gautam, and Thunberg, 1999, Volume II: The Economic Value of New England and Mid-Atlantic Sportfishing in 1994. Hicks et al., 1999). In its comments, the permittee recommended that EPA use this model. This is discussed in detail in the above-referenced memorandum concerning recreational use benefits.[11] As mentioned above, the revised use value estimates continued to produce relatively modest values similar to the original estimates.

Based on the revised analysis, the estimated annual recreational use benefits from compliance with the new CWA § 316(b) permit limits are $93,041 (2002$), undiscounted. If timing of recreational fishing benefits is taken into account, the discounted recreational benefits are $72,648 and $53,420 per year, discounted at 3 and 7 percent, respectively. Since EPA accepts the idea that it is reasonable to use discounting in this analysis and concludes that 3 percent is the more appropriate discount factor for this analysis, the most appropriate recreational use value figure to use from this table is a gain of $72,648 per year from the improvements required by the § 316(b) permit limits.

Therefore, on the basis of the above analyses, the revised estimate of the total annual use value (combined commercial and recreational values) of the environmental improvements required by the new CWA § 316(b) permit requirements is $108,399 (2002$), undiscounted. If timing of use benefits is taken into account, the total commercial and recreational fishery benefits are $84,376 and $61,525 per year, discounted, respectively, at 3 and 7 percent. EPA believes that the former figure is the more appropriate one based on the 3 percent discount rate.

This annual use value estimate is obviously relatively modest. In interpreting this result, however, one must remember that this analysis is also very limited in scope. It leaves out or under-values a number of important aspects of the total value of the resources. First, one must remember that this analysis does not quantify a direct use value for either forage species or the unlanded portion of commercial and

[11] See also, generally, *Economic Guidelines*, at p. 73.

recreational species. This is because neither forage species nor unlanded commercial or recreational fish have direct uses or, therefore, direct use values. Second, the portion of impingement and entrainment losses consisting of fish that are landed by recreational or commercial fishermen represents a small portion of the total age 1 equivalent losses of commercial and recreational fish. Third, recreational and commercial fish (harvested or unharvested) represent less than 15 percent of the total age 1 equivalent losses. Therefore, the use value figures represent only a small portion of the total fish lost to entrainment and impingement. Fourth, as previously discussed, it is also important to understand that this use value estimate omits the increased use value that would result from recovery of the Mount Hope Bay fishery, which EPA expects to occur under its proposed permit limits but not under the limits proposed by the permittee. Finally, this analysis also leaves out certain ecological benefits and, most importantly, the **nonuse values** of the fish that would be preserved as a result of the permit limits proposed by EPA under CWA § 316(b). (Nonuse values are discussed below.) Limitations of the use value analyses are also discussed at pp. 7-142 to 7-145 of EPA's July 22, 2002, Permit Determinations Document and in the consultant memoranda referenced above. In sum, the use value analysis by itself must be regarded as a dramatically incomplete underestimate of the **total** value of resources that would be preserved as a result of the new permit limits issued under CWA § 316(b).

Finally, EPA also notes that the permittee provided additional comments relevant to EPA's use value analyses in a July 30, 2003, submission to EPA. This submission from the permittee appended additional comments from its consultants, Robert Stavins (July 29, 2003). EPA has reviewed and considered these comments. EPA feels the significant points from these comments have been responded to, here and elsewhere, in these responses to comments and in the following memoranda by its consultants:

a. the September 16, 2003, Stratus Memorandum (referenced above) and

b. the October 2, 2003, Response to Comments on Recreational Fishing Benefits (referenced above).

ii. Nonuse Values

As EPA has explained and as commenters have stated, accounting for nonuse values is a critical component of developing as complete an estimate of the total value of ecological resources as possible. In some cases, the nonuse values may represent the bulk of the monetized estimate of total value, and leaving them out entirely would result in an extreme underestimate of total value. Nonuse values include such items as "existence value" and "bequest value." Nonuse values are discussed in § 7.6.3b of EPA's July 22, 2002, Permit Determinations Document,[12] as well as elsewhere in these responses to comments and in the following contractor memoranda:

a. Memorandum from Elena Besedin, Ryan Wardwell, and Michael Fisher, Abt Associates Inc., to Mark Stein and Phil Colarusso, EPA-Region 1, "Meta-Analysis of Non-Use Benefits" (September 2, 2003) ("the September 2, 2003, Non-Use Benefits Meta-Analysis Memorandum");

b. Memorandum from Elena Besedin, Ryan Wardwell, and Michael Fisher, Abt Associates Inc., to Mark Stein and Phil Colarusso, EPA-Region 1, "Response to Comments on Non-Use Benefits Presented in EPA Region 1's July 22, 2002, Draft Determination on the NPDES Permit for BPS, Somerset, MA" (September 2, 2003) ("the September 2, 2003, Non-Use Benefits Responses to Comments Memorandum"); and

c. the September 16, 2003, Stratus Memorandum (referenced above).

[12] See also, generally, *Economic Guidelines*, at pp. 67, 70-71.

EPA has worked with Abt Associates, Inc., and Stratus Consulting, Inc., on the development of these memoranda, independently reviewed them, and is adopting and incorporating them by reference in these responses to comments.

For the Draft Permit, EPA considered and applied multiple methods for estimating the nonuse values of the environmental improvements required by the CWA § 316(b) permit limits.[13] These estimates are presented in § 7.6.3b of EPA's July 22, 2002, Permit Determinations Document and are discussed elsewhere in these responses to comments and in certain of our contractor memoranda. As part of the analysis that EPA labeled "the Benefits Transfer" analysis, the Agency used a "rule of thumb" approach from the literature and past EPA practice under which non-use values were estimated to be 50 percent of the recreational use values. This approach was developed as an option preferable to leaving non-use values out altogether. Yet, as discussed in EPA's July 22, 2002, Permit Determinations Document, this approach is rather arbitrary, likely to yield a substantial underestimate, and should be replaced with better estimation methods if at all possible. See also September 16, 2003, Stratus Memorandum. The permittee also criticized the arbitrariness of the 50 percent of recreational value rule of thumb, essentially agreeing that its values should be disregarded. EPA has, in fact, decided on the basis of these points to disregard the results of the 50 percent of recreational value rule of thumb as unreasonable.

EPA also conducted a type of "benefits transfer" nonuse value assessment that it referred to as the "Per-Person Recreational and Nonuse Value Analysis" (the "Per-Person Analysis"). Here the Agency uses the term "benefits transfer" to refer to a general type of analysis relying on the application of results from studies of other cases to the case at hand, rather than to refer to a specific analysis as the phrase was used above.[14] This analysis is presented in § 7.6.3b.ii of EPA's July 22, 2002, Permit Determinations Document, including discussion of its limitations and why its results were likely conservative. Some commenters expressed support for this analysis, though they also pointed to reasons why it likely produced an underestimate of nonuse values.

The permittee, however, stated a number of disagreements with this analysis and essentially argued that it should also be disregarded. At times, the permittee seemed to argue that the **only** acceptable method of estimating non-use benefits would be to conduct original research (such as a contingent valuation study) on the specific case at hand. EPA disagrees with this position. Many resource economists support the idea that benefits transfer analyses, properly conducted, can be used as an alternative to a primary research survey in order to estimate non-use benefits.[15] While it might be preferable to conduct such research in an ideal world, EPA previously explained that it was not deemed feasible as a matter of cost or timing to conduct such a primary study here.[16] Nor, in any event, does the Agency think that such studies are required for developing individual CWA § 316(b) permits (or for developing regulations). EPA is not aware of any other case in which EPA has conducted such a site-specific contingent valuation study for developing site-specific CWA § 316(b) permit limits. EPA also notes that failing to assess non-use values would only tend to make the qualitative assessment of ecological benefits all the more important.

[13] EPA notes that the permittee did not develop an estimate of non-use benefits for either its December 2001 CWA § 316(b) Demonstration Document or its comments on the Draft Permit, thus valuing non-use benefits at zero. As discussed herein, EPA believes this approach is unreasonable.

[14] See, generally, *Economic Guidelines*, at pp. 59, 85-87.

[15] *Id.*

[16] See, generally, *Economic Guidelines*, at pp. 59, 86.

The permittee also presented comments challenging the reasonableness and appropriateness of the Per-Person Analysis specifically. These comments are responded to in the September 2, 2003, Non-Use Benefits Responses to Comments Memorandum and the September 2, 2003, Non-Use Benefits Meta-Analysis Memorandum, as well as elsewhere in this responses to comments document. Ironically, EPA based the Per-Person Analysis on an approach that was used in a study of the Tuolumne River for which one of the permittee's consultants, Robert Stavins, was the principal author. The permittee and Robert Stavins now question the validity of this method and challenge whether it is appropriate to use it for Mount Hope Bay because, among other points raised, the resources of the bay are not of national importance. EPA has considered these comments and it believes the approach was reasonable for use in this context where (a) a precise benefits estimate is not needed, (b) the Agency did not have better data at that time, (c) nonuse values could potentially be very significant, and (d) the Agency included many conservative assumptions in the analysis. EPA also disagrees that it was unreasonable to apply this approach to Mount Hope Bay. As discussed in its qualitative assessment of benefits, the Agency believes the fishery resources of Mount Hope Bay are very important to the public beyond the merely local level. Mount Hope Bay is a multi-State water body and is an important nursery area for fish of the Narragansett Bay estuary, while the Narragansett Bay estuary is a federally designated estuary of national significance under the Clean Water Act. Moreover, the Agency believes that the public comments it received supporting the Draft Permit from commenters from across Massachusetts, Rhode Island, New England, and the Nation as a whole tend to support its view in this regard.

The nonuse value estimates produced from the Per-Person Analysis were substantial, and the Agency continues to believe these estimates were reasonable. That being said, EPA also has made a number of improvements to its analysis in response to comments from the permittee. Specifically, building from the Per-Person Analysis, EPA has conducted a more sophisticated benefits transfer analysis that is presented in the September 2, 2003, Non-Use Benefits Meta-Analysis Memorandum. In addition, the permittee's comments are responded to in the September 2, 2003, Non-Use Benefits Responses to Comments Memorandum as well as elsewhere in this responses to comments document. EPA will not repeat the discussion in its contractors' memoranda here but will highlight just a few points. First, EPA conducted an even more detailed literature survey to support the Meta-Analysis study. EPA believes that the studies used from the literature survey were reasonable and appropriate and disagrees with the permittee's comment that the studies were not suitable for this benefits transfer. Second, EPA used a statistical regression-based approach, rather than mean values, to provide a more precise benefits transfer applicable to the specific ecological services at issue in its case. While it was reasonable for its original analysis to rely on mean values, the revised approach is more rigorous.[17] Third, EPA revised its definition of the affected population to an approach patterned after approaches from the more recent literature. This approach provided a range of values based on the population of households containing North Atlantic Region anglers and the population of households residing within a particular distance from Mount Hope Bay. Again, EPA does not think our original approach based on membership in certain environmental and fishing organizations was unreasonable. Economic studies find that members of environmental organizations are willing to contribute more to environmental causes, including aquatic habitat improvements. See, e.g., Johnston et al., 2002, "Combining Economic and Ecological Indicators to Prioritize Salt Marsh Restoration Actions," American Journal of Agricultural Economics 84(5):1362-1370. However, the approach in the Meta-Analysis more closely follows the more recent literature. As discussed in the Agency's consultant's memoranda and elsewhere in the permit record, the current Meta-Analysis approach has certain limitations, but it continues to be conservative and for several reasons may provide an underestimate of benefits.

[17] See, generally, *Economic Guidelines*, at p. 87.

The results from the Meta-Analysis also reveal very substantial nonuse benefits from the environmental improvements required by the CWA § 316(b) permit limits in the new permit for BPS. Moreover, EPA emphasizes that these benefits are **not** based on any particular conclusion regarding whether or not these permit limits are necessary to allow `the overall recovery of the fishery of Mount Hope Bay. These values are simply based on estimates of the numbers of fish that would no longer be lost to entrainment and impingement by the BPS cooling water intake. These benefits are substantially greater than those that would be provided by the permit limits proposed by the permittee. Moreover, EPA does believe that the permit limits it has proposed will be sufficient to allow an overall fishery recovery, whereas the limits proposed by the permittee will be insufficient. Therefore, the gap between the benefits of EPA's permit limits and the permit limits proposed by the permittee is likely to be all the more significant.

EPA estimates the annual nonuse value of the entrainment and impingement reductions that will result from the proposed CWA § 316(b) permit limits to be $23.4 and $20.1 million per year (2002$) discounted by 3 and 7 percent, respectively (and rounded off). See Table 5 of the September 2, 2003, Non-Use Benefits Meta-Analysis Memorandum. Since EPA believes 3 percent is the more appropriate discount rate here, the $23.4 million per year (2002$) is the more appropriate figure to use.

EPA also notes that the permittee provided additional comments relevant to EPA's benefits transfer analysis approaches, including the Meta-Analysis approach, in a July 30, 2003, submission to EPA. This submission from the permittee appended additional pertinent comments from its consultants, Robert Stavins (July 29, 2003). EPA has also reviewed and considered these comments. EPA believes the significant points from these comments have been responded to, here and elsewhere, in these responses to comments and in the following memoranda by its consultants:

a. the September 2, 2003, Non-Use Benefits Meta-Analysis Memorandum (referenced above); and

b. the September 2, 2003, Non-Use Benefits Responses to Comments Memorandum (referenced above).

iii. Total Value

The total value is simply the sum of the use values and the nonuse values. EPA estimates the total annual value of the entrainment and impingement reductions that will result from the proposed CWA § 316(b) permit limits to be $23.4 million per year (2002$) discounted at 3 percent (and rounded off).

iv. Habitat Restoration Costs and Values

As mentioned above, in addition to estimating the use and non-use value of the environmental improvements required by the new CWA § 316(b) permit limits, EPA also prepared a Habitat Restoration Cost (HRC) analysis in support of the Draft Permit. The HRC analysis did not directly estimate the benefits of the proposed cooling water intake improvements but did provide useful information for EPA to consider in assessing overall costs and benefits. Specifically, the HRC analysis conservatively estimated what it would cost the public to replace fish lost to the cooling water intake through environmental restoration measures (rather than cooling water intake structure improvements).[18] EPA felt this was a useful point of comparison for consideration of CWA § 316(b) permit compliance costs. EPA also pointed out that there was some limited information from other cases suggesting that HRC values might tend to be less than total value estimates so that the HRC values might, in effect, put a lower bound

[18] Please note that this did not include an evaluation of the feasibility and effectiveness of specific restoration projects at specific sites or involve a determination that such projects would actually be effective for fishery restoration within Mount Hope Bay if the entrainment and impingement by BPS was not substantially reduced. The consideration of restoration was more general in nature.

on possible benefits estimates. The HRC analysis is discussed in §§ 7.6.3b.iii and iv, 7.7.4a, and 7.7.6 of EPA's July 22, 2002, Permit Determinations Document.

A number of commenters were supportive of the HRC analysis and felt that EPA properly undertook and considered it. The permittee, however, objected strenuously to it. Yet, to the extent that the permittee complains that the Region confused "costs" and "benefits" in the HRC analysis, the comment is incorrect. The Region plainly and correctly distinguished the two.

It is also interesting to note that while the permittee seems to have argued in some of its comments that the HRC analysis is entirely inappropriate as a theoretical matter to use for estimating monetized benefits of ecological improvements, it also stated in its comments that "a necessary condition for using defensive expenditures or averting behavior for purposes of benefit estimation is that the researcher **observes** people revealing their preferences by **actually (and voluntarily) incurring costs** to avert (or tolerate) the environmental disruption in question."[19] Thus, the permittee appears to accept the possible validity of this type of replacement cost approach to inferring the monetary value of ecological improvements under certain conditions. In the above-referenced September 16, 2003, Stratus Memorandum, EPA's contractor, Stratus Consulting Inc., argues that the facts they relied upon in preparing the HRC analysis reveal voluntary willingness to pay in the area of BPS for the type of restoration projects being evaluated. Thus, Stratus urges that our case would represent an appropriate one for using replacement costs to infer the value of the natural resources in question. EPA does not need to resolve this issue here. The Agency has decided to continue **not** using the HRC-related analyses to infer estimated values for preserving the fish that would otherwise be lost to the BPS cooling water intake structure. EPA continues to believe, however, that these analyses provide important information to consider in making the CWA § 316(b) permitting determination.

The permittee also commented with respect to the HRC analysis that there is no reason to expect that restoration costs will necessarily be lower than total value because there is no logical relationship between the cost of restoring certain natural resources and the value of those resources that would dictate such a result. EPA believes this point is probably fair. The Agency notes, however, that it did not significantly rely on this factor in reaching its conclusion for the Draft Permit—EPA only pointed out that there was some admittedly limited data that seemed to suggest that HRC costs would tend to be lower than total value. Obviously, EPA does not rely on this factor for its decision on the Final Permit.

Since the permittee also complained that the HRC analysis estimated the cost of restoration projects but did not reveal the willingness of people to pay for such restoration efforts, EPA also prepared a revised analysis based on the HRC approach. The revised analysis sought to measure people's willingness to pay for these types of restoration projects. In other words, whereas the initial HRC analysis estimated what it would cost to undertake environmental restoration projects necessary to produce equivalent numbers and types of fish to offset those lost to the BPS cooling water intake structure, the revised analysis estimated people's willingness to pay values for undertaking such restoration projects. EPA's revised analysis involved a benefits transfer analysis using a study of willingness to pay for the fish production services of these types of environmental restoration projects (e.g., submerged aquatic vegetation, coastal wetlands) in the Peconic Bay area of Long Island. EPA's analysis is presented in the Memorandum from Elena Besedin, Ryan Wardwell, and Michael Fisher, Abt Associates, Inc., to Mark Stein and Phil Colarusso, EPA-Region 1, "Response to Comments on the Habitat Replacement Analysis of I&E Losses at Brayton Point" (September 2, 2003) (the "September 2, 2003, Revised Habitat Replacement Analysis"). EPA has worked with Abt Associates on the development of this report, independently reviewed it, and is adopting and incorporating it by reference into these responses to comments.

[19] See, generally, *Economic Guidelines*, at p. 99.

The September 2, 2003, Revised Habitat Replacement Analysis found that people evidence substantial willingness to pay for environmental restoration projects to restore fish populations. EPA's evaluation was based on consideration of (a) the type and number of restoration projects needed to produce fish equivalent to those that would be preserved by the reduced entrainment and impingement that would result from compliance with the proposed permit limits, (b) the per-household willingness to pay for these types of restoration projects, and (c) the affected population in the area of BPS. Based on the approximately 96 percent reduction in entrainment and impingement that compliance with the new permit's reduced flow limits would achieve, EPA estimated a range of public willingness to pay for the necessary restoration projects of $11,669,407 per year for counties abutting Mount Hope Bay (with a nonuse only value of $10,835,352 per year) to $18,835,025 per year (with a nonuse only value of $17,488,818 per year) for all households within 32.43 miles from Mount Hope Bay. (All figures are given in 2002 dollars.) These willingness-to-pay values do not represent all of the organisms lost to I&E, nor do they represent all the species that could benefit from wetland and eelgrass restoration. Moreover, these values also do not represent all the households that may or even are likely to hold value for preserving the natural resources in question. These estimates, therefore, are likely to represent a lower-bound for the value that people would place on the amount of habitat restoration that would be needed to produce an equivalent number of fish to those that would be saved from entrainment and impingement by compliance with the new intake flow limits in the BPS NPDES permit.

Once again, EPA Region 1 does not propose to use the values for fish and shellfish production services of the environmental restoration projects as a proxy for the value of the fish/shellfish themselves (though the potential validity of this approach could be worth future consideration). Instead, the Agency provides this data as useful information for policy/decision-making officials to consider in otherwise reaching a final conclusion over whether or not the costs of applying Best Technology Available-based requirements should be considered wholly disproportionate to the benefits of doing so.

EPA also notes that the permittee provided additional comments on the HRC analysis, as well as the development of the revisions to it based on the Peconic Bay study, in a July 30, 2003, submission to EPA. This submission from the permittee also appended additional comments from its consultants, Robert Stavins (July 29, 2003) and Economic Analysis, Inc. (June 2, 2003; attached as Appendix A to the Stavins memorandum). EPA has also reviewed and considered these comments. EPA feels the significant points from these comments have been responded to, here and elsewhere, in these responses to comments and in the following memoranda by our consultants:

a. the September 2, 2003, Revised Habitat Replacement Analysis (referenced above);

b. the September 16, 2003, Stratus Memorandum (referenced above); and

c. the Memorandum from Elena Besedin, Marisa Mazotta, and Robert Johnston, Abt Associates, Inc., to Mark Stein, Phil Colarusso, EPA-New England, "Response to Comments on Notice of Data Availability, Proposed Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities Submitted by PG&E to EPA Region 1" (October 2, 2003).

2. Cost Estimation

EPA's cooling water intake capacity limitations for the new NPDES permit for BPS are based on the Best Technology Available for minimizing adverse environmental impacts associated with the plant. EPA has determined that the BTA for BPS is a retrofit of mechanical draft wet cooling towers to the facility so as to convert the cooling system from an open-cycle system to a closed-cycle system (other than the need for make-up water). This is discussed in detail in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document. Virtually all commenters agreed that this technology would be the best technological

approach to meeting the capacity intake limits that EPA has proposed.[20] Indeed, the permitee's proposed permit limits were, in fact, based on the use of this very same technology in its so-called "Enhanced Multi-Mode" configuration. Of course, the permittee disagreed that capacity limits based on providing cooling towers for all four of the BPS generating units are necessary under CWA § 316(b), either from a biological or a legal standpoint. Thus, the permittee's proposed permit limits were based on providing cooling towers in their Enhanced Multi-Mode proposal that would handle the flow from Unit 3 (or Unit 4 if that unit is operating). The permittee also argues that EPA's analysis supporting its CWA § 316(b) limits is based on an incorrect assessment of the costs of implementing the BTA approach for all four generating units, and is inappropriate as a matter of cost-benefit comparison.

In Chapter 7 of EPA's July 22, 2002, Permit Determinations Document, EPA presented detailed cost estimates for BPS to implement the technologies needed to comply with the intake capacity limits proposed for the new permit under CWA § 316(b). As discussed above, at this stage, it is impossible to generate truly precise cost estimates because there are so many unknown factors that must be predicted. A precise estimate of costs is not, however, required. Rather, a reasonable assessment of cost is needed and EPA's consideration of costs was more than reasonable.

EPA's assessment considered capital costs, construction costs, long-term operations and maintenance costs, long-term costs of generation efficiency losses and energy needs, tax consequences, and many other factors. The Agency also considered the costs using multiple analytical approaches (e.g., the "§ 316(b) rulemaking method" as applied to BPS and the "line-by-line method" for estimating capital costs) and multiple possible inputs for different variables (e.g., the useful life of the equipment). EPA evaluated the costs for multiple technological options, including the permittee's Enhanced Multi-Mode proposal, and carefully evaluated the permittee's cost estimates. Finally, EPA's assessment of costs incorporated many conservative assumptions and explained the limitations of EPA's analysis.

EPA has have received many comments with respect to its cost analysis. Some have supported it, while others have challenged it. The most detailed concerns were presented by the permittee. The comments from the permittee and others have been addressed in detail elsewhere in this document and in a number of memoranda by the Agency's consultants, including Abt Associates, Inc. and Science Applications International Corporation, Inc. (SAIC). EPA has worked with its consultants on the development of their reports, independently reviewed them, and is adopting and incorporating them by reference into these responses to comments. These reports include the following:

1. Report by Abt Associates, Inc., Prepared for U.S. Environmental Protection Agency, Region 1 Office, "Cost Analysis of Closed-Cycle Cooling Tower System for Management of Thermal Discharge and Cooling Water Intake for BPS" (August 20, 2003) (the "August 20, 2003, Cost Analysis Report");

2. Memorandum from Michael Fisher, Riley Newbert, Abt Associates, Inc., to Mark Stein, Damien Houlihan, U.S. Environmental Protection Agency Region 1, Shari Goodwin, Tetra Tech, Inc.,

[20] The U.S. Fish and Wildlife Service proposed a different technology by calling upon EPA to reconsider whether it ought to require even more stringent limitations (i.e., no flow) based on retrofitting dry cooling technology to BPS. As discussed in EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document, EPA believes it is unclear whether retrofitting dry-cooling would be feasible at BPS given that EPA has been unable to find a single case of a large existing power plant converting from once-through to dry cooling. Space constraints might also preclude the use of dry cooling technology at BPS. These comments are further addressed elsewhere. In addition, the permittee and the Town of Somerset have raised concerns about other environmental issues potentially raised by the use of cooling towers (such as cooling tower vapor plumes, noise, aesthetic impacts). These comments are also addressed elsewhere in this document.

"Update of Social Cost Analysis for Closed-Cycle System Installation at BPS" (August 20, 2003) (the "August 20, 2003, Social Cost Analysis Report");

3. Report by Abt Associates, Inc., Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Estimated Electricity Rate Impacts of Thermal Discharge/Cooling Water Intake Permit for BPS—Update of Prior Analysis and Response to Comments" (August 20, 2003) (the "August 20, 2003, Electricity Rate Impact Report");

4. The August 12, 2003, Financial Impact Report (referenced above);[21]

5. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Brayton Point Comment Summary & Response" (September 15, 2003);

6. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Revisions to and Results from the Clean Water Act Section 316(b) Cost Methodology for the BPS" (September 15, 2003);

7. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Statistical Analysis of USGen Costs versus SAIC Costs" (September 15, 2003);

8. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Construction Cost Monetary Outlay Schedule" (September 15, 2003);

9. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Summary of Brayton Point Cost" (September 15, 2003);

10. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Estimation of Number of Cooling Towers for Closed-Cycle Entire Station" (September 15, 2003);

11. Report by SAIC, Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Brayton Point Generating Station Trip" (September 15, 2003);

12. Report by MFG, Inc., Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station" (July, 2003); and

13. Report by Hatch, Inc., Prepared for: U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Brayton Point Power Station Cooling Towers—Noise Impact Assessment" (September 10, 2003).

As mentioned above, to develop our capital cost estimates for the Draft Permit, EPA applied two independent approaches: the § 316(b) rulemaking method and the line-by-line method. The former used the approach that EPA developed for the national rulemaking but made certain adjustments to reflect implementation at BPS specifically, such as increasing the costs to reflect retrofitting and the use of salt water for cooling. The line-by-line method was a more site-specific approach based on a close, critical examination of the cost estimates reflected in the costing spreadsheets submitted by the permittee with its December 2001 demonstration documents. While accepting many elements of the permittee's assessment, EPA disagreed with certain other elements, which resulted in EPA's lower cost estimate. The results of

[21] As discussed above, this memorandum is not presently included in the publicly available administrative record due to Confidential Business Information issues.

these two independent estimates were relatively close to each other, but EPA conservatively chose to carry forward the estimates from the § 316(b) method for further analysis because they were higher.

In response to comments, EPA has made certain adjustments to both analyses of the capital costs. These adjustments are discussed in our consultant's memoranda and elsewhere in these responses to comments. Generally, our adjustments have resulted in somewhat higher estimates under both cases. Once again, the estimates were relatively close to each other, but this time the results for the line-by-line method were somewhat higher. EPA again conservatively chose to carry the higher figures, this time from the line-by-line analysis, forward into the subsequent stages of our cost assessment.

EPA has carefully considered the permittee's capital cost estimates as well as its comments on the Agency's capital cost estimates. The Agency recognizes the disparity between its projections and those by the permittee, but based on consideration of the information in the record, it believes EPA's estimates are reasonable and the permittee has substantially overestimated the capital costs associated with complying with the permit's CWA § 316(b) limitations. The difference in capital cost estimates is the largest single source of the difference between the total cost estimates by EPA and the permittee. See August 20, 2003, Cost Analysis Report.

EPA then incorporated our capital cost estimates, along with many other factors, into a financial analysis to determine the present value of the total, after-tax costs of installing technology needed to comply with the new § 316(b) permit limits over the life of the equipment. EPA also calculated equivalent annualized cost values. Other factors accounted for in the analysis include tax consequences, discount rates, lost energy efficiency costs, auxiliary energy costs, gains from "avoided load loss" (i.e., the ability that using cooling towers would confer on BPS to generate more electricity during hot weather periods without "bumping up" against the permit's maximum temperature limits), and other factors. It should also be noted that EPA estimated costs for a number of different options, largely depending on what approach is adopted to address any possible issues related to hazards from cooling tower vapor plumes causing fog and/or ice on roadways. In addition, EPA considered costs under different assumptions regarding the useful life of the equipment. EPA believes that 30 years is a reasonable estimate of the useful life of fiberglass cooling towers, but the permittee has maintained that 20 years is a more appropriate figure. EPA investigated costs using both assumptions.

The permittee also submitted many other comments concerning this analytical step in the cost assessment. EPA has responded to these comments in detail elsewhere in this document or in its consultants' memoranda. See August 20, 2003, Cost Analysis Report. EPA made certain changes that have generally resulted in increased cost estimates. For example, EPA increased the discount rate it used in recognition of changes in the financial status of the owners of BPS and other factors. See August 20, 2003, Abt Cost Analysis Report, Attachment 1 ("Updated Estimated Cost of Capital (Discount Rate) for Present Value/Discounted Cash Flow Analyses of Brayton Point Technology Options"). The permittee also made some adjustments to its overall cost analysis which brought its estimates down somewhat. Thus, while the gap between the overall estimates has narrowed somewhat, EPA's estimates are still two to three times lower than those of the permittee.

Because EPA investigated a number of technological options under different assumptions, the Agency has produced a range of total cost estimates. EPA believes these estimates are reasonable and, in fact, are conservative. Thus, EPA believes the permittee may actually be able to comply with the permit at lower cost. In addition, while the options the Agency has evaluated involve one technological approach or another to managing any vapor plume problem (i.e., hybrid cooling towers **or** bypass capability **or** unit outages), it recognizes that, after considering how to optimize the cooling system at the plant, the permittee might choose to combine different approaches. For example, the permittee might decide to provide hybrid cooling towers for only some of the generating units.

EPA's and the permittee's overall cost estimates are summarized in the table below that the Agency has copied from Table 11 of the August 20, 2003, Cost Analysis Report.

Summary of Company and Abt Associates/EPA Analyses: Cases Analyzed and Summary Results for Previous and Current Analyses

All values (in hundred thousands)	Company Analyses				Abt Associates/EPA Analyses			
	November 2001 Analysis		October 2002 Analysis		April 2002 Proposed Permit		Final Permit Analysis	
	Discount Rate		Discount Rate		Equipment Life		Equipment Life	
Present values are at mid-year 2002	15%	20%	15%	20%	20-year	30-year	20-year	30-year
With Modification for Plume Hazard Abatement								
Multi-Mode/Bypass Capability								
Present value	Not analyzed by company				$68.4	$68.0	$107.2	$109.6
Equivalent annual cost					$9.0	$8.3	$15.7	$15.1
Hybrid Cooling Tower								
Present value	Not analyzed by company		$278.3	$276.8	Not analyzed at proposal		$119.7	$120.2
Equivalent annual cost			$44.5	$56.8			$17.6	$16.6
With No Plume Abatement Modification								
Full Plume Abatement Impact								
Present value	$254.5	$250.3	$229.8	$220.4	$83.3	$85.8	$109.2	$111.2
Equivalent annual cost	$40.7	$51.4	$36.7	$45.3	$11.0	$10.5	$16.0	$15.4
No Plume Abatement Impact								
Present value	Not analyzed by company				Not analyzed at proposal		$88.3	$88.3
Equivalent annual cost							$13.0	$12.2

(** Note: the Abt/EPA estimates used a discount rate of 11.8 percent for the Draft Permit analysis, but increased that to a rate of 13.5 percent for the Final Permit analysis.)

(**See also page 29 of August 20, 2003, Cost Analysis Report for an explanation of the slight difference in the equivalent annual cost listed here and what the company produced.)

The figures in the above table show that EPA's cost estimates for the Final Permit (presented as total present value/equivalent annual cost) range from:

- a low value of $88.3 million/$12.2 million for a 30-year useful life (and $88.3 million/$13.0 million for a 20-year useful life), assuming no modifications for plume abatement and no actual plume abatement outages needed;
- to $111.2 million/$15.4 million for a 30-year useful life (and $109.2 million/$16.0 million for a 20-year useful life), assuming no modifications for plume abatement and 100 percent of the plume abatement outage hours reflected in the permittee's cost analysis;

- to $109.6 million/$15.1 million for a 30-year useful life (and $107.2 million/$15.7 million for a 20-year useful life), assuming plant modifications to handle vapor plume abatement concerns by allowing for bypass of cooling towers without generating unit outages;[22]
- to high values of $120.2 million/$16.6 million for a 30-year useful life (and $119.7 million/$17.6 million for a 20-year useful life), assuming plant modifications to handle vapor plume abatement concerns by utilizing hybrid cooling tower technology (obviating the need for any generating unit outages).[23]

The permittee's higher estimates assume higher possible discount rates of either 15 percent or 20 percent, as well as a 20-year useful life for the equipment. Thus, the permittee also produced a range of values. The permittee's estimate for the option, assuming no modifications for plume abatement, a 15 percent discount rate, and 100 percent of the plume abatement outage hours reflected in the permittee's analysis, is $229.8 million/$36.7 million for a 20-year useful life. Using a 20 percent discount rate, the permittee's estimates were $220.4 million/$45.3 million. These values correspond to the 20-year useful life value in the second bullet above, except that EPA uses a different discount rate. The permittee's estimate for the option, assuming the use of hybrid cooling towers and a 15 percent discount rate, is $278.3 million/$44.5 million for a 20-year useful life. Using a 20 percent discount rate, the permittee's estimates were $276.8 million/$56.8 million. These values correspond to the 20-year useful life value in the fourth bullet above, except that EPA uses a different discount rate.

3. Social Cost Estimate

In the discussion above, EPA has only considered the cost **to the permittee** of implementing technological improvements at BPS to meet the permit's new BTA-based cooling water intake limits under CWA § 316(b) (i.e., a "private cost analysis"). In applying the wholly disproportionate cost test under § 316(b), however, it is also appropriate to consider costs **from the perspective of society** (i.e., the

[22] EPA recognizes that the restrictions placed on flow and on any once-through/bypass operations mean that the permittee will not be able to bypass whenever it wants. Bypass operations would be limited effectively to 122 hours, none of which may occur during the winter flounder spawning season (February through and including May). Therefore, if vapor plume-related outages became necessary during those months or beyond those hours, then there would be some additional outage-related cost for this option. EPA has not estimated any additional costs here, however, for the following reasons: (a) as discussed elsewhere in this document, the number of hours of outage that might be needed is highly unpredictable and the hours, if any, would vary from year to year; (b) as is also discussed elsewhere, EPA believes the permittee has likely overstated the number of hours of outage that might be needed, (c) with the bypass option no additional hours of outage would be needed for generating unit restart; and (d) the cost estimate for this option is in the middle of the range of estimates, and it is unlikely that the costs of any outage hours in excess of what is allowed by the permit would push the costs above that for the hybrid tower option; however, if the cost of this option became more expensive than the hybrid tower option, then the permittee would simply implement hybrid towers.

[23] As discussed elsewhere in these responses to comments, EPA also considered the possible need for additional noise mitigation and the potential cost for such measures. EPA did not end up adding any additional cost for noise mitigation to its capital cost estimates for several reasons, including that the Agency could not determine what would be a reasonable amount to add given the present uncertainty over what, if any, additional mitigation might be needed. EPA did, however, determine that, depending on which manufacturer's noise mitigation measure costs are considered and which EPA capital cost estimate is being considered, it appears that any capital cost increases would likely range from 3 percent to 15 percent. This is well within the approximate 25 percent range of error in the present capital cost estimates. EPA's consultant, Abt Associates, Inc., also determined that adding the highest noise mitigation cost estimate to EPA's highest total cost estimate would increase the total present value (and annualized costs) only by approximately 8 percent. (AR 3215)

"social costs"). Therefore, as in the Draft Permit analysis, see § 7.7.4c of EPA's July 22, 2002, Permit Determinations Document, for the Final Permit analysis EPA converted the company costs to social costs. The social cost analysis is presented in the August 20, 2003, Social Cost Analysis Report by our consultant, Abt Associates, Inc.

The social cost analysis differs in several important ways from the private cost analysis. The latter is framed from the perspective of the permittee and considers the cost of technology implementation in terms of the estimated change in after-tax cash flow to the permittee. Cash flows are presented in nominal dollars (i.e., without removing the expected effects of inflation) and are discounted to present value on the basis of an estimated weighted-average, after-tax cost-of-capital for the permittee. For the social cost analysis, the costs of technology implementation are viewed from the perspective of society. The social cost is understood conceptually to be the opportunity cost to society of using society's resources for installation and operation of the closed cycle system.

In its comments, the permittee accepted the social cost analytic framework used in the Abt Associates analysis for the Draft Permit, but contested the results of the analysis because it relied on estimates of technology installation, operating costs, and other operating impacts that the permittee felt constituted significant underestimates. EPA has responded to the comments regarding capital and operating costs elsewhere in this document.

To develop a social cost estimate for the Final Permit, EPA took the highest estimate from the private cost analysis and then converted it to a social cost figure. The details of this analysis are presented in the August 20, 2003, Social Cost Analysis Report (some limitations on the development of social costs are presented in footnote 2 of the report). As Abt Associates explains:

> [a]lthough the social cost and private cost values are not strictly comparable numerically—the social cost estimates are in constant 2002 dollars while the private cost estimates in *Cost Analysis* are in current dollars—it may nevertheless be noted that the social costs are, in fact of concept, consistently higher than the private costs. The principal reason for this systematic direction of difference is the use of costs without consideration of tax effects, which, in the private cost analysis, shift a significant share of the financial burden to society. Other factors that contribute to social cost being higher than private cost include the estimated higher production cost of generating units that replace electricity not available from Brayton Point because of construction outages or the permanent loss in generating capacity resulting from the auxiliary energy requirements and efficiency effects of the closed cycle system.

Id. at p. 5. While EPA did not calculate the social cost estimates that would be associated with the permittee's private cost estimates, the Agency notes that social costs would again be higher than the private costs for the reasons stated above.

The permittee does not appear to have provided a social cost analysis of its own, although, as stated above, it generally agreed with EPA's approach to social cost analysis. The permittee also stated that social costs are approximately 75 percent higher than the private costs. EPA does not agree that social costs will always be 75 percent greater than private costs. While the analytical framework for calculating social costs from private costs should remain relatively constant, the actual ratio of social costs to private costs in any given case would depend on the facts of that case. EPA acknowledges that for cases such as the present one, social costs will typically be higher than private costs. In addition, the comments filed for

the permittee by its attorneys identify a social cost estimate "on the order of $390 million in present value terms." *Comments of BPS,* submitted on behalf of BPS by Foley Hoag (October 4, 2002), p. 92. However, these comments provide no explanation or reference to support this figure, and the Agency can find no analysis supporting it in any of the comments by the permittee's consultants.

The estimated social costs (present value/equivalent annual cost) for the *With Plume Abatement Technology* cases range from $168.3 million/$15.9 million for the *Multi-Mode Bypass*, 20-year equipment life case, to $196.1 million/$15.8 million for the *Hybrid Cooling Tower*, 30-year equipment life case. For the *With No Plume Abatement Technology* cases, the present value estimates range from $145.3 million/$13.7 million for the *No Plume Abatement Impact*, 20-year equipment life case, to $208.4 million/$16.8 million for the *Full Plume Abatement Impact*, 30-year equipment life case. It should be noted that the equivalent annual cost estimates for the 30-year equipment life values for each technology option—which EPA thinks are more reasonable equipment life values—are consistently lower than the 20-year equipment life values because of the greater period over which the substantial fixed costs of technology installation are amortized.

These social cost estimates for the Final Permit are higher than the estimates developed for the Draft Permit. See *Id.* at Table 2. As Abt Associates explains:

> [f]or the comparable analysis cases, the current values are approximately 24 percent higher for the *With Plume Abatement Technology—Multi-Mode Bypass* cases and approximately 41 percent higher for the *With No Plume Abatement Technology—No Plume Abatement* Impact cases. These higher social cost values reflect the increased cost and operating impact estimates for these cases as documented in the August 2003, *Cost Analysis.*

Id. at p. 5. EPA believes that its analysis of social costs is reasonable and conservative.

4. Additional Factors Considered

In exercising reasonable discretion in applying the wholly disproportionate cost test for the Draft Permit, EPA considered certain factors in addition to the benefits and costs discussed above. See § 7.7.5 of EPA's July 22, 2002, Permit Determinations Document. These included factors such as the effect that compliance costs at BPS might have on consumer electric rates, potential effects on the Region's energy supply, the economic benefit to the permittee from once-through cooling operation and delayed implementation of cooling system upgrades, and whether or not the compliance expenses would or would not be likely to put the plant out of business. EPA will not repeat its earlier evaluation here, and the Agency thinks the considerations expressed there have continued validity. EPA will, however, address certain points here due to updates in its analysis and in response to comments.

First, EPA will address the consumer rate effect issue. EPA's detailed analysis of this issue is presented in the August 20, 2003, Electricity Rate Impact Report, which is incorporated by reference herein and is more fully referenced above. This report also presents responses to comments EPA received from the permittee on the rate impact analysis conducted for the Draft Permit. EPA has updated its consumer rate impact analysis in response to updated estimates of the costs of compliance and in response to updated information obtained from the ISO-NE regarding (a) the distribution of electricity volume by ECP as observed in the ISO-NE hourly wholesale energy market; and (b) the fraction of total New England electricity consumption transacted through the ISO-NE hourly wholesale energy market. See *Id.* at p. 11.

While the rate effect numbers have gone up somewhat, they have not changed significantly, and the Agency's overall conclusion remains the same: Compliance with the permit's CWA § 316(b)

requirements will not have a significant effect on consumer electric rates. As with the prior analysis, EPA has looked at both short-term rate effects resulting from construction-related generating unit outages and long-term effects resulting from increased production costs and slightly reduced generation due to the cooling system improvements. The long-term rate effect to the typical 500-kWh-per-month household from increased production costs and slightly reduced generation as a result of the cooling system improvements is conservatively estimated to range from $0.06 per month to $0.18 per month (figures are rounded up). See *Id.* at Table 9. EPA also conservatively estimates that generating unit construction outages would likely result in a short-term rate effect of $6.27 spread over 36 weeks (i.e., approximately $0.70 per month for just 9 months) for the typical 500-kWh-per-month consumer. See *Id.* at Table 8. EPA further notes that the 9 months of construction outage effect will not likely occur in a single, continuous period; it will more likely be broken into three shorter periods spread over two or more years. The analysis also indicates that even these figures are conservatively estimated and likely represent an overestimate of any effect. See *Id.* at p. 18. In addition, although EPA believes it more appropriate in this context to consider the rate effect on a household basis, in response to comments from the permittee, EPA also considered the potential ongoing rate impact on a total market basis. By comparing the estimated total annual additional retail outlay for New England electricity consumption associated with these potential rate increases ($13.4 million) with the total retail value of New England electricity consumption ($11.803 billion), EPA sees that the total additional retail outlay amounts to 0.11 percent of the total retail value consumed. See *Id.* at Table 10. EPA concludes that this effect is relatively insignificant. Again, the values used in this analysis are conservatively estimated and probably overstate any effect. See *Id.* at p. 19.

EPA notes that in the initial permit appeal decision by EPA Region 4 for *In the Matter of Carolina Power and Light Company (Brunswick Steam Electric Plant, Units 1 and 2)* (National Pollutant Discharge Elimination System Permit No. NC 0007064) (Decision by EPA Region 4) (November 7, 1977) (AR 3111), the Region also calculated the consumer electric rate impact of cooling tower conversion costs to comply with CWA § 316(b). In that case, the Region concluded that the "cost" of complying with these BTA requirements should be considered to be the consumer rate effect. The Region then concluded that the relatively small predicted rate effect of (approximately $0.77 to $0.85 per month in the first year) was "not wholly disproportionate to a 96 percent reduction in the severe adverse environmental impacts of the plant." *Id.* at p. 69. The adverse impacts assessed by the Region included significant entrainment and impingement damage. *Id.* at pp. 33–44. If Region 1 took the same approach in this case (i.e., applied the wholly disproportionate cost test by comparing the predicted rate effect of compliance with BTA measures with the percentage of entrainment and impingement reduction achieved), EPA would also conclude that the costs are not wholly disproportionate to the benefits. EPA believes, however, that its more-detailed consideration of costs in the application of the wholly disproportionate cost test, and its consideration of the rate effects as an "additional consideration" rather than **the** measure of cost, is reasonable and appropriate.

Second, EPA continues to conclude that compliance with the new permit will have no significant effect on the New England region's supply of electricity. No significant comments were raised to the contrary in response to its analysis for the Draft Permit. Matters related to this issue are discussed elsewhere in these responses to comments. Several commenters stated that the region's energy supply would be damaged if BPS either ceased operations or was precluded from burning coal as a fuel source. These commenters argued that burning coal was important for maintaining diversity in the region's "fuel mix" and/or for keeping electricity prices down, because coal is relatively cheap as compared to other major fuel sources (e.g., natural gas, oil). Other commenters disagreed that it was important for the region's energy supply for BPS to remain in operation as a coal-burning facility. These commenters argued that the Region has a more than adequate energy supply, that BPS could be replaced by new, modern generation if necessary to meet demand, and that the southeastern Massachusetts subregion is "export limited." EPA has discussed

this issue elsewhere in tehse responses to comments, but the Agency does not need to resolve the conflict for this permit. EPA concludes that BPS will not close due to the cost of complying with this NPDES permit, and nothing about the permit will preclude the facility from continuing to burn coal if it chooses to do so. Indeed, the low production costs at BPS help to assure the facility's profitability and the strong likelihood that either the current owner of the plant, or some other company, will continue the plant's operation in the future.

In addition, as discussed previously, there will be only a small, insignificant loss in generation due to the expected operation of cooling towers at the facility. This loss is the result of a small reduction in plant efficiency and auxiliary power needs to operate the cooling towers. EPA has increased its estimate of auxiliary power needs somewhat, but the overall effect remains insignificant. Moreover, EPA continues to feel that it is an important benefit of cooling towers that BPS is likely to be able to generate **more** electricity during peak-demand hot weather periods when the region's supply is most severely tested. Again, this is because cooling towers will alleviate the problem of needing to reduce generation during such periods to remain within the permit's maximum discharge temperature limit.

A number of comments were submitted that raised several types of possible adverse community effects if BPS installed cooling towers to comply with the NPDES permit's limits. EPA's permit does not dictate the technology that BPS must use to comply with the new thermal discharge and cooling water intake limits; it only sets performance standards for these parameters, which the permittee can meet in any way it chooses. That being said, EPA has based its CWA § 316(b) BTA limits, as well as its § 301 BAT assessment, on the conclusion that retrofitting cooling towers at BPS would represent the best technology available. Therefore, the Agency has carefully considered these comments and assessed these issues, and they are discussed in greater detail elsewhere in this document as well as in EPA's July 22, 2002, Permit Determinations Document. First, with respect to possible traffic-safety concerns related to fog or ice from cooling tower water vapor emissions, EPA has explained its conclusion that the permittee has not substantiated, and appears to have overstated, this threat. EPA's conclusion continues to be that if further evaluation indicates that steps are needed to mitigate this concern, there are a number of methods of accomplishing such mitigation to ensure public safety (e.g., hybrid towers, enhanced roadway management, cooling tower bypass, unit shutdowns, combinations of these options). Moreover, EPA's cost evaluation conservatively takes the possibility of such mitigation into account, but it expects that the permittee can develop a less expensive approach to the problem, if any, when it focuses on optimizing its design and operational protocols.

EPA has also seen no evidence from public comments, or our own research, to suggest that air emissions from the cooling towers—which are, after all, a widely used technology—will otherwise cause health problems. Although this is not directly relevant to this Clean Water Act permit, EPA further notes that compliance with new Massachusetts air regulations will reduce the plant's air emissions of other pollutants such as particulate, sulfur dioxide, nitrogen oxides, carbon dioxide, and mercury, which, in turn, should help to address the many public comments expressing concern about the public health effects of air emissions from the combustion of coal at BPS. In addition, the evidence shows that salt drift emissions should be able to be controlled through the use of existing technology. These issues will be further addressed in the state's air quality review.

EPA has also considered the issue of noise from cooling towers and concluded that noise impacts can be adequately controlled. This issue will also be further addressed in the state permitting process to ensure that applicable standards are satisfied. EPA also considered aesthetic issues posed by adding cooling towers at the facility. The Agency respects and appreciates the concerns expressed by certain commenters about this point, but continues to conclude that the addition of cooling towers at this industrial site poses only a small additional impact that does not constitute a reason not to impose § 316(b) limits that will otherwise meet the Clean Water Act's requirements.

Finally, the Town of Somerset and various individual residents expressed concern about the social impacts that the Town would face if BPS shut down and ceased paying the Town the substantial tax revenues it has come to rely on. Other commenters objected to this constituting a relevant consideration for EPA, and pointed to the harm the facility has done to the area at large regardless of the tax benefits for Somerset. As EPA has explained, however, it does not believe the permit will cause BPS to shut down. Therefore, the Town's tax concern should not materialize. Furthermore, EPA does not believe that local tax revenue losses can constitute a reason to allow a facility to violate Clean Water Act requirements intended to protect natural resources that belong to the larger public.

E. Decision Concerning the Wholly Disproportionate Cost Test Under CWA § 316(b)

EPA's conclusions for the CWA § 316(b) determination for the Draft Permit are set forth in § 7.7.6 of EPA's July 22, 2002, Permit Determinations Document. Our conclusions for the Final Permit are similar, based on our consideration of public comments and our updated analyses in response to those comments. For the Final Permit, EPA has set the cooling water intake structure capacity limitation at 56 MGD, with an additional 6.847 billion gallons **per year** allowable for cooling tower bypass. In response to comments from the State of Rhode Island and others, however, EPA has have added the restriction that cooling tower bypass/once-through cooling operations cannot be used during the winter flounder spawning season (February through May), so as to avoid serious adverse environmental impact from entrainment/impingement during that time. The intake capacity limits are based on a retrofit of BPS with the Closed-Cycle Entire Station option, and EPA determines that these intake capacity limits reflect the BTA for minimizing adverse environmental effects.

In light of the above analysis, EPA also concludes that the cost of complying with the BTA-based permit limits is not wholly disproportionate to the benefits it would produce. EPA believes this to be the case whether its cost estimates (including its social cost estimate) or the permittee's cost estimates (including the permittee's undocumented social cost estimate stated by its attorneys, as referenced above) are considered, although the Agency believes its estimates are more reasonable and should be used. EPA recognizes that this conclusion depends on its assessment of the benefits of these permit limits, whereas the benefits assessment by the permittee would cut against this conclusion. EPA concludes, however, that its qualitative and quantitative (monetized and nonmonetized) assessment of benefits is reasonable and appropriate, whereas the permittee's approach, which included essentially no qualitative assessment and no estimate of nonuse benefits, is unreasonable.

EPA concludes that there will be great benefits from upgrading BPS's cooling system to utilize the well-established technology of mechanical draft wet cooling towers. Operation of the cooling water intake structure with the current open-cycle system, in combination with other stressors, such as the plant's thermal discharge and overfishing, has caused severe adverse environmental effects to the Mount Hope Bay estuary and, as a result, to the greater Narragansett Bay estuary of which it is a part. The intake kills vast numbers of individual organisms, takes significant percentages of the populations of certain species, and has contributed to the disruption of the balanced indigenous community of organisms that ought to exist in Mount Hope Bay. Severe adverse impacts are likely to remain from the options other than the Closed-Cycle Entire Station option, including the permittee's proposed permit limits based on its "Enhanced Multi-Mode" system proposal. The Closed-Cycle Entire Station option, on the other hand, will dramatically reduce these adverse effects by achieving an approximately 96 percent reduction in entrainment and impingement and will help to give the fishery a chance to recover to a healthy state. Other stresses on the fishery will also be addressed by this permit (thermal discharge), or have been addressed or are being addressed by other public actions underway (controlling overfishing, CSOs). This option will achieve a far greater reduction in adverse impacts than the other options under consideration (e.g., the permittee proposes only a 1/3 reduction) and achieves the requirement to minimize adverse environmental impacts.

As discussed above, compliance with the new permit's § 316(b) limits will have major benefits whether they are evaluated from a qualitative, a quantitative/nonmonetized, or a monetized standpoint. Indeed, given the impossibility of fully monetizing all the benefits of these environmental improvements, it is reasonable and appropriate to consider all these perspectives together. These permit limits will achieve very substantial reductions in the number of organisms and the percentages of species populations entrained and impinged (e.g., winter flounder), by the power plant. According to the analysis by EPA and many commenters, these reductions will also help, along with other steps being taken, to give the overall population a chance to recover. The limits proposed by the permittee would achieve much less in the way of reduced entrainment and impingement impacts and would not, according to EPA and many commenters, be sufficient to allow the recovery of the fishery.

These benefits are extremely important from a qualitative standpoint considering the importance of the natural resources involved. For example, as EPA has explained, the estuarine waters of Mount Hope Bay should provide a productive nursery habitat for the Narragansett Bay estuary, a federally designated estuary of national significance. These waters have also been classified as SA and SB waters by both Massachusetts and Rhode Island, and the designated uses of these waters include providing "excellent fish habitat" and a recreational fishing resource. These benefits are also very substantial from a quantitative, nonmonetized perspective. The permit limits will result in an approximately 96 percent reduction in entrainment and impingement, and large reductions in the percentage of species populations taken by the plant. These reductions will help allow the fishery a chance to recover. The permit limits proposed by the permittee will achieve much lesser reductions and, in EPA's estimation, will not be sufficient to help facilitate the recovery of the fishery.

Finally, EPA's monetized estimate of the benefits of the permit also reveals very substantial benefits. EPA has estimated the total (use and nonuse) benefit of compliance with the permit's CWA § 316(b) limits to be $23.4 million per year (2002$) discounted at 3 percent (and rounded off). It should be understood that this estimate is simply based on the aquatic habitat improvements expected to result from reduced entrainment and impingement losses as a result of these permit limits, and does not depend on an assessment of whether or not these limits are needed to allow the recovery of the overall fishery. Furthermore, as discussed elsewhere, this estimate is conservative in many respects. It also does not attempt to monetize the benefit of thermal discharge reductions, ignores the entrainment of organisms other than fish (invertebrates, crustaceans), and may fail to fully appreciate various ecological benefits of reducing the entrainment of all of these life forms. As a result, it is important to consider this monetized estimate together with the nonmonetized evaluations discussed above. The Agency believes its benefits assessment is reasonable and appropriate. EPA recognizes that it is not a precise estimate, but a precise estimate is neither possible nor required under CWA § 316(b).

EPA believes that the above assessment is also supported by the results of its Habitat Restoration analysis as modified in response to comments. The Agency's updated analysis conservatively estimates public willingness to pay for environmentally sound restoration projects to produce numbers of fish equivalent to those that would be saved by the new permit limits. From this analysis, EPA estimated a range of public willingness to pay for the necessary restoration projects of $11.7 million per year (2002$) (for counties abutting Mount Hope Bay) to $18.8 million per year (2002$) for all households within 32.43 miles of Mount Hope Bay. These willingness to pay values neither represent all of the organisms lost to I&E nor all the species that could benefit from wetland and eelgrass restoration. These values also assume that no households outside the two groups noted above hold any value for preserving the natural resources in question. This is unlikely to be true. These estimates, therefore, are likely to represent lower-bound values. It should also be underscored that this evaluation did not determine the feasibility and effectiveness of specific restoration projects at specific sites or involve a determination that such projects could be effective for fishery restoration within Mount Hope Bay without substantially reducing

entrainment and impingement by BPS. Instead, the consideration of restoration was general in nature. Thus, while the HRC analysis for the Draft Permit indicated that it would cost society more than $28 million per year (2002$) to implement ecologically sound restoration projects to restore the number of fish lost to BPS's cooling water intake structures, and the current analysis conservatively indicates a public willingness to pay of from $11.7 million to $18.8 million per year (2002$) to undertake such restoration, the loss of these organisms could be prevented in the first place by implementing the Closed-Cycle Entire Station option at a similar cost.

EPA also concludes that the permittee's benefits assessment is extremely incomplete. It only includes use values, and incomplete use values at that, as discussed elsewhere. It estimates **no** nonuse values and does not account for benefits from a qualitative or other type of nonmonetized perspective, except perhaps to the extent that the permittee broadly argues in various parts of its comments that the permit limits will make no difference for the fishery and, therefore, are not worth the expense. EPA believes an approach to assessing benefits that is limited solely to use values is incomplete and is not reasonable in the context of developing these CWA § 316(b) permit limits.

In light of the uncertainties surrounding the development of benefits estimates, EPA also conducted a "break-even" analysis. Its results support the reasonableness of our approach and the unreasonableness of the permittee's approach. The break-even analysis is presented in the Memorandum from Elena Besedin and Ryan Wardwell, Abt Associates, Inc., to Mark Stein, U.S. Environmental Protection Agency Region 1, "Non-Use Benefits Break-Even Analysis for Brayton Point" (September 19, 2003). EPA worked with Abt Associates on the development of this analysis, independently considered it, and adopted and incorporated it by reference into these responses to comments. Based on two of EPA's higher estimates of the social cost of compliance with the new CWA § 316(b) permit limits, EPA estimated what household nonuse benefit values would have to be for the affected population in order to be even with those costs. These offsetting values were **less than** the per household figures calculated in the Meta-Analysis, which tends to support the conclusion that the costs are not wholly disproportionate to the benefits (see Table 4). At the same time, if benefit values were limited only to the use values, as the permittee favors, the numbers would suggest that BPS could eliminate more than three times the entire recreational and commercial winter flounder landings for all of Rhode Island, and it would still not be worth it, in the permittee's estimation, to reduce the plant's impacts. If the permittee's cost estimates were used for this analysis, the percentage of the total winter flounder landings that the plant could take before justifying the new permit limits would be even higher. This result suggests that the permittee's analysis is lacking from a public policy perspective.

The total costs of compliance with the permit's CWA § 316(b) limits have been estimated by both EPA and the permittee. These values are also not precise, but again precision is neither possible at this stage nor required under CWA § 316(b). EPA's total private cost estimates range from (a) a low value of $12.2 million per year (2002$), assuming a 30-year useful life for equipment, and the option assuming no modifications for plume abatement and no actual plume abatement outages needed (the annualized value for this option was $13 million (2002$), assuming a 20-year useful life, while the total present value cost over the life of the equipment was $88.3 million (2002$), to (b) a high value of $17.6 million (2002$) per year assuming a 20-year useful life and the hybrid cooling tower option[24] (the total present value for this

[24] As discussed elsewhere in these responses to comments, EPA also considered the possible need for additional noise mitigation and the potential cost for such measures. EPA did not end up adding any additional cost for noise mitigation to its capital cost estimates for several reasons. EPA's contractor, Abt Associates, Inc., also determined that adding the highest noise mitigation cost estimate to EPA's highest total cost estimate would increase the total present value (and annualized costs) only by approximately 8 percent (see AR 3215). Even if these costs were included, it would not alter our conclusion concerning the wholly disproportionate cost test.

scenario was estimated to be $119.7 million (2002$)) (assuming a 30-year useful life of equipment, the annualized cost was $16.6 million and the total present value cost was $120.2 million (2002$). Translating these costs into a social cost estimate, EPA found estimated social costs to range from (a) low values of $12.1 million per year (2002$) (with a corresponding total present value of $149.6 million (2002$)) for the no plume abatement technology option, assuming no plume abatement effects and a 30-year equipment life (assuming a 20-year equipment life, the corresponding values are $13.7 million per year and $145.3 million total present value (2002$)), to (b) a high value of $18.5 million per year (2002$), assuming a 20-year equipment life for the option involving no technological modification for plume abatement but 100 percent of the permittee's predicted plume effects (the corresponding total present value figure is $195.6 million (2002$) (the corresponding values assuming a 30-year equipment life are $16.8 million per year and $208.4 million total present value (2002$)).[25] EPA believes these estimates are reasonable and appropriate.

EPA also believes the permittee has overestimated the costs of compliance with the new permit limits. The permittee also has not provided social cost estimates. The permittee's private cost estimates range from (a) a low value of an annualized cost of $36.7 million (2002$) assuming a 20-year equipment life, a discount rate of 15 percent, and no plume abatement modifications and 100 percent of the permittee's predicted plume effects (the corresponding total present value figure is $229.8 million (2002$), to (b) a high value of an annualized cost of $56.8 million (2002$) assuming a 20-year equipment life, a discount rate of 20 percent, and use of hybrid cooling towers to address vapor plume effects (the corresponding total present value figure is $276.8 million (2002$)). The corresponding social cost figures would be higher, but the permittee did not provide estimates.

EPA's conservative analysis also concludes that the proposed improvements at BPS would have an insignificant effect on consumer electric rates. Furthermore, retrofitting BPS with the Closed-Cycle Entire Station option should not harm the Region's overall energy supply and offers some potential benefits during the peak hot weather demand periods. The option is affordable for the permittee and, although it will reduce the value of the plant, the facility should continue to make substantial profits for its owners. Moreover, while the facility raises some nonwater environmental issues for local residents (e.g., vapor plume, noise), EPA concludes that these issues can be controlled, and they will be further addressed in the future state permitting process and the plant's future, more-detailed design work.

Taking all of the above into account, EPA concludes that the costs of complying with the permit's BTA-based CWA § 316(b) limitations are **not** wholly disproportionate to the benefits of doing so. Such compliance is also technologically and economically practicable. It is also a necessary step, in conjunction with other measures being taken, to allow the recovery of the ecosystem of the Mount Hope Bay estuary and its fishery. The Agency is bolstered in its conclusion by the knowledge that both the Commonwealth of Massachusetts and the State of Rhode Island share its views regarding the appropriateness of the permit limits.

Thus, EPA concludes that the proposed permit limits will satisfy CWA § 316(b). As discussed elsewhere, the Agency also concludes that these limits will satisfy state water quality standards and CWA §§ 301(b)(1)(C), 401(a)(1) and 401(a)(2). EPA also notes that these limits have been certified by the Commonwealth of Massachusetts as satisfying the Massachusetts Coastal Zone Management program as required by the Federal Coastal Zone Management Act. 16 U.S.C. § 1456(c). Further, as concluded by the

[25] The social cost estimates for hybrid cooling towers were somewhat lower than the high EPA estimate described in the text. Assuming a 20-year useful equipment life, the annualized value was $17.9 million, with a total present value of $189.9 million (2002$). Assuming a 30-year equipment life, the annualized value was $15.8 million, with a total present value of $196.1 million (2002$).

National Marine Fisheries Service, these permit limits will satisfy the Magnuson-Stevens Fishery Conservation and Management Act's requirements pertaining to "Essential Fish Habitat."

13. Comment

The permittee disagreed with EPA's statement in § 7.6.3b of the July 22, 2002, Permit Determinations Document that a detailed discussion of the economic theory underlying various methods of estimating monetized benefits of environmental resources was not necessary for this permit determination. Citing *Appalachian Power Co.* v. *EPA*, 251 F.3d 1026 (D.C. Cir., 2001), the permittee asserted that such a position is "flatly inconsistent with administrative precedent, which requires EPA to justify its choice of models and to explain why it chooses the results of one model over the results of a different model."

Response

EPA agrees with the permittee that it is necessary for the Agency to identify, explain, and justify in a reasonable manner the analytical methods it uses in an NPDES permit analysis. EPA's discussion of its economic analyses for this permit, however, was more than adequate.

EPA provided detailed discussion of our economic analysis in §§ 7.6 and 7.7 of the July 22, 2002, Permit Determinations Document. In addition, EPA provided to the public a number of documents prepared by our expert consultants that provide further, in-depth discussion of the Agency's economic analyses. These materials provide a more than adequate explanation of the analytical methods chosen, their theoretical underpinnings, the reasons EPA chose them, and their results. It is clear from these documents that EPA has carefully examined the relevant data, chosen reasonable, appropriate methodologies that are rationally related to this data, and articulated detailed explanations of its economic analyses. EPA is not obliged to write a treatise on natural resource economics to support this NPDES permit. To the extent the permittee argues that EPA should have provided an even more detailed discussion of its economic analyses than it did, EPA believes such a demand is unreasonable and without legal basis.

In support of its comment, the permittee cites to *Appalachian Power Co.* v. *EPA*, 251 F.3d 1026 (D.C. Cir., 2001). Yet, this case is inapposite to the present case. In *Appalachian Power*, the petitioners challenged EPA's use of economic growth factors generated by a widely used utility planning model (the "IPM") to estimate the amount of NOx emission reductions that upwind states could achieve through "highly cost-effective" means. In its analysis, EPA used the IPM to generate growth assumptions for a span of years but used a different set of data for one particular year without offering an explanation for its choice. The court stated that "[e]ven if the EPA finds on remand that its choice was the better one, failure to 'examine the relevant data and articulate a satisfactory explanation for its action' either is arbitrary decisionmaking or at least prevents a court from finding it non-arbitrary." 251 F.3d at 1034 (quoting *Motor Vehicle Mfrs. Ass'n* v. *State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)). In this case, EPA has not made the mistake found by the court in *Appalachian Power*. We also point out that the court in *Appalachian Power* underscored that "agency determinations based upon highly complex and technical matters are 'entitled to great deference,'" *Id.* at 1035 (citations omitted), and that "EPA has 'undoubted power to use predictive models,'... but it must 'explain the assumptions and methodology used in preparing the model'...." *Id.* (quoting *Small Refiner Lead Phase-Down Task Force* v. *EPA*, 705 F.2d 506, 535 (D.C. Cir., 1983) (citations and internal quotation marks omitted)). The court further observed that, "EPA has sufficient discretion to use the IPM model in the first instance even if states believe that some other state-specific modeling is more accurate ..., [and that w]hen it comes to these sorts of technical matters, the EPA is entitled to great deference" *Id.* at 1037 (citing *Environmental Action, Inc.* v. *FERC*, 939 F.2d 1057, 1064 (D.C. Cir., 1991)). Finally, the court observed, "[i]t is only when the model bears no rational relationship to the characteristics of the data to which it is applied that we will hold that the use of the model was arbitrary and capricious." *Id.* (quoting Appalachian Power Co. v. EPA, 135 F. 3d 791, 802 (D.C. Cir., 1998)). The critical problem in Appalachian Power was that the agency had not provided an explanation for the manner in which it used the particular technical model. The facts of that case are

clearly distinguishable from those in the present case, in which EPA explained its analytical approaches and the data it used in substantial detail.

14. Comment

The permittee stated that EPA's biological assessment of the benefits of closed-cycle cooling is flawed, and that the resulting comparison of costs and benefits is therefore unsound. The permittee stated that EPA's biological analysis "grossly overstates" both the losses associated with BPS's cooling water intake system (entrainment and impingement) and the benefits to be obtained from retrofitting the plant with a closed-cycle cooling system.

Response

EPA disagrees with the permittee's complaints regarding the Agency's biological and economic analyses. The permittee states that EPA's biological analysis grossly overstates the losses associated with BPS's cooling water intake system, pointing to two major concerns with EPA's analysis: (a) the assumption of 100 percent mortality for entrained and impinged organisms; and (b) the use of data from 1974–1983, before the major decline of fish stocks in Mount Hope Bay. These issues are addressed below.

In Chapter 7 of EPA's July 22, 2002, Permit Determinations Document, the rationale for assuming 100 percent mortality for entrained and impinged organisms is discussed. Studies of entrainment and impingement survival done at numerous power plants have shown mortality rates to be highly variable from species to species and from plant to plant (EPRI, 2000). Consultants for the permittee produced a site-specific study to examine entrainment survival at BPS. The design of this study was not coordinated with EPA or other members of the BPS Technical Advisory Committee (TAC) prior to its initiation or completion. Ultimately, the permittee submitted a report for entrainment survival in 1997–98. Members of the BPS TAC and scientists from the U.S. Department of Energy (providing services to EPA under an interagency agreement) reviewed this report and found several significant flaws in the experimental design of the study. These flaws were considered of such gravity as to invalidate the study's conclusions. The specific flaws are discussed in EPA's July 22, 2002, Permit Determinations Document (p. 7-111–112). With no compelling plant-specific evidence to the contrary, and in light of the status of the resources in Mount Hope Bay, EPA feels it is justified in making the assumption of 100 percent mortality for organisms entrained at BPS. This assumption may be conservative, but it is reasonable under the circumstances.

The permittee also provided data on impingement survival for the intake at Unit 4. Unit 4 has angled screens, a lower intake velocity and a low-pressure screen wash, which represent superior technology for promoting impingement survival as compared to the intakes at Units 1, 2, and 3. Thus, EPA did not feel it was appropriate to extrapolate initial impingement survival rates from a study done at Unit 4 to the intakes at Units 1, 2, and 3. Finally, impingement studies do not tend to assess the condition of survivors or examine long-term survival, and the study at BPS did neither. A fish that has been injured due to an impingement event may have a lower life expectancy than a healthy individual of the same species. EPA did not receive any compelling information as to why impingement mortality should be significantly less than 100 percent. As a result, and in light of the dire condition of the resources in Mount Hope Bay, EPA also concluded that the conservative assumption of 100 percent mortality is reasonable and justified.

EPA's analysis here relied on entrainment and impingement data from 1974–1983. The rationale for use of this data is discussed in EPA's July 22, 2002, Permit Determinations Document (p. 7-108). The permittee states that EPA should use more recent data for its analysis of entrainment and impingement losses. EPA disagrees. BPS stopped its entrainment monitoring program in 1985. It reinitiated sampling in 1993, but only for winter flounder. That sampling is conducted between February and mid-May. To ensure a complete, consistent, and comprehensive dataset, EPA considered a time period when both entrainment and impingement data was collected for all species.

Additionally, EPA feels that it is appropriate to assess losses from before the collapse of finfish stocks in Mount Hope Bay. EPA believes that operations at BPS, including the conversion of Unit 4 to open-cycle cooling, has been a significant contributor to the collapse of fish populations in Mount Hope Bay. If the Agency were to have considered post-collapse entrainment and impingement data, which is not available for most species anyway, the net effect would have been to understate the impact of BPS by making the absolute numbers of entrainment and impingement losses smaller. Such an approach would provide a misleading picture of the adverse effects of cooling water intake operations. It would also have resulted in skewed, correspondingly lower estimates of the economic benefits that can result from installing various control technologies. Basing an evaluation solely on consideration of post-collapse finfish data could arguably lead to a vicious downward spiral, where, as resources decline, the depleted resource is used as an economic justification for refusing to restore or protect the resources in the first place. Furthermore, as discussed elsewhere, some data suggests that fish populations were already having problems by 1974, and that populations may have been larger before data collection began in 1972. In light of all of the above, EPA believes its use of the 1974–1983 data was reasonable and appropriate in this case.

15. Comment

The permittee stated that EPA's assessment of costs and benefits is unsound because: (a) EPA's calculation of "production foregone" due to entrainment and impingement fails to use current data and contains critical errors which "grossly inflate" the estimate; (b) Region 1's analysis incorrectly assumes that no organisms survive either impingement or entrainment; and (c) Region 1 erroneously calculated the size of the winter flounder population and the level of population impact caused by BPS's operations over the years, instead of accepting BPS's "Empirical Transport Model" estimate. The permittee supported these statements by citing to the comments of its consultants LMS and Raymond Hilborn (July 2002).

Response

The permittee argued that EPA's production foregone estimates were inflated because EPA used fish weights at the midpoint of an age category rather than at the beginning. Ideally, using initial weights of fish in an age category may be preferable. Such data, however, was generally unavailable. EPA's approach, therefore, was reasonable and appropriate.

It is also important to note the relative role that the estimate of production foregone plays in EPA's benefits analysis. EPA does not assign specific benefits to production foregone **per se**. Rather, production foregone is valued indirectly with a trophic transfer model that relates foregone forage production to foregone harvest. The foregone harvest estimates are combined with estimates of adult equivalent losses from entrainment and impingement losses of harvestable species. This calculation produces relatively small benefits estimates, only in the thousands of dollars. Thus, while the permittee may have pointed out some incorrect biological assumptions and/or clerical errors in the estimates of size at age for certain life stages of some species, EPA assessed the import of these errors and found them to be insignificant with respect to the final benefits assessment. In any event, these errors were corrected for the Final Permit analysis.

The issue of entrainment/impingement survival is discussed in detail elsewhere in these responses to comments.

EPA's estimate of the level of the impact to the winter flounder population in Mount Hope Bay is based on a number of elements. As stated above, EPA assumes 100 percent mortality for organisms that are entrained or impinged at the facility. Again, our rationale for doing so is discussed in EPA's July 22, 2002, Permit Determinations Document and in other responses to comments included in this document. EPA also used BPS's recent estimates of winter flounder entrainment and impingement losses and assumes these are accurate. EPA also notes that the BPS estimate is likely an **underestimate** of the true quantity of eggs and larvae entrained by the power plant because BPS collects entrainment data only from

February to mid-May, whereas Keller et al. (1999) document larval winter flounder in the water column through June.

In EPA's calculation, it is implicitly assumed that 100 percent of the eggs and larvae are generated in Mount Hope Bay. For eggs this is a fair assumption, as they are demersal and adhesive and probably do not travel significant distances in the environment. For larvae this assumption is less certain. Winter flounder larvae are pelagic and have varying degrees of ability to maintain their position in the water column. Thus, the exchange of water between Mount Hope Bay and Narragansett Bay likely allows for some exchange of fish larvae as well. Neither the current nor historical net flux of winter flounder larvae into or out of Mount Hope Bay is known.

If the net flux of larvae is currently **out of** Mount Hope Bay, then the assumption that 100 percent of the eggs and larvae lost at BPS have been generated in Mount Hope Bay would hold true. If the net flux of larvae is currently **into** Mount Hope Bay, then the following may be true by extension: BPS is taking all of the larvae generated in Mount Hope Bay and some quantity of the larvae from Narragansett Bay. Thus, BPS would be having some measurable impact on Narragansett Bay as well as Mount Hope Bay.

Due to the presence of four rivers flowing into the northern portion of Mount Hope Bay, the net flux of water is out of Mount Hope Bay. It is fair to assume that no significant quantity of winter flounder larvae are being added to Mount Hope Bay from the freshwater inputs to the north. Unless there are areas of Narragansett Bay with significantly greater concentrations of flounder larvae that feed into Mount Hope Bay, it is reasonable to assume that Mount Hope Bay does not benefit from a substantial net input of larvae from Narragansett Bay. Keller et al. (1999) examined ichthyoplankton concentrations in Narragansett Bay in 1989–1990 and found them to be dramatically lower than comparable concentrations from 1972–1973, and did not find any statistical differences between specific areas of the bay. The waters in Narragansett Bay immediately adjacent to Mount Hope Bay did not have significantly higher concentrations of winter flounder larvae compared to other parts of Narragansett Bay or Mount Hope Bay (MRI data for Mount Hope Bay). In lieu of any evidence to support the idea of a substantial net input of winter flounder larvae from Narragansett Bay, EPA feels that it is reasonable to stay with the assumption that 100 percent of the entrained eggs and larvae are of Mount Hope Bay origin.

The final piece of this calculation is the estimate of the winter flounder population in Mount Hope Bay. Fish population estimates tend to produce results with a high amount of variability. Mark Gibson (Rhode Island DEM), in an attempt to mitigate this variability, used five different methods to derive a pre-1984 winter flounder population estimate of 300,000 fish. These approaches are described in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document. Gibson then used the MRI trawl survey winter flounder abundance data as a "scaler" to estimate a present-day winter flounder population size of a few thousand fish. EPA made an adjustment to Gibson's analysis to assure consistency in the time frames of the Mount Hope Bay population estimates and the entrainment and impingement loss estimates. This adjustment raised the Mount Hope Bay winter flounder population estimate to approximately 7,500 fish.

The permittee's consultant, Raymond Hilborn, has presented analyses suggesting a current winter flounder population in Mount Hope Bay in excess of 300,000 adults. Hilborn uses impingement rates from BPS to establish an abundance estimate per unit area in "upper Mount Hope Bay" (defined by another of the permittee's consultants, Joseph DeAlteris, as the 5 square miles nearest the power plant). He then uses the state of Rhode Island's trawl survey data to establish an abundance estimate for the lower 9 square miles of Mount Hope Bay. In addition, he uses an estimate of Narragansett Bay winter flounder concentrations by Mark Gibson to derive a comparable estimate for Mount Hope Bay. Hilborn justifies the latter approach by inferring that the permittee's Wilcox Trawl (MRI) survey has shown no difference in winter flounder abundance between upper Mount Hope Bay, lower Mount Hope Bay and upper Narragansett Bay.

EPA has discussed in detail elsewhere in these responses to comments the flaws of using impingement rates as a quantitative measure of fish abundance in the receiving water. That discussion will not be repeated here. Additionally, EPA questions the representativeness of the Rhode Island trawl survey for lower Mount Hope Bay. This is also discussed elsewhere in these responses to comments and again, for the sake of brevity, EPA refers the reader to that discussion rather than repeating it here. Commenting specifically on the last approach described above, however, EPA also questions reliance on the Wilcox Trawl survey to support the idea of equal densities between its sampling locations. The Wilcox Trawl survey has a limited number of stations and is a relatively short-lived data series. Indeed, Hilborn does not use the Wilcox Trawl survey results to estimate abundance due to the short duration of the dataset. Additionally, this approach ignores the more statistically robust data used by Gibson (1996) in his analysis that does show a statistical difference in winter flounder abundance between Mount Hope Bay and Narragansett Bay. The permittee's consultant, Joseph DeAlteris, concedes that there is a measurable plant impact in upper Mount Hope Bay. Thus, the assumption of equal densities of winter flounder in all three areas is not supported, and the net result of making this assumption is to overestimate winter flounder population numbers in Mount Hope Bay.

In assessing the likely accuracy of any modeling estimate, it is important to reconcile the model estimate with actual observations and data. Current Mount Hope Bay winter flounder abundance in all trawl surveys remains extremely low, with the MRI standard trawl catching less than one winter flounder per tow, the MRI Wilcox Trawl (which catches a greater size range of fish than the standard trawl) catching approximately one winter flounder per tow (Scherer, pers. comm., 2003), and the Rhode Island Trawl survey currently catching less than 1 winter flounder per tow (Lynch, pers. comm., 2003). If the Agency accepts Hilborn's estimate of 300,000 and assumes that the fish are evenly distributed throughout Mount Hope Bay, then there would be 300,000 fish/390,000,000 square feet (area of 14 square miles converted to feet). This would result in 0.00077 fish per square foot. The MRI and Rhode Island trawl surveys each cover 60,000 square feet per tow. Thus, based on these figures, they should be catching 46 winter flounder per tow (60,000 X 00077 = 46). The current low catch rates seem to contradict the large population numbers predicted by Dr. Hilborn.

EPA looked at possible explanations for this large discrepancy.

1. *Fish are present, but the trawls are inefficient samplers*. There is no question that trawls do not collect 100 percent of the fish present in their path. Catch efficiency of trawls is highly species-specific. MRI assumes a catch efficiency of 50 percent for winter flounder with their gear (Scherer, pers. comm., 2003). Rhode Island DEM assumes a catch efficiency of 75 percent for flatfish with their gear (Lynch, pers. comm., 2002). For Hilborn's estimate to be correct, the trawl surveys would need to be catching 1 winter flounder for every 47 present, or a catch efficiency of only 2 percent. This seems very unlikely. Moreover, limited observational data by EPA scuba divers south of Spar Island near the location of the Rhode Island trawl station did not find any winter flounder. Additionally, commenters on the permit indicate that recreational anglers stopped fishing in Mount Hope Bay for winter flounder years ago due to the lack of success in catching anything.

2. *Fish are present, but not evenly distributed*. It is possible that winter flounder are present, but no longer occur at the fixed trawl station locations. Yet, they did occur at these locations in the past, as evidenced by pre-1984 catch data. Furthermore, although both Rhode Island and MRI select random trawl locations throughout Mount Hope Bay in addition to their fixed station efforts, neither of these programs have identified significant aggregations of winter flounder abundance in other areas of Mount Hope Bay. No convincing reason has been provided regarding why fish would have left these areas.

Of course, data from the fixed station surveys **does** suggest that winter flounder are not evenly distributed throughout Mount Hope Bay. There appears, instead, to be a pronounced preference for water more than

20 feet in depth. Both MRI, which has a deep water station in front of the BPS Taunton River intake, and Rhode Island, which has a deepwater station near Roger Williams College, show significantly greater numbers of winter flounder in the deep water sites as compared to the shallow water sites. Both programs report nearly 80 percent of their winter flounder catch coming from their deep water stations. The Rhode Island monthly program involves two stations, one deep and one shallow. The MRI program has six stations, with five shallow and one deep. With the preponderance of the sampling effort in shallow water, it is highly unlikely that this preference for deeper water is occurring strictly by chance. Review of similar depth preferences by winter flounder for upper Narragansett Bay in the Rhode Island survey show a slight preference for shallow water, with the catch in shallow water constituting 60 percent. The difference in relative depth distribution between Mount Hope Bay and Narragansett Bay is statistically significant. Combining this pronounced preference for deeper water by winter flounder in Mount Hope Bay (i.e., 80 percent) with Hilborn's population estimate of 300,000 would result in 240,000 of those winter flounder residing in deep water. EPA has conservatively estimated that 64 percent of Mount Hope Bay is shallower than 18 feet in depth. The trawl programs define shallow water as 20 feet in depth or less, thus 64 percent would be an underestimate of the actual percentage of "shallow" water. As discussed above, Hilborn's population estimate would conservatively result in approximately 240,000 fish occurring in 36 percent of the area of Mount Hope Bay (i.e., 14,040,000 square feet). This would translate to an approximate winter flounder density of 0.017 fish per square foot in the deep water. Thus, a deep water tow, which covers 60,000 square feet of area, should encounter over 1000 winter flounder. Currently, the deep water tows done by MRI and Rhode Island catch flounder at rates two orders of magnitude less than this (Scherer, pers. comm., 2003; Lynch, pers. comm., 2003).

Finally, Hilborn did not dispute the decline of fish populations in Mount Hope Bay in 1984. Accepting his post-collapse winter flounder population estimate of 300,000 fish, and accounting for the 88 percent decline detected by the MRI trawl survey, would translate to a predecline winter flounder population of almost 3 million adult winter flounder. Assuming the fish were evenly distributed within Mount Hope Bay, this should result in catch rates of over 460 winter flounder per tow. Assuming a preference for deeper water as discussed above, it would result in greater than 10,000 winter flounder per tow in the deep water stations. Yet, actual winter flounder catch rates in Mount Hope Bay from the precollapse period (i.e., pre-1984) were at least a factor of 10 less than these estimates.

Based on our disagreements with the assumptions (e.g., use of impingement data as an indicator of abundance, division of Mount Hope Bay as detailed by DeAlteris) that Hilborn feeds into his model, and the inability to marry his population model estimates with actual observed data, EPA believes that Hilborn's estimate of 300,000 adult winter flounder currently in Mount Hope Bay substantially overestimates what is actually there.

Gibson, MR. 1996. Comparison of trends in the finfish assemblage of Mt. Hope Bay and Narragansett Bay in relation to operations at the New England Power Brayton Point Station. RI Division Fish and Wildlife Research Reference Document 95/1.Revised August, 1996.

Keller, A.A., G. Klein-MacPhee and J. St. Onge Burns. 1999. Abundance and distribution of ichthyoplankton in Narragansett Bay. Rhode Island. 1989-1990. Estuaries. Vol. 22, No.1. pp 149-163.

16. Comment

The permittee stated that EPA indicated in its July 22, 2002, Permit Determinations Document that a 26 percent loss of Mount Hope Bay winter flounder as a result of entrainment and impingement by BPS would be "acceptable."

Response
EPA disagrees. The permittee mischaracterizes the Agency's analysis. EPA never stated that a 26 percent loss (or any other particular percentage loss) of the Mount Hope Bay winter flounder population to entrainment and impingement by the BPS cooling water intake would be "acceptable." Rather, EPA's July 22, 2002, Permit Determinations Document merely calculates the percentage loss that would remain from intake flows associated with the entire station closed-cycle cooling option. Control technologies that would reduce the flow even further (e.g., dry cooling) were deemed, however, not to have been demonstrated to be practicable from an engineering standpoint for a retrofit to a large, existing power plant with open-cycle cooling. (The permittee has indicated support for this conclusion.) This did not, and does not, constitute an endorsement of a 26 percent loss of the Mount Hope Bay winter flounder population as being "acceptable" to EPA. Moreover, as EPA has discussed elsewhere in this document, the Agency believes that the environmental improvements required by the permit, together with other actions being taken (e.g., fishing restrictions), will help bring about the recovery of populations of winter flounder and other species. As this recovery develops, the percentage of the winter flounder population lost to entrainment and impingement at BPS will necessarily go down. Thus, the 26 percent figure is not an "acceptable" level to EPA, but it also is not a figure that EPA believes will apply over time.

17. Comment
The permittee stated that "wholly disproportionate" is not the correct legal standard for evaluation of costs. But even applying that standard, the permittee stated, the cost of retrofitting all four units at BPS with closed-cycle cooling are "wholly disproportionate" to the benefits of such a retrofit. Specifically, the permittee stated that the present value of the cost of a full-station retrofit, including both installation and yearly operating costs, is $236 million, while the present value of the benefits over the life of the technology is $440,000—a cost-to-benefit ratio of 537:1. The permittee stated that, according to Region 4's 1991 "Guidance on § 316(b) Issues," a ratio of 10:1 will be considered wholly disproportionate, and that this is consistent with the Department of Interior's determination of the point at which restoration costs would be considered "grossly disproportionate" and therefore not recoverable as natural resource damages (citing 61 FR 20,560, 20,602 9 (May 7, 1996)).

Response
EPA disagrees that "wholly disproportionate" is not the correct legal standard for evaluation of costs under CWA § 316(b). Although there is nothing on the face of the statute indicating that costs should be considered at all, EPA has long interpreted CWA § 316(b) to bring economic considerations to bear in two ways: (a) the cost of measures to meet BTA requirements should be economically practicable, and (b) the costs of BTA measures should not be "wholly disproportionate" to their benefits. See July 22, 2002, Permit Determinations Document, §§ 7.2.5e, 7.7.2.

EPA also disagrees with the permittee's estimates of costs and monetized benefits. The Agency has concluded that the permittee overestimates the costs, unreasonably underestimates monetized benefits, especially by counting no nonuse values, and inappropriately ignores or understates the nonmonetized benefits of the environmental improvements required by the permit's CWA § 316(b) permit limits. EPA's assessment of costs and benefits is discussed in detail above and elsewhere in this response to comments document as well as in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document.

In addition, the sources cited by the permittee are not binding on the Agency's application of the wholly disproportionate cost-to-benefit test under CWA § 316(b). As discussed in the material cited above, EPA has discretion to reasonably determine when costs are wholly disproportionate to the benefits of complying with BTA-based permit limits in a particular case based on the facts of that case. Exactly where to draw the line might vary in different cases based on factors such as the overall health of the fishery, the nature of the water body being impacted, and perhaps other factors. A ratio of 10:1 might be appropriate in certain cases, but there is no legally binding requirement that EPA use such a ratio. EPA

notes that the permittee indicates that it believes a 10:1 ratio should be used in applying the wholly disproportionate cost-to-benefit test. The EPA document that the permittee refers to as a "guidance" document are only some notes prepared by an employee of EPA Region 4 in 1991 (AR 2136). This EPA Region 4 document is titled, "Some Specific Comments on CWA § 316(b) Issues." The author states that:

> [t]here are no published EPA guidelines relating to what constitutes wholly disproportionate; however, a factor of 10 or more may be a reasonable factor to be used. That is, expenditures of perhaps 10 times the annual environmental damage might be a reasonable basis for evaluation. Using present economic factors this could equate to an expenditure of $150 million or more in capital costs per million dollars in annual environmental damage.

While this discussion is of interest, it does not appear that this suggestion that a 10:1 ratio "may be reasonable" was intended to create a binding requirement for all cases. Moreover, a legally binding requirement cannot be created in a "guidance document" that has not undergone public notice and comment. It is also worth noting that this 10:1 ratio would be satisfied based on EPA's benefit and cost estimates, even apart from our qualitative evaluation.

The permittee also cites to a Department of the Interior (DOI) rulemaking on natural resource damage assessments. The DOI rulemaking presents an entirely different set of circumstances and a different legal framework, and is not binding upon the EPA under CWA § 316(b). Even in that case, DOI proposed a "bright-line standard" of 10:1 in one analytical context, while it noted that in other analytical contexts the role of the proportionality of costs to benefits in decision-making should be "resolved on a case-by-case basis." 61 FR 20560, 20601 (May 7, 1996).

18. Comment

The permittee stated that "EPA is incorrect in suggesting that the wholly disproportionate test is somehow unimportant to the § 316(b) determination." The permittee stated that determination of whether the costs are wholly disproportionate is of critical importance in determining what technology will be considered to be BTA.

Response

The permittee misstates EPA's position. EPA has never suggested that the wholly disproportionate test is "unimportant" to the § 316(b) determination. In fact, EPA has reiterated the importance, and potentially decisive nature, of this economic test throughout various sections of its Determinations Document. See July 22, 2002, Permit Determinations Document, §§ 7.2.5, 7.4, 7.7. EPA notes, however, that under § 316(b), costs are not to be a primary or paramount factor in the § 316(b) decision. See *Id.* The courts have repeatedly expressed the identical view with respect to application of the wholly disproportionate cost test for developing effluent guidelines under the Best Practicable Treatment (BPT) technology standard.

As discussed in the July 22, 2002, Permit Determinations Document, in the absence of any statutory, regulatory, or CWA § 316(b) guidance document indicating exactly how the wholly disproportionate test should be applied, EPA has a substantial range of discretion in applying the test. Looking by way of analogy to case law concerning EPA's application of a "wholly disproportionate cost" test in setting BPT effluent discharge limitations under CWA § 304(b)(1)(B), the courts have held, among other things, that cost is not to be considered a factor of "primary" or "paramount" importance, that this assessment "is a relatively subsidiary task and need not be precise," and that an "overall" assessment is sufficient. CWA § 304(b)(1)(B) **expressly** requires some balancing of costs against benefits in setting BPT standards. See 33 U.S.C. § 1314(b)(1)(B). Presumably, therefore, in applying the "wholly disproportionate cost" test under

CWA § 316(b), which does not even mention the consideration of cost, costs should also not be a primary or paramount factor. See July 22, 2002, Permit Determinations Document, § 7.2.5e.

19. Comment

The permittee stated that the dollar values Region 1 assigns to biological losses are "grossly inflated." The permittee stated that EPA's "Benefits Transfer Analysis" follows a "general framework consistent with accepted practice" and its own "Guidelines for Preparing Economic Analyses" (September 2000) but contains "numerous methodological errors and unreasonable or erroneous factual assumptions," which lead to an overstatement of benefits. Specifically, the permittee stated: (a) Region 1 arbitrarily overstated the commercial values of fish using invalid methods; (b) Region 1 overestimated the recreational values of fishing and failed to select scientifically sound studies involving closely comparable circumstances; (c) Region 1 incorrectly calculated forage fish values based on the cost of obtaining them from a hatchery, which "cannot serve as a proxy for the value people actually accord the fish in nature"; (d) Region 1 calculated nonuse values using a "rule-of-thumb" that is highly speculative and cannot be justified; (e) Region 1 erroneously failed to "discount" the value of the expected benefits of closed-cycle cooling to their "present value"—an error that likely resulted in an overstatement of the benefits estimates by 95 percent; and (f) even using Region 1's dollar values, the costs of closed-cycle cooling are 37 times greater than the benefits and hence, costs are "wholly disproportionate" to the benefits.

Response

EPA has discussed its benefits analyses in detail above, as well as in a series of memoranda by our expert consultants, which are incorporated by reference into these responses to comments. EPA also discussed its benefits analyses in detail in §§ 7.6 and 7.7 of EPA's July 22, 2002, Permit Determinations Document. The Agency disagrees that its initial estimates were unreasonable or arbitrary, and we have made improvements to the analyses in response to comments. EPA's estimates do not rely on points criticized by the permittee, such as hatchery costs or use of the 50 percent of recreational value "rule of thumb" for calculating nonuse values, an approach which the Agency agrees is not appropriate to use here. EPA also has added discounting to its evaluations in response to the permittee's comments. In the end, as discussed above, EPA's monetized benefits estimate is not wholly disproportionate to either its cost estimates or the cost estimates of the permittee. In addition, EPA's conclusion that the costs are not wholly disproportionate to the benefits is supported by our non-monetized assessment of the benefits.

20. Comment

The permittee stated that once Region 1 realized that application of conventional economic analyses would indicate the costs of closed-cycle cooling were wholly disproportionate to the benefits, Region 1 invented several new methods of calculation to inflate the benefits of closed-cycle cooling. The permittee stated that none of the five reasons Region 1 gave for undertaking this exercise is legitimate. Specifically, the permittee stated that (a) traditional economic analysis does capture impacts on eggs and larvae; (b) EPA's use of impingement data from 1974–1983 **inflates** its benefits estimate, because 316(b) determinations must be made based on **current impacts**; (c) effects of thermal discharges and other stressors are irrelevant, because § 316(b) does not permit a consideration of cumulative impacts—it is only concerned with the adverse environmental effects of cooling water intake structures; (d) secondary effects were counted and in fact exaggerated in the "benefits transfer" analysis; and (c) EPA's claim that only closed-cycle cooling will allow sufficient recovery of fish populations to allow for commercial fishing is "wholly speculative and completely irrelevant" to this analysis.

Response

The permittee's accusations regarding the Region's motivations are incorrect and unfounded. EPA was motivated to undertake a reasonable assessment of both costs and benefits (monetized and nonmonetized) in the context of applying CWA § 316(b). In doing so, and recognizing the difficulty of the exercise, EPA looked at both costs and benefits from multiple perspectives. The Agency believes its analyses are

reasonable and appropriate, and it has explained them in detail above as well as in §§ 7.6 and 7.7 of EPA's July 22, 2002, Permit Determinations Document. EPA also quite properly pointed out limitations of the various analyses and believes its explanations are sound. See, e.g., *Id.* at pp. 7-144 to 7-145.

With respect to the specific points in the above comment, the "traditional economic analysis" did not capture the benefits of a majority of the organisms that would be saved from entrainment and impingement by the permit's cooling water intake improvements. *Id.* Elsewhere in these responses to comments, and in the EPA's July 22, 2002, Permit Determinations Document, the Agency has explained why using the 1974–1983 data is appropriate in this context. The effects of thermal discharges and other stressors are **not** totally irrelevant to this analysis, though EPA did not put monetized values on these considerations. The nature and seriousness of the adverse impacts being perpetrated by the power plant's cooling water intake can be exacerbated by the cumulative effects of these other stressors. It makes no more sense for EPA to view cooling water intake effects in some sort of artificial vacuum than it does for EPA to do so with respect to thermal discharges under CWA § 316(a), an approach which EPA has clearly rejected. See *In the Matter of Public Service Company of New Hampshire (Seabrook Station, Units 1 & 2)*, 10 ERC 1257, 1262 (U.S. EPA, NPDES Permit Application No. NH 0020338, Case No. 76-7, June 17, 1977) ("effect of the discharge must be determined not by considering some hypothetical unstressed environment, but by considering its impact on the environment into which the discharge will be made"). It is fair to take these factors into account in applying the wholly disproportionate cost test. EPA has adjusted its approach to the secondary economic effects in response to comments, as is discussed elsewhere in these materials. Finally, as discussed in more detail above, EPA's monetized benefits estimates do **not** depend on its conclusion that the permit limits it has proposed are likely to help to facilitate the recovery of the fishery, while the limits proposed by the permittee are unlikely to do so. EPA's monetized estimates are simply based on the number of fish that would be preserved as a result of the permit limits. EPA's qualitative consideration of benefits does, however, take this difference into account to an extent, as explained above.

In addition, our conclusion with regard to the recovery of the fishery is not "wholly speculative." EPA explained our reasoning and the facts supporting it in EPA's July 22, 2002, Permit Determinations Document and have discussed this issue in more detail elsewhere in these responses to comments. In addition, EPA notes that the May 2003 draft study by RI DEM fisheries expert Mark Gibson, that was submitted to EPA by the permittee with a July 30, 2003, letter from Ernest Hauser, Senior Vice President, PG&E-NEG, to Linda Murphy and Damien Houlihan of EPA, clearly concludes that the proposed permit intake limits are necessary (along with fishing restrictions) to give the Mount Hope Bay winter flounder population a reasonable chance to recover. This is only a draft study, of course, and it is therefore subject to change. However, the permittee requested that EPA consider it, and the Agency has done so and finds that it clearly supports the Agency's conclusions on this subject. This conclusion was reiterated by Mark Gibson in a letter to EPA on September 24, 2003.

21. Comment

The permittee stated that under CWA § 316(b), Region 1 must evaluate the location, design, construction, and capacity of the cooling water intake structure that reflects BTA for minimizing adverse environmental impact at a cost that is "reasonably related to the benefits." In support of this statement, the permittee cites *In re Public Service Company Of New Hampshire, et al.* (Seabrook Station, Units 1 and 2), 10 ERC 1257, 1261, 1 E.A.D 332, 340 (1977) (holding that § 316(b) does not "require use of technology whose cost is wholly disproportionate to the environmental benefit to be gained"). The permittee further stated that EPA is required to consider the technological feasibility and cost of various available alternatives for reducing adverse impact, and to compare the benefits of these alternatives to their costs.

Response

EPA disagrees with the permittee's characterization of the required economic tests. The Agency has provided a detailed explanation of its view on consideration of costs under section 316(b) in the July 22, 2002, Permit Determinations Document. See July 22, 2002, Permit Determinations Document, § 7.2.5e. The *Seabrook* decision established a much more stringent environmental test than the permittee's asserted "reasonably related to" test, which was in fact rejected in the discussion of section 316(b) in *Seabrook.* 10 ERC at 1261. It appears that the permittee is citing language from the initial decision of the Region 1 Regional Administrator (RA), which was reversed on appeal. The RA had stated that "[d]etermining the degree of minimization required calls for a balancing of costs with the magnitude of the environmental impact to be avoided to achieve a reasonable relationship between the costs of the technology and the magnitude of adverse environmental harm avoided." *Id.* Upon review of Region 1's initial decision, the Administrator held that "[t]here is nothing in Section 316(b) indicating that a cost/benefit analysis should be done" and "insofar as the RA's decision may have implied the requirement of a cost-benefit analysis under Section 316(b), it was incorrect." *Id.* The *Seabrook* decision therefore does not support the permittee's assertion and, in fact, establishes a very different economic test—i.e., that costs should be given "some consideration" in determining the degree of minimization to be required and should not be "wholly disproportionate" to the environmental benefit to be gained. See July 22, 2002, Permit Determinations Document, §§ 7.7.2, 7.7.4.

Section 316(b) mandates that the design, location, construction and capacity of a CWIS reflect the "Best Technology Available" for minimizing adverse environmental impact. See July 22, 2002, Permit Determinations Document, § 7.2.5b. Although CWA § 316(b) does not expressly refer to a "technological feasibility" test, EPA has interpreted the term "available" in section 316(b) to mean that, at a minimum, any technology that might be either directly required or indirectly required as the result of a flow limitation must be technologically and economically practicable. See July 22, 2002, Permit Determinations Document, §§ 7.2.5a, 7.2.5b. EPA believes the NPDES permit's limits are, in fact, based on technological approaches that are technologically and economically practicable. Indeed, no significant arguments were presented by the permittee, or any other commenter, to the contrary. (EPA acknowledges, of course, that the permittee objected to the Draft Permit's limits on many other grounds.)

As stated above, CWA § 316(b) requires that the location, design, construction, and capacity of CWIS's reflect the "Best Technology Available" (BTA) for minimizing adverse environmental impacts. As discussed in EPA's July 22, 2002, Permit Determinations Document, "minimizing adverse environmental impacts" means to reduce them to the smallest possible degree. See *Id.* at § 7.2.5d. In addition, the technology that most effectively minimizes adverse environmental impacts will be considered the "Best Technology Available" for that purpose. *Id.* at § 7.2.5b. Consistent with that, and by analogy to EPA's approach to applying the Best Available Technology (BAT) technology standard for effluent discharge guidelines, EPA explained that it would look to the single best-performing CWISs in terms of minimizing adverse environmental impacts to help determine BTA standards. *Id.* Of course, as is also discussed in EPA's Draft Permit record, EPA conducts a case-by-case analysis to determine whether the particular technology used at another facility is technologically and economically feasible for use at the particular facility being permitted. EPA determined that BTA at BPS would involve retrofitting all four generating units at the plant with mechanical draft wet cooling towers given that (a) other existing fossil fuel-burning plants have undergone technological retrofits from open-cycle to closed-cycle cooling using this technology, and (b) a retrofit to closed-cycle cooling is both technologically feasible and economically practicable at BPS. See discussion in Chapter 7 of the July 22, 2002, Permit Determinations Document.

As discussed above, the best-performing technology for minimizing a CWIS's adverse environmental impacts that is both technologically feasible and economically practicable, and whose costs are not wholly disproportionate to its benefits, constitutes BTA for that facility. Therefore, EPA does not agree

that it is legally required to consider the cost and technological feasibility of various available alternatives for reducing adverse impacts to differing degrees. Nevertheless, EPA did just that because it was not entirely clear at the beginning of our evaluation which technological alternative or alternatives would qualify as BTA.

EPA also does not agree that it is required to compare the benefits of all the possible alternatives to their costs to determine what technology constitutes BTA. EPA is also not required to conduct an "incremental" cost-benefit analysis or a "knee of the curve" test in applying the wholly disproportionate cost test under CWA § 316(b). *Id.* at § 7.2.5e. That being said, EPA did provide information regarding estimated costs and benefits for various alternatives in the Draft Permit record. See *Id.* at Tables 7.4-6, 7.4-8, 7.4-9, 7.5-3, 7.5-4, 7.5-6, 7.5-8, 7.5-9, 7.5-11, and 7.6-2.

22. Comment

The permittee stated that Region I's "per-person recreational and nonuse value analysis" of benefits (a) has no basis in economic theory or in EPA's Guidelines, and (b) rests on arbitrary judgments by EPA. The permittee stated that there is no reason to believe individuals in New England or throughout the country would be willing to pay anything for the incremental improvement of a distant water body. Furthermore, the permittee stated that Region 1's use of the per-person method in this case is "particularly unconscionable given that EPA headquarters, citing the same concerns ... expressly rejected this method as a valuation technique for its § 316(b) rule."

Response

EPA disagrees with this comment. EPA explained the theoretical basis for this benefits transfer approach and its foundation in the literature in Chapter 7 of the July 22, 2002, Permit Determinations Document. The Agency has made some improvements to this work in response to comments, and these are discussed above. The Agency disagrees that EPA headquarters has "expressly rejected this method", and it does not believe the materials referenced by the permittee support its claim in this regard. Finally, EPA does not agree that there is no reason to believe individuals in New England or throughout the country would be willing to pay anything for the incremental improvement of a distant waterbody. The Agency provided support for the conclusions it reached in this regard. The Agency also established the basis for the affected population groupings that it used for the "per-person" analysis. The comments it received on the Draft Permit from people and groups representing people from around New England and the Nation support the Agency's thinking. Nevertheless, for the Final Permit analysis, in response to comments, EPA altered it's definition of the affected population to use narrower definitions based on the distance from the affected resource, consistent with an approach from the literature. This is discussed in more detail above, and the results continue to support EPA's conclusions regarding the permit.

23. Comment

The permittee stated that Region 1's use of the "habitat replacement cost" (HRC) method in its valuation of benefits has no support in EPA's "Guidelines for Preparing Economic Analyses" (September 2000) or in fundamental economic theory. The permittee stated that it is "quite apparent" that the costs of restoration activities will not be related to the benefits that they produce. The permittee stated that Region 1 "completely irrationally" used the HRC method as a conservative "lower bound" on the "total value" of the resources, and that Region 1 did not provide any demonstration that restoration costs are likely to be lower than the total use and nonuse values in this case. In addition, the permittee stated, restoration costs have in numerous cases been found to be dramatically higher than the total of use and nonuse values. The permittee stated that where Congress has by statute "made certain categories of individuals or firms responsible for replacing resources they damage," it makes sense to calculate such values, but that § 316(b) does not provide for the recovery of natural resources damages. Instead, the permittee stated, § 316(b) "requires the calculation of valid benefits values, which the HRC method does not and cannot provide." The permittee stated that the best the HRC method can do is to compare the cost of reducing

fish losses through changes in BPS's operations with the cost of achieving the same level of reduction through restoration measures, and that this comparison fails to indicate which is the more appropriate method.

Response
The permittee's comments regarding the HRC analysis are discussed in detail in the text above and in memoranda by EPA's expert consultants that are referenced above. That discussion will not be repeated here.

24. Comment
The permittee stated that Region 1 "grossly understates" the "social costs" of the proposed permit limits. The permittee stated that Region 1 acknowledges that the social costs of the retrofit are approximately 75 percent greater than the costs to BPS alone. Since Region 1 far underestimated the costs to BPS, the permittee stated, Region 1's calculation of social costs was based on a "flawed premise." The permittee stated that using a "more reasonable estimate" of the costs to BPS of performing the retrofit, the social cost of the retrofit would be about $390 million in present value terms.

Response
EPA discussed social costs in more detail above. As discussed above, EPA believes it has reasonably and appropriately estimated the social costs. In its comments, the permittee essentially accepts the social cost analytic framework used in the Abt Associates analysis for the Draft Permit, but contests the results of this analysis because it relied on what the permittee feels are underestimates of technology installation and operating costs and other operating impacts. EPA has responded to the comments regarding capital and operating costs elsewhere in this document. EPA recognizes that since social costs will be higher than private costs, the social costs corresponding to the permittee's private costs estimates would also be higher. The Agency did not, however, calculate social cost estimates based on the permittee's private cost estimates. In addition, the permittee does not appear to have provided a social cost analysis of its own based on its private cost estimates. Comments filed for the permittee by its attorneys identify a social cost estimate of "on the order of $390 million in present value terms," see *Comments of Brayton Point Station*, submitted on behalf of BPS by Foley Hoag (October 4, 2002), p. 92, but these comments provide no reference for this figure, and EPA can find no analysis supporting it in any of the comments by the permittee's consultants. In any event, the Agency does not believe such a social cost figure would change the results of the wholly disproportionate cost test. Finally, the permittee also stated that the social costs are approximately 75 percent higher than the private costs. EPA does not agree that this constitutes a rule of thumb applicable in all cases. While the analytical framework for calculating social costs from private costs remains the same, the actual ratio of social to private costs in any given case would depend on the facts of that case.

25. Comment
The permittee stated that Region 1's analysis is "incomplete and misleading" as to who will ultimately pay the costs of retrofitting closed-cycle cooling at BPS. The permittee agreed with Region 1 that electricity rates will rise by a relatively small amount if its permit limits are imposed but stated that Region 1 makes no mention of the total amount of money that electricity users will pay. The permittee stated that based on Region 1's estimates, the increase in electricity rates for users will amount to $7.6 million, and that this number significantly understates the cost because Region 1 ignores the fact that increased generation costs at BPS will affect the price of electricity sold throughout New England. Therefore, the permittee stated, Region 1's alternative estimate, which implies costs of $32.8 million annually, is "more realistic." The permittee stated that because BPS makes up a small share of total generation in New England, nearly all of this increase in electricity costs will benefit other electricity generators. The permittee further stated that a significant portion of BPS's "lost profit" due to the retrofit is money that would otherwise have been paid in taxes to the federal government, estimated by BPS's

consultant to cost the federal treasury $144 million in present value terms. Finally, the permittee stated, most of the $236 million cost of the retrofit will be "paid for" by a reduction in returns to thousands of individuals across the country who hold stock in BPS's parent company.

Response
The permittee's comments concerning EPA's consumer rate effect analysis are addressed above. EPA also reasonably and appropriately discussed the costs of the retrofit and acknowledged that they will principally be borne by the company and its shareholders. While the permittee also complains that increased generation costs at BPS will benefit other generators, this will not be a large effect within the overall regional electricity market. It is also not a concern of EPA. The Agency does not base CWA permit limits on which companies will and which companies will not profit in some way from a legal requirement. The Agency bases such limits on the applicable legal requirements. The permittee further argues that lost profits at BPS will result in a drop of $144 million in present value terms in tax revenues to the Federal treasury. Without accepting that this is necessarily a correct value, even if it is, it is not an important consideration to EPA in developing CWA permit limits. There has never been an indication in the statute, regulations, case law, or Agency legal interpretations that EPA is to apply the CWA with an eye to maximizing federal tax revenues.

26. Comment
The permittee stated that "[t]here is no support for EPA's contention that economic practicability refers solely to whether a facility can comply with the proposed BTA and remain in business." Citing the proposed Phase II 316(b) rule, the permittee stated that EPA's implementation of the economic practicability test "suggests that additional factors are to be considered."

Response
EPA disagrees. As discussed in section 7.2.5a of the July 22, 2002, Permit Determinations Document, the only support for cost considerations in the legislative history of CWA § 316(b) comes from one representative's comments that "best technology available" in § 316(b) should be interpreted to mean "the best technology available commercially at an economically practicable cost." 1972 Legislative History, p. 264. EPA has interpreted this statement in the § 316(b) context to mean that the application of BTA "should not impose an impracticable and unbearable economic burden" on plant operations; that is, the cost of proposed BTA actions should not be financially impossible for a plant to implement and remain in business. See July 22, 2002, Permit Determinations Document, § 7.2.5a.

As discussed elsewhere in this document, the permittee's reliance on the discussion of costs in the Proposed Phase II 316(b) Rule is misplaced. The preamble to the proposed rule states that "[b]ecause the Agency is inviting comment on a broad range of alternatives for potential promulgation, today's proposal is not intended as guidance for determining the best technology available to minimize the adverse environmental impact of cooling water intake structures at potentially regulated Phase II existing facilities." 67 Fed. Reg. at 17124. Until EPA promulgates final regulations based on the proposal, § 316(b) determinations for existing facilities are to be made "on a case-by-case basis applying best professional judgment," which may be more or less stringent than the proposal. *Id.* That being said, EPA does not see anything in the discussion the permittee references from the preamble of the Phase II Rule, 67 FR 17123, 17144-145 (April 9, 2003), that is fundamentally inconsistent with the assessment the Agency has undertaken. For example, EPA also evaluated regional energy effects and consumer ratepayer effects, as well as the costs to the permittee and its ability to afford them.

27. Comment
The permittee stated that the "line-by-line" analysis is invalid and thus does not support EPA's conclusions regarding the "conservative" nature of the § 316(b) estimate. Moreover, the permittee stated, EPA acknowledges the § 316(b) methodology makes no allowance for site-specific conditions. The

permittee noted that a site-specific analysis was performed by Stone & Webster and confirmed by Bechtel, which shows costs significantly higher than the § 316(b)-based estimate.

Response
EPA used two methods of cost estimation. It undertook a site-specific analysis which we have referred to as the "line-by-line analysis" because it is based on the permittee's line-item costing spreadsheets as a major input to the analysis. We also conducted a more generic analysis using the so-called "CWA § 316(b) method." EPA has addressed the permittee's comments on EPA's independent cost analyses in detail elsewhere in these responses to comments. EPA concludes that both our analyses were reasonable and valid. See SAIC's report, "Statistical Analysis of USGen Costs versus SAIC Costs" (Appendix Q). EPA also notes that the § 316(b) analysis was adjusted in various ways to provide a more site-specific value (e.g., adjustment for use of salt water). Finally, EPA notes that its two separate, independent analyses came up with relatively similar estimates, and EPA then used the **higher** of the two in its further detailed financial assessment.

EPA disagrees that Bechtel "confirmed" Stone and Webster's analysis. Bechtel did not produce any independent costs for retrofitting Brayton Point Station. In the executive summary of Bechtel's report, Bechtel concludes merely that "... the S&W cost estimates were performed using tools, methods, and assumptions common in the industry and are within the range of cost estimates reasonably anticipated for this type of retrofit work."

28. Comment
The permittee also stated that SAIC presented no information sufficient to support its cost estimate for multimode operation. The permittee said it "agreed that [sic] the cost to install conventional plume abatement technology would be prohibitively expensive."

Response
EPA responds elsewhere to the comments regarding the basis for our cost estimate for equipping the cooling towers to operate in a multi-mode configuration. In addition, EPA did **not** state that the cost of conventional plume abatement technology would be prohibitively expensive. To the contrary, for the Draft Permit EPA looked at the cost of this technology and indicated that it would be more expensive, but affordable. The Agency questioned, however, whether it would be needed. See EPA's July 22, 2002, Permit Determinations Document, pp. 7-33–34, 7-49–51, 7-81, and 7-169. In response to comments, for the Final Permit, EPA has looked in more detail at cooling towers with plume abatement capability. Again, EPA concludes that the costs for this type of cooling towers are higher but, as discussed in more detail elsewhere in these responses to comments, they are affordable and are not wholly disproportionate to the benefits.

30. Comment
The permittee presented conflicting comments concerning the auxiliary power "penalty" for cooling towers. In one place, it agreed that EPA should have used BPS's estimate, but in another place it complained that EPA did not use its own consultant's higher estimate in order to be conservative.

Response
As discussed elsewhere in these responses to comments in more detail, for the Final Permit EPA decided to use its consultant's higher, but reasonable, auxiliary power estimate to be consistent with our conservative approach to the analysis.

31. Comment
The permittee stated that SAIC's conclusion that BPS overestimated the efficiency losses associated with cooling towers is based on "generic information not applicable to BPS."

Response
EPA has concluded that its estimate of efficiency losses is reasonable and appropriate and has addressed the permittee's comments regarding the efficiency "penalty" in detail elsewhere in these responses to comments.

32. Comment
The permittee stated that in preparing the Draft Permit, EPA relied on two forms of economic benefits analysis used in the § 316(b) Phase II rulemaking without meaningfully addressing the numerous critical comments, including comments from BPS, filed in the rulemaking process regarding these methods. The permittee stated that this failure to adequately respond to comments was "inconsistent with the requirements of reasoned decisionmaking" (citing *Chemical Manufacturers Assoc.* v. *EPA*, 28 F.3d 1259, 1265-66 [D.C. Cir., 1994]).

Response
In developing an individual draft permit under the CWA, EPA is obligated to respond to significant, timely comments on the draft permit. The Agency has done so in this document, including detailed responses to comments concerning the "benefits transfer" and "HRC" analyses from the Draft Permit as well as numerous other matters.

EPA is not required to respond to comments earlier provided to EPA Headquarters about a proposed rulemaking. This is especially so when, as discussed above, EPA has been clear that Regions preparing case-by-case individual permits under existing practice are not to use the draft regulations as guidance to direct their permitting. Moreover, it is not even clear what comments or which methods the permittee is referring to; the permittee has only provided a general reference to its comments in the rulemaking without pointing to specific comments. See *NRDC* v. *EPA*, 863 F.2d 1420, fn. 7 (9th Cir., 1988) (upholding EPA's decision not to consider comments pertaining to national rulemaking because "requiring each EPA Region to consider all the comments relating to the national rulemaking in each BPJ permit would impose an unreasonable burden on the agency"); *Mount Diablo Hosp.* v. *Shalala*, 3 F.3d 1226 (9th Cir. 1993) ("there is no obligation to make references in the agency explanation to all the specific issues raised in comments. The agency's explanation must simply enable a reviewing court to see what major issues of policy were ventilated by the informal proceedings and why the agency reacted to them the way it did"). That being said, EPA Region 1's analysis for the Draft Permit was not identical to that conducted by EPA Headquarters for the proposed rulemaking. Therefore, the permittee's comments to Headquarters do not clearly apply to the Region's work on the permit. For example, EPA Region 1 did not use the HRC evaluation to provide an estimate of the actual value of the resources damaged by the BPS cooling water intake structure, whereas Headquarters did for its proposed rule. Indeed, the Region's approach was likely more consistent with the gist of some of the comments that the permittee provided to Headquarters.

In addition, the case cited by the permittee is distinguishable on its facts. In *Chemical Manufacturers Assoc.* v. *EPA*, 28 F.3d 1259 (D.C. Cir., 1994), the petitioners presented specific objections to the EPA's use of a particular air-dispersion model to predict the ambient air of a pollutant called MDI. 28 F.3d at 1265–66. The court stated that EPA had "responded in a high-handed and conclusory manner" to these comments. *Id.* For example, the court observed, EPA "accepted [the petitioner's] point that MDI is a solid at the ambient temperature (20 ^{o}C) at which the model assumes that the generic pollutant is a gas, yet it dismissed [the petitioner's] objection that a solid cannot act as a gas with the facile assertion that 'it is likely that MDI is emitted at temperatures higher than ambient and so would disperse much like any other pollutant,' that is, as a gas." *Id.* at 1266. The court noted that "in fact, the record shows that MDI is still a solid at 37 ^{o}C." *Id.* Stating that EPA had made a "speculative factual assertion" that bespoke a "let them eat cake" attitude, the court vacated EPA's decision designating MDI as a high-risk pollutant. *Id.* Contrary to the facts in *Chemical Manufacturers*, for this permit, EPA has carefully considered the

permittee's comments and responded reasonably and adequately to them. Furthermore, EPA has always been willing to meet with the permittee and consider its views and data.

33. Comment
The permittee stated that "[v]irtually every one of EPA's supposed 'conclusions' is ultimately no more than conclusory assertions." Specifically, the permittee stated, EPA (a) prejudged the outcome by assuming that "only" closed-cycle cooling will allow recovery of fish in Mount Hope Bay; (b) reiterated "speculative conclusions" regarding the unimportance of fogging, icing and noise impacts; and (c) stated that its economic analysis is not "primary" and need not be "precise."

Response
EPA disagrees with this comment. The Agency did not "prejudge" its permit determination. EPA has explained in detail the bases for its conclusions related to the issues noted above in the July 22, 2002, Permit Determinations Document and in this document.

Biological Impacts

34. Comment
The permittee stated it submitted three new papers presenting biological analyses on July 3, 2002, and that EPA's refusal to consider these new reports, prior to issuance of the Draft Permit is "inconsistent with the requirements of reasoned decision making" (citing *Chemical Manufacturers Assoc.* v. *EPA*, 28 F.3d 1259, 1265–66 (D.C. Cir., 1994)). The permittee further stated that "[t]he clear implication is that EPA had made up its mind and had determined that it would not hear evidence to the contrary."

Response
EPA disagrees with this comment and believes the criticism it presents is patently unfair. As explained in § 7.5 of the July 22, 2002, Permit Determinations Document, EPA was not able to consider the three new studies prior to issuance of the Draft Permit because of their extremely late submittal. Although the permittee's permit application was due in January 1998, and it finally submitted its completed CWA §§ 316(a) and (b) Demonstration Documents in December 2001, it did not submit these three new studies until July 3, 2002. EPA was just about to issue the Draft NPDES permit and did so on July 22, 2002. While EPA had delayed reissuance of this overdue permit—the permit expired in July 1998—to give careful consideration to the permittee's Demonstration Documents, among other things, the Agency could not perpetually delay the permit in response to repeated late submissions from the permittee. In any event, EPA explained in the July 22, 2002, Permit Determinations Document (at pp. 1–3, 6–2) that the Agency would give the permittee's new analyses careful evaluation during the public comment period, along with other public comments and/or new information that might be submitted during the comment period. EPA has made good on this commitment. The permittee's submissions have been considered and responded to in detail in this document.

In addition, as discussed in the response above, *Chemical Manufacturers Assoc.* v. *EPA* is distinguishable from the present case.

35. Comment
The permittee stated that EPA's implication that "unusual impingement events" at BPS are a significant adverse impact of the station is "unfounded." The permittee also stated that EPA's suggestion that entire schools of fish may be eliminated in these events is "completely speculative."

Response
BPS is required to monitor impingement rates on an ongoing basis, and it is acknowledged that some low level of fish mortality will occur as part of the routine operation of the station. However, when 25 or greater fish per hour are impinged, this is deemed an "unusual impingement event" by the terms of the

permit and triggers additional data collection requirements for the permittee. These discrete events may involve large numbers of one or two species, or lower numbers of a wide spectrum of species, being impinged by the plant's intakes. In Chapter 7 of its July 22, 2002, Permit Determinations Document, EPA describes the magnitude and frequency of some of the recent unusual impingement events.

Without commenting on each individual event over the history of the plant's operation, EPA views these events cumulatively, and many of them individually, as significant adverse impacts. Any time tens of thousands of fish are killed by a facility, even if they are not commercially important, EPA views this as a significant adverse impact. Even the forage species that tend to be impinged in very high numbers have important ecological functions, as they provide a link from the planktonic food chain to the higher fish and bird species. EPA has long maintained that impingement of fish is an adverse impact under CWA § 316(b), and our view here is consistent with this longstanding position. Moreover, EPA is not the only entity concerned about impingement losses of forage species to power plants. The Atlantic States Marine Fisheries Commission has initiated a study examining the impact of power plant entrainment and impingement losses to Atlantic menhaden populations along the mid-Atlantic coast. Finally, the adverse impacts from impingement must also be considered together with other adverse impacts from the intake, such as the entrainment of huge numbers of organisms from the estuary.

Over the last year, EPA has required BPS to provide more detailed information regarding unusual impingement events in hopes of gaining an understanding of what initiates them and what may cause them to end. Historically, BPS has only reported the number and species of fish lost, but no effort was made to attempt to understand why these events occurred. In response to queries from EPA, the permittee and its consultants suggested that wind direction, tidal state, and/or the presence of coal delivery ships may all play a role in triggering these events. Thus, EPA requested specific information on plant flow, water temperature, wind speed and direction, tidal information, and presence/absence of coal delivery vessels corresponding with the time of any future events. Since this request, several additional unusual impingement events have occurred, and BPS has provided the additional information, but to date there is no strong correlation between any of the factors evaluated and the magnitude and duration of any particular event.

These events typically continue for several days at a time and can consist of tens of thousands of individual fish. EPA believes that what generally happens with the schooling forage fish is that they tend to follow the shallow water along the shoreline, and when they reach BPS, the intake structure acts as a contiguous part of the shoreline. Thus, fish swim by it, but on the far side of the intake the shoreline becomes a wall. The fish could follow this wall, but it leads them out over the dredged berthing area for the coal vessels, which represents deep water. These fish likely stay in shallow water to avoid predation, thus they may tend to become trapped in the inlet in front of the intake. As a result, they become susceptible to large impingement events. Some of the recent large events have involved on the order of 40,000–70,000 fish. It is EPA's judgement that this may represent essentially the effective elimination of a school of fish. This is further supported by the fact that these events may run for several days to over a week, which is more than the time the fish would have needed to have left the area, and there is no clear reason as to why the events eventually end other than that the supply of fish in front of the intake may have been exhausted. EPA note's the permittee has not provided any compelling alternative explanation.

36. Comment

The permittee disagreed with EPA's statement that Mount Hope Bay constitutes only 0.05 percent of the total surface area of Rhode Island state waters.

Response

The commentor is correct that Mount Hope Bay constitutes 5 percent (not 0.05 percent) of the surface area of Rhode Island state waters.

37. Comment
The permittee stated that EPA is incorrect to dismiss density dependence in its analysis of entrainment effects, and that the concept of density dependence is firmly established in the scientific literature.

Response
EPA does not reject the concept of density dependence out of hand. Density dependent effects may occur when high levels of abundance of one species lead to increased mortality rates for the individuals of that species. This may occur due to competition for resources, be it food or space, or as a result of greater susceptibility to predation. Thus, theoretically, as abundance numbers decrease, mortality rates for the survivors will also decrease.

The permittee is asking for credit for reducing density dependence effects in Mount Hope Bay plankton communities by virtue of the power plant's killing large quantities of plankton. Thus, the permittee argues that it is actually a beneficial effect for the power plant's cooling water intake to kill billions of fish eggs and larvae. EPA's rationale for not considering density dependence effects in this manner in our assessment of the adverse impacts of cooling water intake operation is clearly articulated in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document (page 7-112). The permittee has simply provided no compelling evidence that density dependence effects are occurring in Mount Hope Bay and plainly has no basis for assessing the relative importance of these effects even if they were occurring. While the permittee cites a report by Collie and Delong (2002) in support of their comment, this report provides no compelling evidence of density dependence effects. EPA sees no solid evidence of these effects occurring in Mount Hope Bay, and as such believes it would be inappropriate to change our analyses.

38. Comment
The permittee disagreed with EPA's statement that loss of larvae could "reduce the resilience of population, making it more susceptible to a decline and prevent or inhibit the recovery of a particular population that is depressed ..." The permittee stated that this statement is "entirely speculative" and unsupported. The permittee further stated that there is no support for EPA's view that making a population more susceptible to a decline or inhibiting its recovery is a valid consideration under § 316(b).

Response
Members of the BPS TAC have long voiced concern that entrainment of eggs and larvae may be reducing the resilience (or "compensatory reserve") of the winter flounder population in Mount Hope Bay. The theory is that fish populations will produce large numbers of eggs in anticipation of years with the most favorable environmental conditions. In years with favorable conditions, survival and subsequent recruitment to the adult fishery increases. These pulses of high recruitment can sustain a population at a high or adequate abundance level for several years past the recruitment event, which may be important for helping the population weather years with adverse environmental conditions. In other words, the good years provide a "reserve" to help compensate for the bad ones. The "compensatory reserve" theory is a well-established scientific theory and it is proper to consider it in this context. See, e.g., 66 FR 65294 (Dec. 18, 2001) (Preamble to Final Phase I CWA § 316(b) Regulations) (discussion of compensatory reserve issue).

TAC members had voiced concern that large entrainment losses may prevent these pulses of recruitment from occurring and negatively effect the resilience of the winter flounder population. EPA mentioned this concern in our § 316(b) analysis and believes it is a valid consideration that tends to support our decision. EPA recognizes, however, that it does not have definitive information on this issue, and it was not a key basis of EPA's decision.

39. Comment
The permittee stated that it does not understand how EPA estimated entrainment rates to be 14 percent greater under current operations than during 1974–1983. The permittee stated that, in fact, entrainment rates are likely to be lower for many species because the abundances are lower.

Response
The explanation of our entrainment rates is laid out clearly in our Determinations Document in Chapter 7. Briefly, these estimates are a function of the available entrainment data, estimates of current operation of Unit 4, and differences in entrainment rates at Unit 4 compared to Units 1, 2, and 3. BPS has not collected comprehensive entrainment samples since 1985. Thus, no recent estimates of entrainment of larval fish and eggs, other than winter flounder, exists for the station. EPA used the historical entrainment rates, the only information available, and modified these rates for current plant flow and technologies. There has yet to be established a clear relationship between adult abundance in the bay and entrainment rates for individual species, thus EPA did not reduce our estimates of entrainment rates based on observed lower adult abundance in the bay.

40. Comment
The permittee stated that EPA's conclusion that Mount Hope Bay is the appropriate reference point for entrainment and impingement losses of species other than winter flounder that have no natal fidelity to Mount Hope Bay is "arbitrary and incorrect." The permittee stated that "[a]s even EPA admits, there is an exchange of some quantity of fish larvae in Narragansett Bay." In addition, the permittee asserted, many of the species that may be affected by the plant in Mount Hope Bay are part of much larger coastal populations. The permittee stated that, according to EPA's existing precedent, where the relevant population is large, the existence of even significant levels of impact will be acceptable.

Response
Under EPA's current mode of applying CWA § 316(b), each permit's limits are determined on a case-by-case basis in light of the facts of that case. EPA has never declared that even significant levels of adverse impact will be acceptable where the relevant population affected is large. Again, as discussed in detail in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document, EPA considers the intake's adverse impacts from a variety of perspectives to assess their magnitude and these impacts must be minimized in accordance with the BTA, except to the extent that the costs of the BTA would be wholly disproportionate to its benefits.

EPA maintains that Mount Hope Bay is the appropriate frame of reference for entrainment and impingement losses for a number of reasons. First, winter flounder is not the only relevant species that has a high degree of fidelity to natal spawning grounds. Weakfish and anadromous fish species do as well. Second, EPA is interested in quantifying impacts of its permit decisions to particular water bodies as well as to fish populations at large. Mount Hope Bay, with its constricted connections to Narragansett Bay is obviously the water body at issue. It is the source of BPS's cooling water, and it receives BPS's thermal discharge.

Under CWA § 316(b), EPA must ensure that the cooling water intake reflects the BTA for minimizing adverse environmental impacts. Under applicable water quality standards, designated uses and criteria applicable to a particular water body must be satisfied. Under § 316(a), EPA is required to assure the protection and propagation of the balanced indigenous community in **the** receiving water. In applying these standards, EPA believes it is appropriate to consider impacts to the Mount Hope Bay populations of these organisms. This is clearly so under CWA § 316(a) and water quality standards, including consideration of the cumulative effects of intake entrainment and impingement and discharges.

It is also the case under CWA § 316(b), where taking a large percentage or number of a species from a particular water body is an adverse impact. EPA recognizes that the significance of that impact **may** be less if that species is part of a much larger breeding population. However, EPA does not think the argument should be carried too far. First, these effects could disrupt the local balanced, indigenous community. Second, the fact that a species also exists and breeds elsewhere should not be used to justify extirpation of local populations of a species. Indeed, if this approach was taken across the board, the cumulative effects could be devastating to the species. For example, EPA does not believe it would be wise public policy to allow for the local extirpation in Mount Hope Bay of a wide-ranging species such as, for example, Atlantic menhaden, even though that impact may not significantly harm the East Coast interbreeding population of Atlantic menhaden. Moreover, as stated above, these losses may be important for normal ecosystem dynamics in Mount Hope Bay.

The permittee cites to the *Seabrook* case in support of its position, but the situation in Mount Hope Bay is clearly distinguishable from that case. In *Seabrook*, a key factor was that the proposed intake location had been moved from the estuary to a more distant ocean location, at significant expense to the company. See *In the Matter of Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2)*, 1978 WL 2140 (p. 25), 1 E.A.D. 455 (NPDES Permit Application No. NH 0020338, Case No. 76-7) (August 4, 1978) (Decision of the Administrator on remand). This was done in order to reduce adverse environmental impacts. Having chosen that new ocean location, EPA then evaluated the impacts with respect to the relevant ocean populations of organisms. In this regard, the *Seabrook* decision was based on its unique facts. These facts obviously differ from the case of BPS, with its cooling water intake structure in the Mount Hope Bay/Narragansett Bay estuary. *Id.*

41. Comment

The permittee stated that EPA's conclusion, based on Mark Gibson's report, that Mount Hope Bay has experienced more severe changes in fish abundance than in Narragansett Bay is incorrect. The permittee further stated that the Wilcox trawl data "convincingly demonstrates that **present** abundances of fish in Mount Hope Bay and Narragansett Bay are essentially identical."

Response

The permittee has relied on an analysis by its consultant, Joseph DeAlteris, to support its comment that declines in fish abundance in Mount Hope Bay and Narragansett Bay are "essentially identical." EPA has reviewed and considered this analysis and the permittee's comments based on it. EPA's critique of this analysis is presented elsewhere in these responses to comments. The Agency still maintains that the decline in fish abundance in Mount Hope Bay is statistically different than that of Narragansett Bay. EPA has fully explained the data upon which it bases this conclusion. The permittee submits results from the Wilcox Trawl survey, but this effort was only initiated relatively recently (in 1997). This survey only samples a small portion of Narragansett Bay, and it began well after the collapse of fish stocks occurred in Mount Hope Bay. Due to the short duration of this survey and the limited number of samples, the statistical power of this survey is low. Thus, it is not surprising that it did not detect a difference between Mount Hope Bay and Narragansett Bay. It should be noted that another of the permittee's consultants, Raymond Hilborn, declined to use the results of this survey in a quantitative fashion due to its limited duration. EPA believes the analysis from the 1996 Gibson report demonstrates that Mount Hope Bay has exhibited an unique decline in fish abundance. Even PG&E-NEG's consultant, Joseph DeAlteris, has admitted that the facility is having a measurable impact on the upper third of Mount Hope Bay. Based on the limitations of the Wilcox Trawl as discussed above, EPA believes that the conclusions from the Gibson report are still valid.

Gibson, MR. 1996. Comparison of trends in the finfish assemblage of Mt. Hope Bay and Narragansett Bay in relation to operations at the New England Power Brayton Point Station. RI Division Fish and Wildlife Research Reference Document 95/1.Revised August, 1996.

42. Comment
The permittee stated that recorded catch rates do not form an adequate basis for concluding that the population numbers for windowpane and tautog are as low as winter flounder.

Response
EPA's document states that the low catch rates suggest that abundance for these other species may be as low as winter flounder. The Agency believes that making this suggestion is reasonable and appropriate based on the available data. EPA does not, however, draw any definitive conclusions on this point, and it does not then carry forward the analysis to calculate a percentage of the population lost to entrainment and impingement based on this information.

43. Comment
The permittee stated that EPA makes no attempt to quantify or explain what it means by "total ecosystem production foregone," and that there is no precedent for including this concept in a § 316(b) analysis.

Response
A Production Foregone Analysis simply estimates the amount of biomass that would have been produced by organisms that are lost to entrainment or impingement. Typically, these calculations are done exclusively for nekton or fish. Fish are only one component of any aquatic ecosystem. Phytoplankton and invertebrates comprise essential pieces of the food chain, and these species are also susceptible to entrainment and impingement. Entrainment and impingement losses of organisms other than fish are rarely quantified due to the difficulty and cost of the identification work and the sheer numbers of organisms that would need to be enumerated. BPS has never quantified entrainment and impingement losses of organisms other than fish. The concept of total ecosystem production foregone simply acknowledges that these facilities entrain and impinge more than just fish. It is a well established ecological principle that creatures at lower levels of the food chain exist in greater abundance than creatures at the upper levels of food chain. The data does not exist to quantify the losses of planktonic life stages of crustaceans, shellfish, worms, other invertebrates, and phytoplankton, but it is unquestionably larger than the nekton production foregone, based on the sheer abundance of these organisms in the marine environment. EPA believes it is appropriate for the Agency to try to assess or consider the impact of plant operations to all of the various marine communities found in Mount Hope Bay. Though EPA cannot quantify the entrainment and impingement losses to these communities, EPA's analysis acknowledges that it is occurring.

44. Comment
On July 30, 2003, PG&E-NEG submitted additional information for EPA's consideration. This submission included a nine page cover letter, a report prepared by LMS entitled "Mark R. Gibson's May 2003 Assessment of BPS's Impact on Mount Hope Bay Winter Flounder: A Comparison to Prior Assessments," a variety of material on economics and a Draft May, 2003 report by Mark Gibson entitled "An Assessment of the Impacts of Fishing and Brayton Point Power Station on Local Stocks of Winter Flounder Using a Nested, Biomass Dynamics Model." The major point related to the biological analysis of this submission is that the permittee claims that Gibson's report shows that EPA overestimated the effect of the plant on the winter flounder population in Mount Hope Bay. Specifically, they point to this report as evidence that Gibson believes that the population of winter flounder in Mount Hope Bay is currently 423,000 individuals.

Response
EPA has reviewed the permittee's submission, including the Draft report by Mark Gibson. The intent of Gibson's analysis is to examine the cumulative impact of fishing and BPS on winter flounder in Narragansett and Mount Hope Bays. The focus and most important result of this analysis is the long-term abundance trend estimate, rather than a specific population estimate. The report asks whether specific combinations of fishing management and reduction in BPS flow are likely to result in a winter flounder

population in Mount Hope Bay that will recover within a reasonable time frame (10 years). Gibson does not specifically provide an estimate of the Mount Hope Bay winter flounder population in numbers of fish, as that is not the intent of this analysis. Based on this analysis, Gibson concludes that dramatic reductions in plant operations, consistent with EPA's draft permit conditions, are needed in conjunction with further reductions in fishing mortality to ensure a recovery of the winter flounder population in Mount Hope Bay. Reducing fishing mortality alone will not result in a recovery of winter flounder in Mount Hope Bay within a reasonable time frame, nor will reducing only mortality from BPS be sufficient to restore winter flounder in Mount Hope Bay. (This is consistent with EPA's conclusions and, as discussed elsewhere, fishing restrictions are being implemented by Massachusetts, Rhode Island, and the Federal government.)

In its submission to EPA, the permittee derived a population estimate for winter flounder in Mount Hope Bay from Mark Gibson's analysis. The Gibson analysis is a biomass model, and one can convert biomass to numbers of individual fish by assuming a specific weight per adult fish. The permittee, therefore, converts Gibson's biomass numbers and derives an estimate of 423,000 adult winter flounder in Mount Hope Bay. EPA has consistently maintained that any model-generated results must reasonably match actual data collected in the field. In this particular case, any model estimate of flounder abundance in Mount Hope Bay must produce values that can be reasonably correlated with the MRI trawl survey results. In its earlier comments on the Draft Permit, the permittee's consultant Raymond Hilborn, derived a winter flounder population estimate of 300,000 for Mount Hope Bay. EPA responded to this comment with an analysis examining winter flounder distribution within Mount Hope Bay and winter flounder catch rates from the MRI and RI DEM trawl surveys. These calculations showed that a baywide population estimate of 300,000 produced winter flounder densities on the bottom that were dramatically inconsistent with winter flounder catch rates from the trawls. This analysis showed that catch rates were an order of magnitude or greater too low for the winter flounder population in Mount Hope Bay to truly be 300,000. A population estimate of 423,000 would only produce higher densities of winter flounder on the bottom and a greater discrepancy with the trawl survey results. EPA has shared this analysis with Mark Gibson, who acknowledges a "scaling problem" exists in his new draft analysis. Of course, the "scaling problem" does not affect long-term abundance patterns (i.e., the model still shows a collapse in 1984-1985).

Mark Gibson has discussed the permittee's characterization of his work with EPA and has submitted to us a September 24, 2003, letter reiterating his major conclusion that EPA's permit limits are appropriate, and refuting PG&E-NEG's characterization of his work. Furthermore, Gibson states that:

> . . . direct calculation of stock size from company and RIDEM surveys using area swept or ratio methods indicate that the population of winter flounder in Mt. Hope Bay is quite small. These low abundance estimates, and the implied high plant impact considering company equivalent adult calculations, remain viable given the assumptions used.

EPA's believes its Mount Hope Bay winter flounder population estimate of 7,500 fish remains reasonable, and Gibson's new work does not change our conclusion in this regard.

Moreover, having reviewed the permittee's submission and Gibson's work, as well as having discussed the matter with Mr. Gibson, EPA finds no compelling reason to change the conditions in the Draft Permit based on these materials. First, Gibson's report was only a draft report, which means it is a work in progress, and its content and analysis is subject to change. Second, the final conclusion of this draft report suggests that EPA's Draft Permit conditions are appropriate. Third, the only piece of the analysis that is arguably inconsistent with EPA's work to date is the derived population estimate of winter flounder for Mount Hope Bay. Yet, EPA, in responding to other comments from the permittee, shows that winter flounder population estimates for Mount Hope Bay in the hundreds of thousands of fish are very unlikely. Finally, Mr. Gibson has reaffirmed his support for EPA's permit conditions based on the abundance trend

analysis and, in effect, notes that he believes the permittee's winter flounder population estimate based on the draft paper is unsound.

Response # IV.45	**Document #**: 1132, 1148

Comment

EPA received two comments suggesting that the proposed flow limits for the Draft Permit are not sufficiently stringent and the impacts associated with 122 hours/year of once-through cooling are not estimated.

Response

EPA examined the environmental impacts associated with various cooling water intake-related technologies. The Agency determined that a reduction in flow was the best way to reduce impacts from entrainment and impingement. Obviously, from a biological standpoint, an alternative that required no water withdrawal at all would eliminate impingement and entrainment losses completely. However, EPA felt that the approximately 96 percent intake flow reduction required by the new permit limits would adequately minimize adverse environmental impacts from the intake. These limits would achieve a corresponding 96 percent reduction in entrainment and impingement of marine organisms by the intake. In addition, EPA was unable to determine based on present information that a greater flow reduction based on a plant cooling system conversion to dry cooling was feasible. EPA then decided to allow the additional 122 hours of once-through cooling operation – based on flows consistent with the permit's § 316(a)-based thermal discharge limits – because we determined that the additional flow would not likely involve significant impacts in light of the large reductions already required. The Rhode Island DEM and others have expressed concern, however, about the possible effects of this once-through cooling flow during sensitive biological periods. In response to these comments EPA has adopted an additional limitation in the permit which will prohibit the once-through cooling operations between February and May to protect winter flounder spawning. We believe this restriction is a reasonable step to further minimize adverse environmental impacts from BPS's cooling water withdrawals. It is not possible to precisely quantify the impact of the 122 hours of once-through cooling because it will be dependent on ichthyoplankton concentrations in the bay at the time that these bypasses take place. Ichthyoplankton concentrations can be highly variable. However, EPA believes that the provision discussed above will ensure that the impact from the additional bypass operation will be adequately minimized and that it will represent a minor incremental impact on the Mount Hope Bay ecosystem in light of the large reductions in adverse impacts that the permit requires.

Response # IV.46	**Document #**: 1159

Comment

One commenter noted that damage provisions are included in the permit for fish kills associated with discharge-related events, but there is no similar provision for mortalities associated with impingement events. The commenter felt that there should be an equivalent provision for impingement-related mortality.

Response

EPA has decided to remove any fish kill damages provisions from the permit for the following reasons: 1) the provision is taken directly from Massachusetts General Law Ch.130 § 23 (2003) and it applies regardless of whether it is spelled out in the permit; 2) it is a matter of state law and is not federally enforceable; and 3) removing the condition makes the permit more concise. The damages provisions included in the Draft Permit were simply repeated from past BPS discharge permits. These provisions were originally placed in the permit in response to two large fish kill events which, EPA concluded, resulted from a combination of elevated temperature and chlorine discharges. While the Massachusetts law

addresses certain types of fish kills, it does not address impingement-related mortality. Thus, the permit's damages provisions never addressed impingement fish kills.

Response # IV.47	**Document #**: 1133

Comment
EPA received one comment stating that PG&E-NEG's proposed enhanced multi-mode system would result in the loss of large percentages of the resident winter flounder, windowpane, tautog, and hogchoker populations through entrainment and impingement. The ecosystem production forgone would greatly exceed 54 million pounds per year and would exceed the allowable total catch for any sector of the fishing industry. Unlike fishing, the take of these fish provides no benefit to humans or the ecosystem.

Response
Although the proposed enhanced multi-mode system would represent a reduction in flow, it would still result in an annual average daily flow of 650 MGD (the permittee proposes a daily maximum flow limit of 1298.5 MGD, with seasonal monthly average flow limits of 600 MGD for October - May and 750 MGD for June - September). As a result, large quantities of fish eggs, larvae, and other planktonic life would continue to be entrained by the station. Small fish and invertebrates would continue to be impinged in large numbers. The entrainment and impingement losses are converted to adult equivalents by applying various natural mortality rates for each life stage until one reaches the age 3 adult stage. Natural mortality rates are taken from the scientific literature. Once converted to age 3 adults, these losses can be compared to similar aged fish in the bay for a comparison. For winter flounder, EPA estimates that the proposed enhanced multi-mode would result in a take of 70 percent of the adult winter flounder population in the bay. In addition, EPA estimated that the loss of non-commercial forage fish would be more than 54 million pounds per year. EPA agrees with the commenter that the loss of these fish does not provide any direct benefit to humans.

Response # IV.48	**Document #**: 1133

Comment
EPA received one comment stating that impacts on species abundance and diversity are underestimated because data collection began several years after the plant was operational.

Response
It is true that quantitative fish population data do not exist for Mount Hope Bay prior to the construction and operation of BPS. Limited data collected in 1970 by the Massachusetts Division of Marine Fisheries show winter flounder to be the most abundant species taken in their trawl survey. Windowpane was the third most abundant species in this survey. Currently, winter flounder and windowpane rank near the bottom for fish abundance.

BPS has been operating since the late 1960s, which predates the Clean Water Act (CWA) and many other important pieces of environmental legislation. The owners of BPS were not legally required to collect data on fish populations in Mount Hope Bay until 1972. Thus, EPA does not have a precise quantitative sense of the pre-BPS biological community in Mount Hope Bay. However, the data that exist from the early 1970s,qualitatively show a community with abundant winter flounder and windowpane. Anecdotal information also suggests a thriving fishery in the past.

Response # IV.49	**Document #**: 1161

Comment
One commenter addressed a report submitted to EPA by PG&E-NEG from Ray Hilborn. That commenter felt that Hilborn's estimate of winter flounder population size in Mount Hope Bay is unrealistically large based on existing trawl survey data.

Response
EPA has responded to this point elsewhere in this document when discussing the size of the fish population in Mount Hope Bay. Please refer to responses regarding § 316(b) for this discussion.

Response # IV.50	**Document #**: 1161

Comment
RI DEM submitted a series of very detailed technical comments regarding PG&E-NEG's permit renewal application of November 2001 and the additional submissions from Joseph DeAlteris and Ray Hilborn on behalf of PG&E-NEG. These comments covered a wide range of issues, but were primarily focused on specific biological analyses. The major issues covered included thermal acclimation, the effect of predation by cormorants on winter flounder, regional winter flounder abundance trends, estimation of the winter flounder population in Mount Hope Bay, and the effects of stressors other than BPS on fish populations in Mount Hope Bay.

Response
EPA carefully considered all the points raised by RI DEM in development of this Response to Comments Document and the conditions in the Final Permit. EPA discusses these issues in great detail in its responses to comments made by PG&E-NEG throughout this document.

Response # IV.51	**Document #**: 1036, 1038, 1039, 1062, 1071, 1211

Comment
EPA received six comments expressing concern over the impact from entrainment and impingement of large numbers of fish eggs and larvae.

Response
Monitoring data from BPS document the large quantities of fish eggs, larvae, juveniles, and adults either entrained or impinged. For more detail, see Chapter 7 of EPA's July 22, 2002, Permit Determinations Document.

Response # IV.52	**Document #**: 1148

Comment
EPA did not sufficiently integrate all the individual factors affecting fish stocks and aquatic life in Mount Hope Bay. The commenter felt that if EPA integrated all these factors, it might find that the limits in its discharge permit are not sufficiently protective.

Response
Models have not yet been developed that will allow the Agency to estimate the integrated impact of entrainment and impingement mortality, thermally induced effects (lower egg survival due to temperature-enhanced predation, chronic mortality in juveniles, and temperature avoidance), and other factors. A theoretically complete analysis would examine the impact of all plant operations on every species in the bay and would be able to predict changes in each species' abundance and how those changes might affect one another. In an estuarine system like Mount Hope Bay that would involve hundreds of species and require more data than EPA could reasonably expect to gather in one person's lifetime. Developing an

integrated analysis, one that examines all life stages, for even one species is technically challenging. The Technical Advisory Committee (TAC) and PG&E-NEG's consultants worked on a cumulative impacts analysis that would use a modification of an existing population model called RAMAS. This application of the RAMAS model was an attempt to link fishing mortality, entrainment, and impingement losses from BPS with thermal discharge impacts on habitat suitability for winter flounder in Mount Hope Bay. Unfortunately, this modification did not produce results that could satisfactorily reproduce historical data, so EPA has no confidence in its ability to predict the future. Thus, EPA has not relied on the RAMAS model in any decision-making capacity. Absent an integrated model, EPA believes that conservative assumptions are warranted in looking at the impacts of the individual components (thermal discharge, entrainment, impingement). It is quite possible that the impacts from these individual stressors might not be simply additive in nature. However, the best assessment EPA can currently make is to use conservative assumptions for each individual stressor and use its best professional judgment regarding the acceptability of the cumulative impacts.

Response # IV.53	**Document #**: 1133

Comment

EPA received one comment stating that PG&E-NEG provided data on only a limited number of finfish species and did not include forage species or invertebrates such as lobster, crabs, mussels, and shrimp.

Response

For BPS and other power plant facilities, the resource agencies develop a list of Representative Important Species (RIS) and Critical Aquatic Organisms (CAO). The RIS and CAO lists are intended to look at commercially or ecologically important species within each specific receiving water. The RIS list for Mount Hope Bay includes the following species:

alewife	Atlantic menhaden	Atlantic nutworm
Atlantic silverside	bay anchovy	bluefish
blue mussel	eelgrass	four-eyed amphipod
hogchoker	quahog	rainbow smelt
sand lance	scup	seaboard goby
silver hake	striped bass	tautog
threespine stickleback	tube worm	weakfish
white perch	windowpane	winter flounder

The CAO list consists of only the finfish species listed above. For an analysis of the effects of PG&E-NEG's proposed § 316(a) variance-based thermal discharge limits, the permittee was required to provide a thermal analysis for each species on the RIS list. For an analysis of intake effects under § 316(b), PG&E-NEG was required to provide information for the species on the CAO list. Currently, no species of crab, lobster, or shrimp appear on either list, so PG&E-NEG was not obligated to submit data about these species. However, in EPA's review of potential thermal effects on Mount Hope Bay, it became apparent that the sand shrimp, *Crangon septemspinosa*, might have an ecologically significant role in Mount Hope Bay. Thus, these lists will be expanded in the future to consider (at a minimum) the sand shrimp. PG&E-NEG did an abbreviated analysis for impacts on blue mussels in their Partial Demonstration Document submitted in May 2001 and an analysis for quahog in their full variance submission submitted in December 2001.

Response # IV.54	**Document #**: 1005, 1019, 1146, 1180

Comment
Four commenters expressed concern about the biological impact of water withdrawal and thermal discharge from BPS on Mount Hope Bay.

Response
EPA believes that BPS's current operations are affecting Mount Hope Bay and the organisms that live there. EPA has designed the current permit to substantially reduce these impacts so as to assure the protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife in and on Mount Hope Bay. For more detailed information, see Chapters 6 and 7 of EPA's July 22, 2002, Permit Determinations Document.

Response # IV.55	**Document #**: 1160

Comment
One commenter stated that many economically important fish stocks have been affected by a myriad of stresses. Impacts on fish stocks from fishing are being aggressively limited by the New England Fishery Management Council, Atlantic States Marine Fisheries Commission, and the States of Rhode Island and Massachusetts. Evidence indicates that impacts on fisheries resources in Mount Hope Bay extend far beyond the results of fishing. Therefore, the commenter urged an aggressive approach to limit impacts from BPS.

Response
The Marine Research, Inc. (MRI) trawl survey measures fish abundance in the bay, which reflects the cumulative stresses felt by that population. The fact that fish stocks are statistically lower in Mount Hope Bay compared to adjacent Narragansett Bay suggests that a site-specific stressor is affecting those populations. EPA has set what it believes are appropriate limits to allow for the protection and propagation of a balanced indigenous population in Mount Hope Bay, and to assure that cooling water intake capacity reflects the Best Technology Available for minimizing adverse environmental impacts. EPA believes these limits will help allow for the recovery of the Mount Hope Bay ecosystem. This recovery effort will certainly require continued strong fishery management by Rhode Island, Massachusetts, the Federal government, and other partners, as well as continued efforts to control other pollution sources into the bay.

Response # IV.56	**Document #**: 1161

Comment
One commenter stated that the limits in the Draft Permit represent the minimum restrictions necessary to assure a recovery of Mount Hope Bay. The impacts associated with the limits in the Draft Permit are not insignificant. Any substantial increase in withdrawal rates above the proposed limits in the permit will likely result in violation of Rhode Island State water quality standards.

Response
EPA recognizes that the quantity of water withdrawn from the bay and the quantity of heat discharged back to it under this permit are not trivial. However, EPA has concluded that the limits in the permit will comply with CWA requirements. The reduction of more than 90 percent of the plant's impact on the bay should be a major step forward in the recovery of the Mount Hope Bay ecosystem.

Response # IV.57	**Document #**: 1161

Comment
One commenter gave comments on a technical report submitted to EPA by PG&E-NEG from Joseph DeAlteris. The commenter made the following points as to why the analysis by DeAlteris is flawed: (1) The DeAlteris analysis relies on data generated by the State of Rhode Island DEM and these data are not accurately represented in this analysis and (2) DeAlteris uses an index of abundance for winter flounder juveniles that had been dismissed by PG&E-NEG, their consultant MRI, and the TAC as an unreliable measure of juvenile winter flounder abundance.

Response
The RI DEM has informed EPA that DeAlteris's representation of the Rhode Island trawl survey was incorrect. After several exchanges of information between DeAlteris and the RI DEM, this mistake was rectified. DeAlteris assured the Agency that the changes were minor and had no material effect on his conclusions. He submitted amended summary statistic tables, per EPA's request, after the comment period had been closed.

DeAlteris also submitted an analysis of winter flounder abundance based on a survey conducted by MRI using 300-foot beach seines. This seine survey was not designed to sample winter flounder nursery habitat. As a result, from 1981 to 1997 the survey has averaged less than one fish per haul (excluding one unusually high sample in 1992). Thus, the TAC, BPS, and MRI subsequently devised a winter-flounder-specific beach seine survey using a 50-foot net at 10 stations. Catch rates are highly variable, but have been in the range of one to four winter flounder per haul. Statistical analysis of young-of-the-year winter flounder would be more appropriately done with results from the 50-foot net, which targets this species and is a more statistically robust data set because of a greater number of sampling stations. It is unclear why DeAlteris chose to use results from the 300-foot seine.

Response # IV.58	**Document #**: 1161

Comment
One commenter stated that since 1972 the facility has entrained more than 10 billion winter flounder larvae, which translates to more than 3 million age 3 recruits. In addition, the facility has added more than 1,100 tBtu of waste heat to Mount Hope Bay. Coincidentally, winter flounder in Mount Hope Bay declined to less than 10 percent of their former abundance. This dramatic decline has not been seen in other areas and the species is recovering in southern New England and Georges Bank.

Response
EPA agrees that the facility has taken large quantities of winter flounder, as well as many other species, since it first went into operation in the late 1960s. The exact magnitude of these losses is not quantifiable because, prior to the enactment of the CWA, BPS was not required to collect data and thus did not do so. Furthermore, to date data have not been collected for all bay resident species. EPA also agrees that the decline of winter flounder in Mount Hope Bay is dramatic and shows a different abundance trend than other discrete winter flounder populations. For a specific discussion on the thermal discharge effects, please see the discussion of § 316(a) section elsewhere in this document.

Response # IV.59	**Document #**: 1202

Comment
EPA received one comment stating that the data in reports submitted by RI DEM are misleading and that RI DEM selectively chose data to include in their analysis.

Response

The selection and interpretation of data is important in determining, first, whether there is an impact from BPS's thermal discharge and cooling water intake and, second, how significant that impact might be. Multiple finfish surveys exist for Narragansett Bay and Mount Hope Bay, each done with different gear, sampling effort, and objectives. Marine Research, Inc. (MRI) has been conducting trawl surveys with fixed stations since 1972. This data set is the most statistically robust for Mount Hope Bay. This survey has the greatest number of stations in Mount Hope Bay and the highest level of replication of any fish surveys in Mount Hope Bay. This survey was originally designed to examine changes in fish abundance in response to operations at BPS. RI DEM also conducts a fixed-station trawl survey, which uses one deep station and one shallow station in Mount Hope Bay. For this survey, deep water is defined as >20 feet deep and shallow water is defined as <20 feet deep. This sampling effort is part of a larger statewide survey, whose objective is to provide a statewide assessment of fisheries resources. Results from this survey are similar to those from the MRI survey in that few, if any, fish are caught in the shallow station and a slightly greater number of fish are caught in the deep station. Mathematically, at first glance it appears that the RI DEM trawl survey shows greater abundance than the MRI survey. This is in part due to the greater mathematical weight placed on the deep water station in the RI DEM survey. Since the deep station is one of only two stations, it contributes 50 percent to the average abundance value. In the MRI survey, the deep water station is one of six stations, thus contributing only 17 percent to the survey's average catch value. EPA estimates that 36 percent of Mount Hope Bay is more than 18 feet deep. Existing nautical charts provide depths in 6-foot intervals; thus, no exact estimate of areas of Mount Hope Bay less than 20 feet deep could be derived. EPA's estimate encompasses only 13 square miles of area and does not include significant amounts of the lower portions of the four rivers flowing into the bay. If these were included and precise bathymetric data were available to distinguish the 20-foot contour, it would greatly reduce the relative contribution of deep water to something much less than 36 percent. Thus, the weighting of deep water stations to the trawl survey abundance value is more appropriate for the MRI trawl survey than for the RI DEM survey based on the bathymetry of Mount Hope Bay. This is not to discount the RI DEM survey, whose trends support the notion of a dramatic fish decline and the absence of fish in the shallow waters of Mount Hope Bay. However, it is important to note that giving each station equal weight is not representative of the relative distribution of shallow and deep water in Mount Hope Bay and can produce a misleading result.

The BPS impingement data have also been suggested as a valid means of assessing fish abundance in Mount Hope Bay. EPA believes this is a qualitative measure at best and should not be used for quantitative analyses. For a full discussion of this, EPA refers the reader to responses regarding § 316(b) elsewhere in this document. In conclusion, EPA believes that RI DEM did have a valid reason not to treat all data equally.

That being said, Mark Gibson of RI DEM has undertaken an additional analysis that does treat all data sources equally. The end result is the same. His model predicts that to ensure any recovery in winter flounder in Mount Hope Bay, both overfishing and plant operations need to be stringently controlled.

Response # IV.60	**Document #**: 1042, 1053, 1091, 1070, 1211

Comment

Five commenters stated that reducing the level of heat and flow is necessary to allow for a recovery of finfish populations and the health of Mount Hope Bay.

Response

EPA recognizes that the cumulative impacts from BPS must be considered in developing permit limits to satisfy CWA requirements. In order to satisfy the standards of CWA §§ 316(a) and (b), EPA's discharge permit calls for substantial reductions in both intake flow and thermal discharge from BPS. EPA believes

these reductions are warranted under the statute and should also help to facilitate the recovery of finfish populations and the marine environment in Mount Hope Bay.

Response # IV.61-65	**Document #**: 1004, 1012 1034, 1146, 1150, 1151, 1168, 1175, 1178, 1186, 1187, 1189, 1200, 1203, 1210, 1216, 1223, 1229, 1237, 1218

Summary
EPA received numerous oral and written comments on the cost of complying with the Draft Permit conditions. Most of these comments addressed either EPA's or the company's cost estimates of installing mechanical draft cooling towers at BPS.

61. Comment
One commenter expressed concern that "the EPA has underestimated the costs of installing new technology and the lost revenues that it will entail. ..." (1004) Another stated that the "cost of the measures required by the draft permit is wholly disproportionate to the environmental benefits." (1168) Another recommended that the "construction estimate for the closed loop cooling system should be redone/verified." (1012) Another commenter stated that "[a]ny decisions on the new draft permit should be based on realistic cost estimates to demonstrate that the agency is truly committed to fairness... [and that p]rior to the release of the permit, I would urge EPA to submit the project scope to another construction and engineering firm, more experienced in this type of work than EPA's existing consultant." (1178) Another commenter expressed concern over EPA's estimates because the estimates "ignore the specific conditions at BPS" and stated that EPA's estimates "failed to use appropriate construction rates burdened with all the realistic costs of a construction effort including workmen's compensation, payroll taxes, general and liability insurance and other costs incidental to construction." (1216).

Response
Introduction

EPA more fully discusses its obligation to consider costs under the Clean Water Act (CWA) in the July 2002 Permit Determinations Document and elsewhere in this response to comments. However, it is worth repeating here that EPA is not required to develop precise cost information under the CWA. While EPA is required to reasonably **consider** cost, that consideration is "a relatively subsidiary task and need not be **precise** (emphasis added)." *Eli Lilly and Company* v. *Costle*, 598 F.2d 638, 656 (1st Cir. 1979). EPA believes it has gone well beyond this legal requirement in estimating the cost of retrofitting BPS to closed-cycle cooling.

EPA acknowledges that BPS hired an experienced power plant construction and engineering firm to produce its cost estimates (Stone and Webster). Stone and Webster produced spreadsheets and cost estimates for several technologies which could be employed at BPS to reduce its impact on Mount Hope Bay (e.g., helper towers, closed-cycle cooling, variable speed pumps). These estimates were provided to EPA in the company's December 2001 § 316(a) and 316(b) Demonstration Document (see AR 192). In response to the Draft Permit, the permittee also retained Bechtel Corporation to submit comments on Stone and Webster's estimate. See Brayton Point Station, Brayton Point Comment Summary & Response, report by SAIC (Appendix O). It should be noted that Bechtel Corporation did not produce a new cost estimate. It simply commented on Stone and Webster's (and SAIC's) work.

Both of the permittee's engineering firms recognized that the estimates provided to EPA are "order of magnitude" estimates based on preliminary engineering design and, as such, should only be considered accurate to within +/- 25 percent. Furthermore, Stone and Webster include an additional 10 percent for contingencies and an additional 10 percent increase for "indeterminates" in its estimates. While they describe these as reasonable additions for this level of design, the adjustments are a further indication that

the costs submitted to EPA by Stone and Webster, and reviewed by Bechtel Corporation, should not be viewed as **precise** estimates. Rather, they should be considered rough, or "order of magnitude" estimates. EPA is under no obligation to develop costs to a more accurate level of detail than the company has provided to date. Rather, EPA is required only to **consider** costs in the development of the permit pursuant to CWA requirements.

While EPA has carefully considered the permittee's cost estimates and its comments concerning cost, it was also reasonable for EPA to independently evaluate the cost of the relevant options, rather than just accept the company's estimates. EPA procured the services of a reputable engineering firm (SAIC International Inc.) to assist in reviewing the capital and operational cost(s) of conversion. EPA also obtained the services of Abt Associates Inc., a firm with extensive financial and economic expertise, to conduct a financial/economic analysis to determine the cost to the permittee over time of installing and operating new technology at BPS.

In response to comments concerning SAIC's work, EPA acknowledges that SAIC, as a firm, is not in the business of power plant design and construction. SAIC personnel do, however, have individual experience in the design and construction of power plants. The combination of SAIC's independence from the power plant industry as a firm, which eliminates potential conflicts of interest, and the fact that its personnel have knowledge and experience with power plants, makes SAIC well suited for the task of considering, on behalf of EPA, the costs of retrofitting BPS with mechanical draft cooling towers. Using SAIC was also cost-effective for EPA given that the company had already been retained to assist EPA with similar types of issues in the development of CWA § 316(b) regulations. Such cost efficiency is a significant consideration given limited Federal funds. No comments were raised concerning the adequacy of Abt's expertise.

EPA believes it has provided an appropriate level of consideration of costs for this project using SAIC and the cost estimation methods it developed. SAIC used two separate and distinct methods to develop two reasonable and appropriate estimates of capital costs. Nevertheless, in considering the comment regarding using another engineering firm to develop costs, EPA investigated using the services of a company in the business of, among other things, constructing and installing cooling towers at large industrial facilities (Hatch Associates) to develop another cost estimate. EPA transmitted the information that Stone and Webster had developed on behalf of the permittee to Hatch Associates (the project scope), and asked Hatch Associates to review the material. EPA then received a quote from Hatch for the cost to provide another "order of magnitude" estimate of the cost of converting BPS to closed-cycle cooling. Hatch estimated that it would cost nearly $300,000 to produce such an estimate.

EPA decided that expending such a sum for yet another estimate of the cost of closed-cycle cooling at BPS would be unjustified since EPA had already devoted significant public resources to developing cost estimates using SAIC (including evaluating the permittee's estimates, responding to comments on SAIC's estimates, and having SAIC personnel conduct a site visit). Therefore, EPA disagrees that it should submit the project scope to another engineering firm to get another cost estimate (in effect, a third cost estimate). EPA believes it has gone well beyond its minimum legal obligation to consider costs.

As previously stated, SAIC used two separate and distinct methods to assist EPA in its consideration of costs for the permit, namely, the "316(b) costing methodology" and the "line-by-line" approach. EPA believes both methods are valid ways to consider the costs of converting BPS to closed-cycle cooling to support the development of CWA § 316(b) limits for the BPS permit. The § 316(b) costing methodology is generic industry-wide costing approach used to support a national rulemaking. It is not site specific in orientation, although it does include a regional cost adjustment factor and its application for BPS incorporated some site-specific considerations, such as using saltwater (rather than freshwater) for cooling. The line-by-line analysis, however, is a site-specific method. It used Stone and Webster's design,

including the size of the cooling tower array and the amount of material necessary (e.g., pipes, pump sizing), to convert the BPS plant to closed-cycle cooling. The line-by-line method is therefore considered a site-specific analysis. For the Draft Permit, the estimates from the two analyses were relatively close together, but since the § 316(b) costing methodology yielded the higher of the two estimates, EPA conservatively chose to use its results in its cost assessment.

EPA received considerable comment on both methods and has revised both methods as appropriate in response to these comments. Specific responses to these comments are presented in detail in memoranda prepared by EPA's consultants. EPA worked with its consultants in developing these memoranda, independently evaluated them, and incorporates them by reference into these responses to comments.

Cost Considerations and Plume Effects

The cost of retrofitting BPS with mechanical draft cooling towers could be influenced by the potential vapor plume-related impacts from cooling towers and the associated costs to mitigate them. For a more detailed discussion of the plume-related impacts, see MFG's report "An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station." See Appendix M. A brief discussion of the potential plume issue as it relates to the mitigation costs is presented below. The vapor plume issue is also discussed in Chapter 7 of the July 22, 2002, Permit Determinations Document and elsewhere in these responses to comments.

In brief, mechanical draft cooling towers work by using the atmosphere to dissipate waste heat. Instead of returning heated water to Mount Hope Bay as presently happens, the heated water would be sprayed into the top of mechanical draft cooling towers. The droplets of water then travel down the "fill" of the cooling tower. Large fans at the top of the cooling tower draw in air in a counter-current direction to the falling water droplets. As the air contacts the droplets, the water is cooled primarily (although not entirely) through the process of evaporation. The evaporated droplets are expelled at the top of the cooling towers, resulting in the emission of water vapor.

Because the air exiting the cooling tower is almost always fully saturated with water (i.e., 100 percent humidity), the plume usually condenses immediately after exiting the cooling tower and then reevaporates at some downwind point. In general, condensed plumes remain aloft and evaporate before contacting the ground. Meteorological conditions dictate the exiting plume characteristics. For example, under some conditions, it is possible for the plume to come in contact with the ground, resulting in a condition called "fogging," or, in colder weather, an "icing" condition. Both of these impacts are undesirable as they have the ability to present potentially hazardous driving conditions. It is important to note that cooling tower technology is well established and has been used for decades at power plants and in many other industrial applications throughout the world. Plume-related concerns are hardly unique to the use of cooling towers at BPS and, in most cases, are satisfactorily addressed through proper sizing and siting of cooling towers or by using certain available technologies.

The choice of technique for addressing potential plume concerns affects the cost estimate for the cooling tower(s) conversion at BPS and is therefore discussed below. While it is uncertain whether significant vapor plumes would arise at BPS from the use of cooling towers, EPA believes the possibility made it reasonable to consider the issue in greater detail. As a result, EPA evaluated several ways of abating plume concerns at BPS (and the resulting costs). These methods are as follows: (1) shut down the cooling towers **and** the associated generating units during times of predicted plume impacts, (2) install "bypass" technology that allows the facility to bypass the cooling tower and switch to once-through cooling during times of predicted plume impacts, and (3) install well-established plume abatement technology (hybrid cooling towers) to eliminate plume-related impacts. Two additional alternatives (an enhanced traffic safety management program; and resiting and/or reconfiguring some or all of the cooling towers) are not re-

evaluated in this response to comments, although EPA believes they remain potential mitigation measures available to the company, as was discussed in Chapter 7 of EPA's July 22, 2002 Permit Determinations Document. EPA also notes that these methods are not mutually exclusive; that is, they may be used in combination depending on what the company determines to be the optimal way to address the concern. For example, the permittee could install hybrid cooling towers for some generating units, while equipping some or all of the others for possible bypass or relying on unit shutdowns.

Cooling Tower and Associated Generating Unit Shutdown

The company has estimated the cost of implementing an entire station closed-cycle system using generating unit shutdowns to avoid vapor plume problems. For this option, the company proposes that it would shut down the cooling tower(s) and associated generating unit(s) during times when the company anticipates icing or fogging. The company then calculated the resulting lost revenue and included it in the estimated cost of converting the station entirely to closed-cycle cooling using mechanical draft cooling towers.

EPA has identified several concerns with this approach. First, to EPA's knowledge, this would be an atypical solution to the problem. EPA has not identified any facilities that shut down generating units as a way of abating cooling tower plumes. This seems an especially anomalous approach for a baseload generating facility. The company itself admits that the generating units are not designed to operate under such conditions and expresses concern that such operations could damage the units and supporting equipment.

A second concern with this approach (especially regarding estimating costs) is that predicting the number of hours of shutdown that might possibly be required is a highly speculative task. The permittee based its estimate on a theoretical model and an assumed price of electricity during these shutdowns. EPA has identified several apparent problems with the company's modeling effort that result in an inadequately justified, excessive predicted number of plume-induced shutdowns hours (see MFG report, Appendix M). The problem of estimating the cost of unit outages is compounded by the difficulty of predicting future electricity prices.

Despite the concerns discussed above, EPA did not simply reject the company's approach. Instead, the Agency evaluated it and at least partially addressed its concerns by developing a range of costs for possible generating unit shutdowns. On one end is the case of zero plume-induced shutdowns, and on the other end is the company's full estimate of plume-related shutdowns. EPA has analyzed both cases, and the results are presented later in this response. It should be noted that, at this point, EPA believes using this mitigation measure produces the least-accurate cost estimate. (It should also be noted that EPA assessed the cost of a range of generating unit shutdown scenarios for the Draft Permit as well.)

Cooling Tower Bypass During Times of Predicted Plume Hazard

The bypass technology as designed for BPS is based on the company's concept of the so-called "Enhanced Multi-Mode" (EMM) system. The EMM system would use a 20-cell tower, interconnected to Units 3 and 4, and equipped with the necessary plumbing and valving to allow the cooling tower to be bypassed during times of predicted plume effects. The company has explained that it would develop predictive weather criteria which would be used to determine when the potential exists for a hazardous icing or fogging condition (the company would also do this if the generating unit shutdown option is selected). The unit would then be switched to once-through cooling. EPA notes that this approach is similar in concept to other facilities that use cooling towers seasonally, essentially employing "bypass" technology to switch from open-cycle to closed-cycle cooling to abate certain seasonal environmental concerns. BPS acknowledges that this type of operation is used at the Dresden Nuclear Plant.

EPA has developed cost estimates to implement a bypass solution at BPS, and the results are presented below. The company, even in its comments on the Draft Permit, did not develop its own cost estimates for bypass technology. EPA notes, however, that bypass capability is a central part of the permittee's EMM proposal, for which the company did provide a cost estimate. The permittee questioned EPA's estimate of the cost of adding bypass capability, but after considering those comments, EPA has concluded that its estimate of costs for this approach is reasonable. The permittee's comments in this regard are addressed in detail the following two reports by the Agency's consultant, SAIC: "Brayton Point Station, Brayton Point Comment Summary & Response" and "Brayton Point Station, Revisions to and Results from the Clean Water Act §316(b) Cost Methodology for the Brayton Point Station" (Appendices O and P, respectively).

Some commenters stated that the number of hours of bypass allowed by the permit were excessive, would result in adverse environmental impacts, and were inconsistent with the technology standard requirement of CWA § 316(b) and State water quality standards. These comments are addressed elsewhere in this response to comments. The company, however, commented that the number of hours allowed for bypass operation under the Draft Permit was insufficient because they do not cover the full number of generating unit shutdown hours that the company's model predicts would be needed to avoid any possible plume hazard. EPA disagrees with this comment for several reasons.

First, EPA wants to be clear that, as explained elsewhere, EPA did not base the number of bypass hours allowed in the permit on an assessment of how many hours might or might not be needed to eliminate any plume-related concerns. Rather, the number of bypass hours is based on the hours of once-through thermal discharges that the Agency has determined could be permitted while still satisfying the biological standard of § 316(a) of the CWA. EPA also concluded that the marginal flow increase associated with those hours of bypass operation would not run afoul of the CWA § 316(b) requirement that intake capacity limits reflect the best technology available for minimizing adverse environmental impacts. In addition, EPA also noted that allowing some hours of bypass capability in the Final Permit would give the company additional operational flexibility to address plume-related concerns if they became an issue.

Second, as discussed above, in MFG's report, "An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station" (see Appendix M) and in EPA's Draft Permit Determinations Document, EPA presently has little confidence in the company's current hourly estimate of plume-induced effects or that the plume issue will create a hazard necessitating a technological fix. Only actual operating experience can determine how many hours, if any, of bypassing the cooling towers area is likely to be necessary to prevent adverse impacts. In the meantime, however, the 122 hours of bypass operations allowed by the permit would add operational flexibility.

Third, EPA points out that the number of hours of shutdown (or bypass) that the permittee calls for is much greater than the number of hours of actual icing or fogging predicted by its model. This is because the permittee sets an extremely (and perhaps excessively) conservative trigger point for shutting down units to avoid development of a plume problem. Since the construction of the cooling towers will take a number of years, EPA expects that the permittee would have time to refine and relax this trigger point if it chooses to handle any plume problems with unit shutdowns and/or cooling tower bypasses.

Finally, EPA points out that its current approach is reasonable based on the currently available information and the numerous uncertainties related to these issues. If experience shows that a different approach might be warranted, new permit conditions with regard to bypass hours can be assessed either for permit reissuance or in response to a permit modification proposal.

EPA's capital cost estimate for employing bypass technology is presented below. (See SAIC and Abt for a complete report on the development of bypass capability and its costs - Appendices S and A, respectively).

Plume-Abatement Technology

The most common, and definitive, method of addressing plume-related concerns from cooling towers is to equip the towers with technology that abates the plume so that plume impacts are eliminated. Cooling tower manufacturers offer plume-abatement technology that can be added (in some instances after installation) to standard mechanical draft cooling towers. This type of technology is referred to as a "wet/dry" or "hybrid" tower. This is discussed in § 7.4.a.1(C) of EPA's Draft Permit Determinations Document. Basically, the plume is heated before it leaves the tower. This additional heat raises the plume height and the temperature of the plume so that the plume is no longer saturated with water (less than 100 percent humidity), thereby allowing the plume to mix with the surrounding air before the water vapor in the plume has a chance to condense. This technology is widely used to abate plume effects and has the added benefit of reducing the visibility of the plume, which can be considered aesthetically unpleasing. See *Id.*

EPA has also considered the additional cost of outfitting the cooling towers with this technology (see SAIC report - Appendix S), and those results are presented below. EPA notes that the permittee also submitted cost estimates based on using plume-abatement technology. The results of that analysis are also presented below.

In summary, the company is presented with the possibility of using some **combination** of technologies and/or shutdowns to address any vapor plume hazard concerns. Further, as indicated in §§ 7.4.a.1(C) and 4.5.2a of the July 2002 Determinations Document, EPA maintains that roadway precautions, such as the use of salt and sand to control icing, might also be effective in reducing any potential plume hazards.

Revised Capital Cost Estimates

EPA has made certain revisions to both of its capital cost-estimating methods (the § 316(b) methodology and the line-by-line approach) in response to comments received on the Draft Permit. The changes are not discussed here but are presented in Appendices O and P. EPA believes that the revisions made are reasonable and consistent with its conservative approach to cost estimation for this permit. Generally, the changes have resulted in somewhat higher capital cost estimates than developed for the Draft Permit. EPA's estimates continue to be lower than those presented by the permittee.

The following table shows EPA's revised capital cost estimates (for entire-station closed-cycle cooling) based on its revisions to these two cost-estimating methods. It also presents Stone and Webster's capital cost estimates (one with plume-abatement technology and one without).

Summary of Revised SAIC Capital Cost Estimates for the § 316(b) Rule and Line-by-Line Cost Estimation Methodologies, and for Stone and Webster's (S & W) Cost Estimates

Technology and Methodology	Capital Cost Estimates, $ millions			
	Units 1+2	Unit 3	Unit 4	All Stations
SAIC OPTION A: **§ 316(b):** Fiberglass towers, retrofit, salt water (SW)	39.1	31.5	29.6	100.2
LbL: Closed cycle*	42.3	32.7	28.3	103.3
SAIC OPTION B: **§ 316(b):** Fiberglass towers, retrofit, SW, and plume abatement	52.5	42.3	39.7	134.5
LbL: Closed cycle with plume abatement *, **	56.7	43.7	38.6	139.1
SAIC OPTION C: **§ 316(b):** Fiberglass towers, retrofit, SW, and multi-mode	48.4	39	36.5	123.9
LbL: Closed cycle with multi-mode (bypass) factor*	52.8	40.9	35.4	129.1
Stone and Webster OPTION A S & W closed-cycle costs without plume abatement*, **	72.3	56.4	48	176.7
Stone and Webster OPTION B S & W closed-cycle costs with plume abatement*, **	---	---	---	247.6

* Like the § 316(b) method estimates reported in this table, the line-by-line options and the Stone and Webster capital cost estimates also assume the use of fiberglass towers, retrofitting at BPS, and capability to use saltwater.

** "Plume abatement" means "installing cooling towers that have the technological capability to abate plumes during operations." The permittee stated that adding this "capability would add roughly $70.6 million onto the costs of the Entire Station Closed-Cycle option."

During the development of the Draft Permit, the § 316(b) methodology yielded the higher of EPA's two capital cost estimates for entire-station closed-cycle cooling with bypass capability (though these two independent estimates came out fairly close together, giving the Agency additional confidence in their reasonableness). Therefore, to be conservative, EPA carried these higher capital cost estimates forward into its overall cost assessment. After modifying the two methods in response to comments received, however, the line-by-line method produced the higher capital cost estimate. Therefore, consistent with its approach to the Draft Permit, EPA carried the new higher capital cost estimate from the line-by-line analysis forward into its overall financial cost assessment.

EPA also notes that the permittee provided additional comments relevant to EPA's capital cost assessment in a July 30, 2003, submission to EPA. This submission from the permittee appended additional pertinent comments from its consultant, Robert Stavins (July 29, 2003). EPA has also reviewed and considered these comments. The permittee argues that certain analyses conducted by the Department of Energy (DOE) that estimate cooling tower retrofit capital costs at other facilities, and potential revised estimates by EPA in the context of the developing national § 316(b) rulemaking for existing power plants of unit outages for conversions at nuclear power plants, indicate that the region's capital cost analysis based on the § 316(b) method for BPS is incorrect and the permittee's analysis is correct. EPA has reviewed and considered the permittee's comments (including those of Robert Stavins), as well as the DOE reports, and does not think

they warrant any changes to its analysis. This is discussed in detail in the Memorandum by Damien Houlihan, EPA, to the BPS File (September 24, 2003). See Administrative Record No. 3190. EPA will make only a few points here. First, as discussed above, the Region's capital cost estimates for the Final Permit are based on the site-specific, line-by-line method, rather than the § 316(b) method, although it believes the § 316(b) method remains valid, especially with the adjustments it has made for its site-specific application to BPS in response to comments. The DOE analysis regarding other power plants does not change that. Second, with respect to possible revisions regarding EPA headquarters' national estimates for retrofit-related unit outages at nuclear power plants, the Region also does not believe this is a basis for changing the site-specific estimate of unit outages at BPS. EPA headquarters only indicated it is considering or adopting changed outage estimates for nuclear power plants, which have a host of additional safety and regulatory issues different from those at fossil fuel-fired plants. BPS is not a nuclear plant. EPA continues to believe its site-specific estimate for BPS was reasonable.

Revised Cost Analysis of Closed-Cycle Cooling

EPA received comments on its overall financial analysis of the cost to convert BPS to closed-cycle cooling. EPA has responded to those comments and revised its cost analysis as appropriate. These responses are presented elsewhere in this document and in memoranda by our consultants. See Memorandum by Abt Associates, Inc., prepared for U.S. Environmental Protection Agency, Region 1 Office, "Cost Analysis of Closed-Cycle Cooling Tower System for Management of Thermal Discharge and Cooling Water Intake for BPS" (August 20, 2003).

The revised cost estimates incorporate capital and other initial costs, including construction duration and construction outage, and annual operating costs, such as maintenance expenses, auxiliary power consumption, and efficiency losses. The revised analysis also considers the capital outlay schedule, the discount rate, the useful life of the equipment, the construction start date, tax considerations, and the economic gains to the company due to its ability to generate more electricity during hot weather periods as a result of using cooling towers (the "avoided load loss"). Comments concerning these issues are addressed elsewhere in these comments as well as in memoranda by its consultants, Abt Associates, Inc. and SAIC.

Several analytical cases were considered based on different economic assumptions and different approaches to addressing any vapor plume issues, and the reader is again referred to the August 20, 2003 report, "Cost Analysis of Closed-Cycle Cooling Tower System for Management of Thermal Discharge and Cooling Water Intake for BPS" by Abt Associates, Inc. for a detailed explanation of the cases considered. The following table shows the key results of the analyses by both EPA and the permittee:

Summary of Company and Abt Associates/EPA Analyses: Cases Analyzed and Summary Results for Previous and Current Analyses

	Company Analyses*				Abt Associates/EPA Analyses**			
All values ($000,000)	November 2001 Analysis		October 2002 Analysis		April 2002 Proposed Permit		Final Permit Analysis	
	Discount Rate		Discount Rate		Equipment Life		Equipment Life	
Present values are at	15%	20%	15%	20%	20-year	30-year	20-year	30-year
With Modification for Plume Hazard Abatement								
Multi-Mode/Bypass Capability								
Present value	Not analyzed by company				$68.4	$68.0	$107.2	$109.6
Equivalent annual cost					$9.0	$8.3	$15.7	$15.1
Hybrid Cooling Tower	Not analyzed by				Not analyzed at			
Present value	company		$278.3	$276.8	proposal		$119.7	$120.2

Equivalent annual cost			$44.5	$56.8			$17.6	$16.6
With No Plume Abatement Modification								
Full Plume Abatement Impact								
Present value	$254.5	$250.3	$229.8	$220.4	$83.3	$85.8	$109.2	$111.2
Equivalent annual cost	$40.7	$51.4	$36.7	$45.3	$11.0	$10.5	$16.0	$15.4
No Plume Abatement Impact								
Present value	Not analyzed by company				Not analyzed at proposal		$88.3	$88.3
Equivalent annual cost							$13.0	$12.2

*see page 29 of Abt's memorandum "Cost Analysis of Closed-Cycle Cooling Tower System for Management of Thermal Discharge and Cooling Water Intake for BPS" for an explanation of the slight difference in the equivalent annual cost listed here and what the company produced.

** the Abt/EPA estimates used a discount rate of 11.8 percent for the Draft Permit analysis, but increased that to a rate of 13.5 percent for the Final Permit analysis.

EPA has carefully considered the expected costs of meeting the Final Permit conditions using mechanical draft cooling towers. EPA's various approaches to estimating these costs yielded a range of present value, total costs depending on the analytical case being analyzed from a low of $88.3 million to a high of $120.2 million (equivalent annual costs range from $12.2 million to $17.6 million, depending on the assumed useful life of the equipment). Since the Draft Permit, EPA's cost estimates went up somewhat and the permittee's estimates came down somewhat, but the permittee's estimates remain higher (by two to three times, depending on which figures one is comparing).

For a detailed discussion of EPA's cost analysis for the Final Permit, see the August 20, 2003 report, "Cost Analysis of Closed-Cycle Cooling Tower System for Management of Thermal Discharge and Cooling Water Intake for BPS" by Abt Associates, Inc. In addition, the application of the "wholly disproportionate" cost test is discussed elsewhere in this document.

Additional Factors to Consider in Determining the Cost of Retrofitting BPS

EPA has also taken into account several other cost considerations regarding retrofitting BPS with mechanical draft cooling towers. These other factors include complying with noise requirements, including the service water flow into the design of the cooling system, and the final design or size of the cooling tower array. Each of these factors is discussed in more detail below.

Noise.

The issue of noise resulting from the operation of cooling towers at BPS will be subject to further review during subsequent DEP permitting. The Commonwealth of Massachusetts has noise regulations (310 CMR 7.10) that must be complied with to address community concerns. Mechanical draft cooling towers might affect ambient sound levels in the surrounding community. To date, the company has not provided sufficient information to fully evaluate the potential noise impacts and possible mitigation measures associated with cooling tower operation at BPS. BPS will have to submit additional detailed information to the DEP pertaining to noise impacts and mitigation measures before it can receive the necessary approvals to construct and operate cooling towers. (There are no applicable Federal noise requirements.)

DEP's air quality permit review will include application of the DEP noise guidance relating to the proposed cooling technology. As part of this evaluation, DEP will require BPS to assess the potential noise impacts in comparison to existing background noise levels. The review will examine the source of additional noise; ways to minimize noise; and whether or not the noise impacts can be addressed beyond the property boundary of the noise source, if the impacts were to exceed the applicable quidelines. Until

the DEP's noise review and related approvals are issued it is unclear what, if any, noise mitigation will be needed for a cooling tower installation at BPS.

Despite the lack of Federal noise requirements and the future, independent application of State noise requirements by the DEP, EPA nevertheless investigated potential ambient noise increases from converting BPS to a closed-cycle cooling tower system in an effort to be as thorough as possible in the consideration of costs and community environmental impacts. EPA's noise evaluation is presented in the report by Hatch, Inc., prepared for U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., "Brayton Point Power Station Cooling Towers - Noise Impact Assessment" (September 29, 2003). See Appendix L. EPA participated in the development of this report, has independently reviewed and evaluated it, and incorporates it by reference into these responses to comments. This evaluation also considered the costs of noise mitigation measures that might potentially be needed. EPA responds to comments regarding noise issues apart from cost considerations elsewhere in these responses to comments.

Based on its review of current information, EPA has concluded that although installation of cooling towers could result in noise impacts requiring mitigation, such mitigation can be accomplished and Massachusetts regulations can be satisfied using established technology known to the industry. While noise control measures beyond a simple low noise cooling tower could be needed to accomplish this mitigation, it is impossible at this time to be sure what additional measures, if any, would be called for. Nevertheless, it is clear that a range of suitable measures exists among the state-of-the-art technologies to properly control noise emissions.

EPA's consultant communicated with cooling tower equipment vendors to develop a range of cost estimates for various levels of noise mitigation. This information indicates that cooling towers equipped with different degrees of noise control equipment could be needed to meet Massachusetts regulations and that cooling towers so equipped could range in price from approximately $28.5 million to $39 million, depending on the level of noise control required and the manufacturer. See "Brayton Point Power Station Cooling Towers - Noise Impact Assessment" by Hatch, Inc., prepared for U.S. Environmental Protection Agency, Region 1 Office, and Tetra Tech, Inc., Appendix L. Cooling towers equipped with these measures, therefore, could cost somewhat more than the $25.2 million for cooling towers that Stone and Webster estimated. It should be noted that the above-referenced figures reflect the cost for design, supply, and installation of the cooling towers, but do not reflect other related construction costs such as excavation, construction of the cooling tower basin and foundation. Stone and Webster's total cooling tower cost estimate, **including** these cost elements, is approximately $47 million. Yet, the extent of noise abatement features included in this cost estimate by Stone and Webster is unclear. EPA used the Stone and Webster total cooling tower cost estimate (i.e., $47 million) in developing its independent capital cost estimate using the "line-by-line method."[26]

EPA concludes that it is reasonable to continue using the Stone and Webster estimate in the Agency's line-by-line cost estimate without increasing it for additional noise mitigation. This conclusion is based on several points. It is impossible at this juncture to be predict what, if any, additional noise mitigation will be needed as a result of the MA DEP's noise review and approval process. The permittee will need to apply for approvals to the MA DEP and include a noise analysis of its own. This review process will

[26] EPA used a somewhat higher figure ($52 million) in developing its estimate under the 316(b) cost estimation method. Due to other factors in the evaluation, the overall total cost estimated by the line-by-line method ended up being higher than the cost estimated by the § 316(b) method. As a result, EPA carried results from the line-by-line method analysis forward for its detailed cost analysis. This is discussed in more detail elsewhere in this response to comments document.

ultimately determine the level of mitigation, if any, that is required. Moreover, it is unclear what degree of noise abatement features are already reflected in the Stone and Webster cooling tower cost estimate. The noise analysis by EPA's consultant Hatch was not meant to, and could not, serve as the basis of the MA DEP's regulatory decisions regarding noise. Hatch's noise analysis provides information on possible noise effects and means of noise control in order to evaluate the feasibility (or infeasibility) of operating cooling towers at BPS that would satisfy MA DEP noise requirements. Having demonstrated that attaining such compliance was feasible, EPA also asked Hatch to provide an estimate of the possible cost of installing cooling towers including potentially needed noise mitigation measures. As mentioned above, Hatch determined that one manufacturer indicated it could provide cooling towers with any needed noise control features for about $28.5 million, while a second manufacturer estimated it could provide the cooling towers with various levels of noise mitigation for prices ranging as high as $39 million. Yet, as stated above, it is unclear what if any additional measures may be needed.

Therefore, EPA could not determine a reasonable amount to add to the $25.2 million figure. The Agency does not think this makes a significant difference because one vendor's estimate is only about $3 million more that Stone and Webster's estimate, and because neither estimate would add more than from 3 to 15 percent to the overall capital costs estimated by EPA for closed-cycle cooling for all four generating units at BPS. (Obviously, the percentage increase would be even less for the permittee's higher capital cost estimates.) See also AR 3215 (regarding possible effect of noise mitigation on total cost, as opposed to capital cost). These values are well within the 25 percent margin of error for the present cost estimates, and would also be largely covered by the permittee's allowance for indeterminates and contingencies. Finally, the estimates provided by Hatch include additional cost resulting from including the service water flow in the design requirement of the entire station closed-cycle (see below). In other words, the increased cost of the estimates obtained by Hatch are not solely due to noise mitigation.

Service Water Flow.

As discussed elsewhere in this response to comments document, the company claims that service water flow was not included in EPA's design of the entire station closed-cycle system.

EPA has considered the cost of using cooling towers designed to handle the additional service water flow (see Appendix B to the Hatch report, which considered both noise control treatment and the use of cooling towers large enough to treat the service water). EPA determined that using cooling towers capable of handling the additional service water flow can be purchased for between $28.5 million and $39 million. As discussed above, EPA has decided that no upward adjustment is necessary to account for the additional volume of service water because it does not appear that the marginal cost increase would be significant and EPA cannot determine from the available information what portion of the increased cost relates to this element and what portion relates to noise mitigation. EPA also notes that it used the permittee's own capital cost estimate for the cooling towers. Therefore, if the permittee failed to identify additional costs attributable to the service water flow in its cost estimates or comments on the permit, EPA cannot be faulted for doing the same.

Final Design of Cooling Towers

Stone and Webster, on behalf of the company, submitted an engineering design for the number of cooling towers and the number of cells per cooling tower required for the entire station closed-cycle system. This design calls for a total of 72 cells for the entire facility, broken down as follows:

- Units 1 and 2 - 30-cell cooling tower (combined)
- Unit 3 - 22 cells

- Unit 4 - 20 cells

EPA notes that the company's "enhanced multi-mode" design calls for a cooling tower containing 20 cells.

For its cost assessment for the Draft and Final Permits, EPA simply accepted the permittee's proposal of a 72-cell cooling tower array. However, for the Final Permit, EPA has also independently evaluated Stone and Webster's 72-cell design for entire station closed-cycle. Based on this evaluation, EPA has concluded that Stone and Webster's apparent flow-based cooling tower size scaling method (from the enhanced multi-mode design to the entire station closed-cycle design) appears to have resulted in a substantial overestimation of the number of cells per cooling tower required for the entire station closed-cycle system. One independent analysis conducted for EPA concluded that the number of cells might have been overestimated by approximately 24 percent (58 cells versus 72 cells) (see SAIC report - Appendix T).

Since the number of cells per cooling tower affects a variety of important factors such as noise and potential plume impacts in addition to costs, EPA asked its expert consultants to independently evaluate the number of cells per cooling tower needed at BPS as part of their analysis (Hatch Associates, regarding noise, and MFG, Inc., regarding plume impacts). Both of these contractors also concluded that Stone and Webster overestimated the number of cooling tower cells required to cool BPS.

Hatch Associates, as part of its noise analysis, submitted the design parameters as given by the company to cooling tower vendors and requested that these vendors determine the design (and costs) needed to meet these given parameters. It should be noted here that Hatch also included the service water flow in the information given to the cooling tower manufacturers, something that the company failed to include in its design parameters. Manufacturers 1 and 2 estimated that the required number of cells was 66 and 56, respectively. This is a further indication that Stone and Webster's design overestimated the required number of cells, especially since Hatch Associates included larger flows to the towers to incorporate the additional service water flow.

MFG, Inc., as part of its plume impact analysis, reevaluated the number of cells required to handle the thermal load of BPS. MFG reasonably assumed that the permittee's consultant, EarthTech, used the same 1.43×10^8 Btu/hr per cell for its entire station closed-cycle CALPUFF plume modeling, as the permittee's other consultant, TRC, Inc., did in its Enhanced Multi-Mode CALPUFF plume modeling effort. MFG also concluded that the 1.43×10^8 Btu/hr per cell heat rejection rate per cell is a reasonable value for BPS. Based on application of this per cell value to the full plant design of 72 cells, the calculated total heat load rejected would be about 90 TBtu/year, assuming, as EarthTech apparently has, that all cells are running continuously at full load for the year. The plant is currently limited to 42 TBtu/year, and the company reports that its heat load is actually less than 42 TBtu/year. EarthTech's modeling clearly appears to have assumed a much greater total heat load than would actually be rejected by the plant.

Understanding that the design of the cooling towers should be based on maximum capacity, MFG concluded that even at the maximum rate, too much cooling has been assumed to be needed. MFG calculated the maximum cooling tower needs based on an energy balance of BPS. Even with all units running at full load, MFG computed that the maximum number of cooling tower cells required is approximately 60 (at a heat rejection rate of 1.43×10^8 Btu/hr per cell).

MFG's analysis leads to two important conclusions. First, it is likely that the cooling tower plume impacts studies were performed with assumptions involving much greater water vapor emissions than would ever occur at BPS. Second, the company has likely overstated the number of cells and therefore

the size (and cost) of the cooling towers required to implement entire station closed-cycle cooling at BPS (see MFG report, Appendix M).

Therefore, in summary, EPA has concluded that Stone and Webster has significantly overestimated the size (and cost) of the cooling tower array needed to convert BPS to closed-cycle cooling using mechanical draft cooling towers. This conclusion is based on three analyses, conducted independently and using different methods. EPA believes that Stone and Webster incorrectly scaled from the 20-cell enhanced multi-mode system, thereby also overestimating the cost of the cooling towers themselves. In addition to this overestimation, this error was carried forward and affected the plume model submitted by the company, the comments on noise submitted by the company, and the concerns about space restraints for construction raised by the company.

EPA notes that the company could further reduce the number of cells required by increasing the approach from 8 to 10 °F (that is, increasing the cooling tower outlet temperature from 85 to 87 °F). A system designed with cooler water for the condenser allows steam to condense at a lower pressure so more power can be generated and less fuel is needed per unit of power produced. On the other hand, the larger the flow, the greater the costs of pumping power. Similarly, the costs for piping, valves, and the cooling towers rise with increasing flow rates. The greater the cooling offered by a tower (the smaller the approach, that is, outlet temperature at 85 °F versus 87 °F), the more it costs and, with mechanical draft towers, the more fan power is required. Thus, the choice of the most economical closed-cycle cooling system is a trade-off of lost capability from the generator versus increased capital and operating costs for the cooling system.

The optimization process requires developing estimates of the costs of the system, the power consumed by the pumps and fans, the operation and maintenance costs for the system, and the value of the lost capacity and power generation resulting from the closed-cycle system for a reasonable range of flow rates and condenser inlet temperatures. Stone and Webster has not submitted any information indicating that this type of analysis has been performed.

EPA also notes that the number of cells (and costs) for Unit 3 could be further reduced by adopting the enhanced multi-mode tower design parameters into the design of the closed-cycle Unit 3 design (decrease the flow and increase the hot water inlet temperature). In Stone and Webster's design, the enhanced multi-mode is designed to handle all the heat from Unit 3 using two fewer cells than the Unit 3 closed-cycle design.

Based on the above, EPA has concluded that Stone and Webster's design for the entire station closed-cycle alternative appears to unreasonably overstate the size of the cooling towers needed to convert BPS to closed-cycle cooling. As a result, the company, through its consultants, has also overstated the cost of the cooling tower component in its line-by-line estimate. While EPA recognizes that the company's estimate is only a rough order of magnitude figure, its values in this regard seem unreasonably high. Nevertheless, in an effort to be conservative, EPA retained the company's cooling tower cost estimate in its line-by-line analysis.

Summary/Conclusions

EPA has carefully considered the costs of retrofitting BPS with mechanical draft cooling towers on all units. EPA used site-specific information submitted by the company as the basis for one capital cost estimate (the line-by-line method) and used another more generic, national methodology (with some adjustments to reflect site-specific considerations) to develop a second capital cost estimate (the § 316(b) method). The national costing approach corroborates the site-specific analysis. To be conservative and consistent with the Draft Permit, EPA is basing the cost of compliance on the higher of the two estimates

(in this case, the site-specific line-by-line analysis). In some instances (for example, noise), EPA's analysis was more detailed than the permittee's. EPA then included its higher capital cost estimate in its overall long-term cost estimate, which included annual expenses, tax considerations, and other factors mentioned above.

From its analysis, and a careful consideration and review of the permittee's estimates, EPA believes that the company has likely overstated the costs of converting BPS to closed-cycle cooling. The company submitted preliminary design specifications with a margin of error of +/- 25 percent. The preliminary design does not appear to be optimized with respect to the number of cooling tower cells. The fact that the company now claims that the service water flow was not included in the design is a further indication that the design did not include other important considerations. In addition, the company submitted estimates of plume impacts that are inadequately justified and might be significantly overstated. The company's noise analysis was general in nature and also likely overstated the noise impacts. EPA expects that the firm selected by the permittee to develop the final design will significantly refine the company's preliminary design assumptions, resulting in lower costs to undertake the cooling system retrofit that constitutes BTA under CWA § 316(b).

EPA also believes the company has made little or no effort to take advantage of savings that could be realized by managing its construction projects in a coordinated manner (see SAIC trip report- Appendix U). While the company criticized EPA for including some estimated economies of scale in the Draft Permit analysis, the company does not yet appear to be attending to realizing economies of scale through management and coordination of its air pollution equipment installation, re-locating the switchyard, and converting the station to closed-cycle cooling. EPA expects, of course, that the permittee may make such efforts once it becomes clear what is necessary to comply with the new NPDES permit and the new air regulations.

Finally, EPA also notes here that the company appears to have erred in several respects in describing the enhanced multi-mode system. Specifically, the company has requested thermal permit limits well above what could be achieved by the EMM (28 TBtu/year versus about 22 TBtu/year). The company also appears to have made errors in its CALPUFF plume effects model (assuming full operation of EMM, counting background fog and the like; see MFG memo, Appendix M). Finally, regarding hours of operation, the company's approach is internally inconsistent. It requests permit limits that result from less than full operation of the EMM, yet it submitted vapor plume modeling results based on full operation.

62. Comment

Commenter 1186 stated that "EPA should have paid closer attention to the report by their own consultant. If they had, they would have seen in Table 5 of that report, that $68 million for the cooling tower design is not for a fiberglass cooling tower, [and] it is not for a cooling [tower] constructed for use in saltwater, as we have at Brayton Point. In fact, the cooling tower proposed is a pressure treated, redwood design for use in freshwater applications." regarding construction material for the towers, Commenter 1237 stated, "It needs to be fiberglass. A lot more money."

Response

EPA disagrees that it has made the errors suggested by the commenters. EPA notes that the capital cost estimate it used in its Draft Permit analysis was based on the cost of a fiberglass tower to function using salt water for an estimated cost of $93.8 million. The $93.8 million capital cost figure was used in EPA's financial analysis, which considered other relevant cost factors such as construction downtime and outages, discount rate, efficiency losses, and avoided load loss, among others. The resulting total present-value of cost after tax was computed to be approximately $68 million for the Draft Permit.

63. Comment
One commenter (1034) stated that PG&E-NEG should not avoid antipollution improvements and that "the costs that they avoid get transferred to the citizens of Fall River" and that PG&E-NEG should "[p]roduce power in a manner that includes all of the costs of producing power." The same commenter noted that the "cost of generating electricity should be borne by the generator, not by residents of Fall River. Mount Hope Bay belongs to all citizens of the Commonwealth of Massachusetts and the State of Rhode Island. The bay is not PG&E's private pond to debase and destroy."

Response
The comment is noted. EPA agrees that the waters and fishery of Mount Hope Bay are public resources and that a public policy challenge is posed when harm to the public's environment from private business operations is not appropriately addressed. This is sometimes referred to as the problem of "uncompensated externalities."

64. Comment
A commenter (1146) noted that there are "tangible and intangible costs to generating power" and that "the associated intangible costs are also very real. These include the costs associated with the collapse of the fishing industry in Mount Hope Bay and the environmental damage that results from the discharge of almost a billion gallons of hot water per day into the Bay. The EPA's proposal will address these costs now before they become unmanageable."

Response
EPA agrees that power generation creates many intangible costs to the environment and that it should include these effects in its consideration of costs and benefits. EPA has tried to address this concern in its assessment of benefits from both nonmonetized and monetized perspectives. EPA's assessment of benefits and the application of the "wholly disproportionate cost" (to benefits) test is discussed in detail elsewhere in this response to comments, as well as in Chapter 7 of our July 22, 2002, Draft Permit Determinations Document. In addition, Congress recognized this problem when it enacted the CWA and this is reflected in the statute's environmental standards.

65. Comment
At least one commenter (1223) stated that, regarding the difference in EPA's and the company's cost estimates, "it really doesn't matter because despite the substantial difference in the cost estimates, both the company's and EPA's estimates reveal costs that are wholly disproportionate to the benefits when those benefits are rigorously evaluated."

Response
EPA disagrees that the costs to the company are wholly disproportionate to the benefits, even if the permittee's cost estimates are used. As explained elsewhere in this document, costs are only one part of the equation and benefits also need to be taken into account. EPA discusses its consideration of costs and benefits elsewhere in this response to comments.

Response # IV.66-85	**Document #**: 1004, 1130, 1132, 1133, 1150, 1156, 1164, 1165, 1168, 1177, 1184, 1195, 1203, 1208, 1223, 1227

Summary
EPA received a number of comments that have been classified as dealing with assessing the benefits of making cooling water intake structure improvements in the context of conducting economic analysis. These comments are addressed here. EPA also received comments, including some of the above-listed comments, that addressed other sorts of economic issues. These include, for example, comments

regarding possible effects on ratepayers of undertaking such improvements. Comments addressing these other types of economic issues are responded to in other sections of this document.

66. Comment

The Town of Somerset Board of Selectmen stated that, in its view, the costs to the permittee of complying with the limitations proposed in the Draft NPDES Permit would be "wholly disproportionate to the benefits" that would result. The Board noted that EPA had not "guaranteed" that the expenditures would result in recovery of the fishery. The Fall River Area Chamber of Commerce also stated that the cost to the permittee of installing cooling towers for all four generating units at BPS would be "in excess of [the] benefits to aquatic populations." (1004, 1168, 1156)

Response

As indicated in the Draft Permit materials and elsewhere in this document, EPA disagrees that the cost of complying with the Draft NPDES Permit would be wholly disproportionate to the benefits of such compliance.

First, it is important to remember that the "wholly disproportionate cost" test applies under CWA § 316(b), but does **not** apply to the other legal standards that provide the basis for the limitations in this permit. For example, costs and benefits are not required considerations in applying CWA § 316(a) on a case-by-case basis or developing limitations to comply with State water quality standards.

Second, the quantitative or qualitative considerations upon which the commenters base their conclusion regarding costs and benefits are unclear. EPA expects that the conclusion is derived from the cost and benefit assessment work conducted by the permittee. The Town refers, however, to cost estimates ranging from $300 million to "perhaps well over $500 million" and provides no basis or reference for these figures. The $300 million figure is larger, but not a great deal larger, than the permittee's highest estimate of approximately $275 million. The $500 million figure, however, is substantially larger than even the permittee's largest estimate. In any event, EPA believes these figures are substantial overestimates of the cost of complying with the permit. Moreover, even assuming the permittee's costs, EPA's analyses indicate that the costs are not wholly disproportionate to the benefits.

With respect to benefits, the Town makes no reference to any particular monetized benefits estimate. The Town's comments appear to suggest, however, that it is likely to have accepted the permittee's assessment despite the fact that the permittee did not provide its benefits analysis, at least to EPA, by the time of issuance of the Draft Permit. The Town does not expressly assess benefits from a qualitative perspective but appears to agree that restoring the fishery is an important goal. Yet the Town points out that EPA has not "guaranteed" that plant improvements necessary to comply with the permit will, in fact, bring about that recovery. EPA is not required to provide such a guarantee in setting permit limits, and it would be impossible to provide one. Nevertheless, EPA has explained why it has concluded that improvements at the plant, coupled with other steps under way (such as fishing restrictions and combined sewer overflow abatement), should lead to a recovery of the fishery. The Agency has also explained why it believes that lesser environmental improvements at the plant are likely to impede or prevent a recovery despite these other steps. But even apart from the issue of fishery recovery, it is clear that the power plant withdraws and kills trillions of organisms, including billions of fish eggs and larvae, and that the power plant's thermal discharge alters the habitat of the Mount Hope Bay estuary. It is equally clear that the permit limits proposed by EPA will achieve substantially greater reductions in these adverse environmental impacts than the permit limits proposed by the permittee (approximately 95 percent versus 33 percent). EPA has properly taken all of these considerations into account in its unmonetized assessment of the benefits of reduced environmental effects that would be effectuated by the permit. Moreover, EPA's monetary assessment of the benefits of compliance with the new permit is **not** based on any assessment of whether or not the fishery will recover as a result of the permit's requirements. It is

simply based on the number of fish taken by the plant. These figures are soundly established and are, in fact, conservative estimates.

These analyses support EPA's permit. EPA has detailed its assessments of costs and benefits in the Draft Permit materials and elsewhere in these responses to public comments.

With respect to the comment that the cost to the permittee of installing cooling towers for all four generating units at BPS would be "in excess of [the] benefits to aquatic populations," EPA has several responses. First, the commenter appears to be proposing a strict cost-benefit test under which estimated costs may not be permitted to exceed estimated benefits. The CWA does not require such a test. As discussed in EPA's Draft Permit materials and elsewhere in this document, neither a precise nor a strict cost-benefit analysis is required. Under CWA § 316(b), costs and benefits are considered under the "wholly disproportionate cost" test, while under the BAT technology standard applicable to thermal discharges, costs only need to be "considered." Furthermore, costs and benefits are not required considerations in applying CWA § 316(a) on a case-by-case basis or in developing permit limitations to comply with State water quality standards. Second, EPA concludes that the cost of permit compliance will **not** exceed the benefits, when a reasonable qualitative and quantitative consideration of the benefits is properly taken into account. With respect to a solely monetary assessment of costs and benefits, EPA recognizes that all the estimates of costs and benefits are uncertain. EPA has, however, considered the costs and benefits from various perspectives and made adjustments to different variables. As a result, EPA have come up with a range of figures that provide reasonable estimates. Moreover, its monetized benefits estimates are conservative in many respects (e.g., they do not include benefits for habitat improvements from reduced thermal discharges). Since estimation of benefits is not required under the legal standards applicable to thermal discharges, EPA did not undertake the difficult exercise of developing a monetized estimate of the benefits of reduced thermal discharges. In the end, EPA reasonably concluded that the costs of complying with the new permit would not be wholly disproportionate to the benefits.

67. Comment

Save The Bay of Rhode Island commented that changing the power plant to closed-cycle cooling is a "widely available, economically achievable" technology and its costs would neither be "wholly disproportionate to its environmental benefits" nor passed through to electric consumers to a significant extent. (1133)

Response

EPA agrees with these comments and would add only that while cooling towers are clearly "widely available" for electric power plants, existing power plants have less commonly been retrofitted to closed-cycle cooling systems. That being said, EPA found a number of pertinent cases involving the retrofit of existing power plants from once-through cooling systems to closed-cycle cooling systems using cooling towers. EPA has also determined that at BPS in particular, a retrofit to closed-cycle cooling is both economically practicable and technologically feasible. Because of the substantial flow reductions allowed by closed-cycle cooling, along with associated reductions in adverse environmental impacts from entrainment and impingement, it is clear that this technological approach constitutes the BTA for application at BPS.

68. Comment

Save The Bay of Rhode Island stated that Congress did not want EPA to give costs and economics primary importance in applying CWA § 316(b) and that EPA is "barred [from] directly compar[ing] the costs and benefits of pollutant reduction in determining the BTA," as the permittee urges EPA to do. It also stated that under CWA § 316(b) EPA should focus on benefits and harms to the environment rather than the permittee's ability or inability to pay for pollution abatement measures. (1133)

Response

EPA agrees that Congress did not intend EPA to give costs and economics primary importance in determining permit limitations under CWA § 316(b). EPA also agrees that under CWA § 316(b), Congress intended the Agency to focus on environmental factors to determine permit limits that reflect the BTA for minimizing the adverse environmental impact from cooling water withdrawals. That being said, EPA has interpreted § 316(b) to require an evaluation of economic practicability in light of the statutory language referring to technological "availability" and a statement from the legislative history indicating that costs imposed under § 316(b) should not be impracticable. In the development of national, industry-wide standards, costs for a particular technology could be determined to be financially practicable for the industry as a whole even though some individual facilities might not be able to afford it. See, for example, *Environmental Protection Agency* v. *National Crushed Stone Association*, 449 U.S. 64, 81 (1980). In applying a technology standard on a site-specific, best professional judgment (BPJ) basis, however, EPA must look at financial practicability for the specific facility. In this case, the cost of complying with limits based on BTA are financially practicable for BPS.

The commenter also argued that EPA is "barred [from] directly compar[ing] the costs and benefits of pollutant reduction in determining the BTA." This comment refers to the application of CWA § 316(b), which is the source of the BTA standard. EPA does not agree with this comment. It is true that the language of CWA § 316(b) makes no mention of the consideration of costs or benefits, either individually or in comparison to each other. It is also true that this is distinct from how Congress has addressed the development of other technology-based standards, such as BPT and BAT standards. See 33 U.S.C. § 1314(b)(2)(A) and (B). Nevertheless, EPA has long taken the view that while Congress did not intend that a cost-benefit assessment be conducted to determine limitations under CWA § 316(b), or that a precise assessment of costs and benefits was necessary, Congress did intend that EPA could give "some consideration" to costs and that EPA would do this using a "wholly disproportionate cost test." See *In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2)*, 10 ERC 1257, 1261 (NPDES Permit Application No. NH0020338, Case No. 76-7; June 17, 1977 [Decision of the Administrator]). This entails some comparison of costs against benefits. The First Circuit Court of Appeals in dictum in the case of *Seacoast Anti-Pollution League* v. *Costle*, 597 F.2d 306, 311 (1st Cir. 1979), stated that costs **could** be considered in setting limitations under CWA § 316(b) and noted EPA's wholly disproportionate cost test with approval. All of this is discussed in Chapter 7 of EPA's Draft Permit materials.

69. Comment

The Conservation Law Foundation of New England (CLF) commented that EPA correctly applied the "wholly disproportionate cost" test as part of its application of CWA § 316(b). CLF stated that the wholly disproportionate test under CWA § 316(b) requires only a general consideration of costs (citation: *Seabrook*, 10 Env. Rept. Cas. (BNA) at 1261), and that such consideration of costs is clearly secondary to the statutory mandate to require the "best technology available to minimize environmental costs." CLF noted that CWA § 316(b) makes no mention of cost considerations in setting BTA for cooling water intake structures, and that EPA made clear in the preamble to its 1976 regulations that no comparison of costs and social benefits was required (citation: 41 Fed. Reg. 17388). (As explained by EPA elsewhere, these regulations were later withdrawn following remand by the Federal court to EPA on procedural grounds unrelated to this issue.) CLF also stated that court decisions indicate that cost is a lesser consideration when applying a wholly disproportionate cost test (citations: *BASF*, 598 F.2d at 637; *Weyerhauser*, 590 F.2d at 1048). One of the reasons for this, as explained by CLF, is that Congress recognized the difficulty of precisely quantifying all the benefits from environmental improvements resulting from pollution control (citations: *American Petroleum*, 540 F.2d at 1038; *Appalachian Power*, 545 F.2d at 1361). CLF also stated that legislative history and court decisions reveal that Congress intended that the CWA force the implementation of new technologies on existing pollution sources in

ways that might be expensive and difficult, that plant closures might result, and that Congress expressly rejected an economic hardship exemption as an "excuse" for continued pollution discharges. CLF further commented that Congress intended the CWA's technology-forcing mandate to have preeminent importance over economic considerations (citations: Legislative History of CWA of 1972 [Report on Economic Impact of CWA]; *Crushed Stone*, 449 U.S. at 79-81; *NRDC*, 822 F.2d at 123-24; and *Tanners' Council*, 540 F.2d at 1195). (1132)

Response
EPA generally agrees with these comments. The Agency notes, however, that Congress did consider economic concerns in enacting the CWA and various provisions of the statute mandate that EPA evaluate economic considerations in certain ways. EPA's analysis here is fully consistent with the directives of the statute.

70. Comment
A member of the Rhode Island Salt Water Anglers Association stated that the numbers of fish (e.g., flounder and tautog) that he had seen over his lifetime in Mount Hope Bay and Narragansett Bay no longer exist and that his children are missing out on the benefits of that abundance, and that EPA needs to take account of the benefits that our children and our children's children would receive from restoration of a healthy fishery. He commented that these benefits are not being counted when people put price tags on the benefits of the proposed cooling system improvements at the power plant. (1227)

Response
EPA agrees that the deterioration of the ecosystem and fishery of Mount Hope Bay is interfering with the public's enjoyment of the beneficial uses of natural resources that belong to the public and that have been designated to provide those benefits. The waters of the Mount Hope Bay estuary are supposed to provide good quality fish habitat and a fishing resource for the public. Instead, these waters have had to be closed to commercial and most recreational fishing. EPA agrees that these are important problems that should be addressed under the CWA. EPA has concluded that BPS operations have significantly contributed to these problems—along with other stressors—and that the new NPDES permit will reduce the negative impacts from the power plant. The improvements in BPS operations in conjunction with control of other stressors should lead to a recovery in fish stocks. EPA believes that public enjoyment of this resource can be restored to levels that were enjoyed in the past and that are supposed to be maintained. EPA has looked at **both** costs and benefits in determining the appropriate permit limits for BPS. Moreover, EPA's assessment of benefits tries to take into account the types of concerns raised by the commenter. See the July 2002 Permit Determinations Document, §7.6.

71. Comment
The Attorney General of Rhode Island commented that Mount Hope Bay provided important public benefits as an "important spawning and nursery area for millennia, and for the better part of the 20th century . . . as a valuable commercial and recreational fishery resource." He indicated that reducing the adverse environmental impacts of the BPS cooling system as proposed by the Draft NPDES Permit would benefit the State of Rhode Island's environment, commercial fishing, and recreational industries. (1150, 1208)

Response
EPA acknowledges these comments and has considered them in its assessment of the impacts of the facility and the benefits of controlling these impacts.

72. Comment
Save The Bay of Rhode Island commented that the thermal discharge and cooling water withdrawal reductions proposed by the Draft NPDES Permit would not only ensure the future of the plant and

people's jobs, but would also ensure the health of the marine environment of Mount Hope Bay, providing substantial benefits to all who enjoy it and use it. (1177)

Response

EPA agrees that the power plant should be able to comply with the new permit and remain in business. EPA also agrees that, as a result, the permit should not result in job losses. Furthermore, some additional jobs might be created as a result of the construction of cooling system upgrades to comply with the new permit. EPA also agrees that compliance with the permit should help to restore and maintain the health of the Mount Hope Bay estuary and that this will provide substantial benefits to the public, some of which can be estimated in monetary terms and some of which can be assessed only in nonmonetary or qualitative terms.

73. Comment

Save The Bay of Rhode Island made a number of comments regarding the public benefits that would be provided by a healthy Mount Hope Bay ecosystem. Save The Bay stated that Mount Hope Bay is one of the most important recreational and cultural resources in the region. It also stated that the bay is an anomalous, unique ecosystem compared to other hydrologically similar embayments in the region, or to Narragansett Bay, because its temperatures, temperature patterns, circulation, flow dynamics, and marine species assemblages and distribution are unique and unusual. It commented that Mount Hope Bay was historically a biologically significant nursery area for many species of fish in Narragansett Bay and Rhode Island Sound, and that it once supported a thriving commercial fishery. In addition, Save The Bay stated that Mount Hope Bay was once one of the most productive estuaries in the Northeast and a main breeding ground for commercial species of fish for Narragansett Bay. It stated that it is difficult to estimate the value of the fishery that once existed, but anecdotal evidence suggests that these waters might have been used by dozens of vessels on a regular basis for generations. Save The Bay commented that Mount Hope Bay's importance as a natural resource is indicated by its designation as essential fish habitat (EFH) for species such as winter flounder under Federal fishery conservation laws, and by the fact that both Rhode Island and Massachusetts classify the bay's waters as either "SA" or "SB," the two highest classifications under State water quality standards. Save The Bay pointed out that these classifications indicate that the waters are supposed to be suitable for high quality fish and wildlife habitat, fishing, recreation, swimming, and shellfish harvesting, but stated that these classifications are not being attained because of the adverse impacts of the power plant (as well as other sources of degradation which are being addressed by the public). Save The Bay further commented that although Mount Hope Bay continues to support limited recreational fishing and direct-contact recreation—such as sailing, power boating, water-skiing, and shellfishing—there is now almost no commercial fishing and only very limited recreational fishing for winter flounder around the deep areas near Mount Hope Bridge. It stated that while low winter flounder populations led to strict State fishing restrictions, commercial vessels had already ceased to fish Mount Hope Bay during the 1980s, as it became economically infeasible because of diminished fish populations. Finally, Save The Bay also commented that while waterfront property values have tripled in Rhode Island in the last 5 years, most of the shorefront land around Mount Hope Bay remains undeveloped. (1133)

Response

EPA agrees that Mount Hope Bay is an unique ecosystem. Geologically, it is a large shallow water body with constricted connections to the larger Narragansett Bay. Hydrologically, it receives freshwater from 4 different river systems making it truly an estuarine environment. This estuarine nature and shallow depth make it an attractive spawning and nursery habitat for numerous species. Additionally, the constricted points of water exchange may result in greater retention of larvae spawned in Mount Hope Bay. No other part of Narragansett Bay has a similar combination of characteristics.

EPA agrees that the permit should provide significant public benefits. The Mount Hope Bay estuarine ecosystem is an important public natural resource. Indeed, it is an important part of the larger Narragansett Bay estuary, a designated estuary of national significance under the CWA's National Estuary Program. The shallow, protected waters of the Mount Hope Bay estuary should provide high quality habitat, including nursery and spawning areas, for many important species of fish, such as winter flounder, tautog, striped bass, and others. As the commenter notes, both the Massachusetts and Rhode Island portions of Mount Hope Bay have been designated as SA and SB waters (the two highest classifications) and are designated by the States to provide high quality fish habitat and a resource for fishing. Consistent with other comments and information in the record, the commenter points out that these waters once provided a fruitful commercial and recreational fishing resource, but that commercial fishing ceased during the 1980s and recreational fishing has had to be drastically restricted, because of diminished fish populations.

EPA agrees with the commenter that applicable State water quality classifications/designations are not presently being attained because of the deterioration of the fishery, the adverse alteration of the habitat, and the fact that stringent fishing restrictions have had to be imposed. EPA believes that operation of BPS's cooling system has contributed to these problems. Overfishing and other problems have also likely contributed to these problems. EPA agrees with the commenter that the proposed permit conditions will help to restore the quality of the fish habitat and the fishery. Other steps are also being taken that will contribute to this restoration. These include improved water pollution controls (e.g., Fall River CSO abatement) and fishing restrictions. While the permit's thermal discharge and cooling water withdrawals limits are based on the standards of CWA § 316(a) and § 316(b), respectively, EPA believes that these steps will ultimately help enable the fishery to recover so that fishing restrictions can be relaxed within an overall context of continued, careful management, and the designated uses for Mount Hope Bay can be attained.

In other words, although the thermal discharge conditions in the permit are based on CWA § 316(a), rather than State water quality standards, EPA concludes that the thermal discharge requirements will, in fact, help to achieve the water quality classifications, designated uses, and narrative criteria of the States' standards. This is not surprising since the States' standards are generally consistent with the standards of CWA § 316(a). In addition, EPA concludes that the permit's cooling water intake conditions, which were developed under CWA § 316(b), will also satisfy State water quality standards, and that these permit conditions cannot be made significantly less stringent without violating these State standards. EPA's analysis regarding the application of State water quality standards in the development of this permit is discussed in Chapter 5 and § 7.2.9 of the Draft Permit materials, and elsewhere in this document.

EPA has also noted that the waters of Mount Hope Bay have been designated as EFH for winter flounder by the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fisheries Conservation and Management Act. EPA has, therefore, consulted with NMFS regarding this permit. NMFS indicated its concern about the protection of this habitat and its support for the conditions of the Draft Permit. NMFS further indicated that as long as the Final Permit is not made less stringent, it would recommend no **additional** conservation conditions for the permit. EPA has not made the permit less stringent in any significant way.

74. Comment

The Conservation Law Foundation of New England (CLF) commented that the public would substantially benefit from the recovery of the Mount Hope Bay ecosystem that would result from the proposed improvements at BPS, in conjunction with other environmental improvements that are in place or under way. CLF stated that Mount Hope Bay has the potential to be an important fishery and ecological resource. CLF noted that the bay's waters are designated as EFH for various species under Federal fishery conservation laws and that the bay is part of the larger Narragansett Bay estuary, a

Federally designated estuary of national environmental significance. CLF also noted that significant public investments have been made or are being made to improve the environment in the area, such as the City of Fall River's $150 million CSO abatement program designed to contribute to the attainment of water quality standards. CLF stated that the City, in light of its own investment, has called for BPS to meet the requirements of the proposed NPDES permit. CLF also noted that Massachusetts owns tidal salt marsh land in the area of BPS. In addition, CLF stated that fishing restrictions have been imposed by the States in an effort to help recover the fishery as the degradation of Mount Hope Bay, including by BPS, has coincided with fishery declines. CLF further stated that the permittee itself estimated that entrainment and impingement losses at BPS constitute almost 2 percent of the Rhode Island commercial winter flounder catch alone. CLF then commented that this loss is economically significant given the "role of fishing as an economic driver in Rhode Island." CLF stated that in 2001, Rhode Island commercial fishing yielded 4,687 jobs and generated $758 million in direct sales, which in turn generated a total economic impact of approximately $1.7 billion for the Rhode Island economy. CLF then stated that it is time for the permittee to make the improvements at BPS that are called for by the Draft NPDES Permit given the public investments in the ecological recovery of Mount Hope Bay and the serious harms to the public from the power plant's cooling system. (1132)

Response

EPA agrees that substantial public benefits would result from the recovery of the Mount Hope Bay ecosystem. EPA has also concluded that the reduced environmental impacts required by the new NPDES permit for BPS will, in conjunction with other environmental improvements that are in place or under way, be essential to achieving that recovery. EPA has discussed the points raised by the commenter in § 7.6.3a of the Draft Permit materials and elsewhere in this document and its analysis is essentially consistent with the comment. EPA has considered the comments by the City of Fall River, which support the conditions of the Draft Permit, as alluded to by the commenter. EPA has also considered the major expenditures being undertaken by the City to reduce its pollutant discharges to Mount Hope Bay in order to comply with applicable water quality standards, as is discussed in the Draft Permit materials and elsewhere in this document. EPA is also aware that the commenter (i.e., CLF) has invested considerable effort on its own part to bring an enforcement case, which was settled with the City, to ensure that the City of Fall River takes necessary actions to abate CSOs in order to comply with State water quality standards and to restore/protect water quality in Mount Hope Bay. EPA has issued administrative orders to the City in the past to ensure that Fall River's public sewage treatment plant would meet all applicable CWA standards in order to protect the Mount Hope Bay estuary, and the City has made required improvements to the treatment plant. Finally, improvements to the power plant's cooling system that result in markedly reduced entrainment of fish eggs and larvae should be beneficial to the biological productivity of the publicly owned salt marsh habitats.

EPA acknowledges the commenter's statements regarding the importance of commercial fishing to the Rhode Island economy and adverse impact of BPS entrainment and impingement on the fishing industry. The economic loss in the commercial fishing industry resulting from BPS entrainment and impingement is accounted for as part of EPA's benefit analyses. However, our analysis is narrow in the sense that it fails to quantify the broader impact of the economics losses in the commercial fishing industry on general employment and income in Rhode Island, which would include the economic multiplier effects from the impacts in the commercial fishing industry. EPA generally agrees with the commenter's points and believes they add further justification for undertaking the technology improvements required by the Final Permit.

75. Comment

Save The Bay stated that while it is very difficult to fully define the value of the resources adversely affected by the power plant's cooling system, both RI DEM and EPA have tried to do so in different

ways. It further commented that despite the inadequately low benefits assessments developed by all the parties here, even conservative estimates of natural resources damages by the power plant rise to "the double digit millions" of dollars. (1133)

Response
EPA agrees that (a) it is very difficult to fully define in monetary terms the value of the resources adversely affected by the power plant's cooling system, and (b) even conservative, incomplete efforts to monetize the benefit (or value) of the natural resources that would be preserved/protected as a result of meeting the requirements of the new permit rise to "the double digit millions of dollars" annually. In light of the impossibility of fully monetizing all the benefits of preserving these natural resources, EPA has also properly undertaken nonmonetary and "qualitative" considerations of these benefits. Moreover, in light of the unavoidable imperfection of, and uncertainty about, the various estimates of costs and benefits, EPA has considered the results from multiple methods of estimation. EPA's assessments of benefits and costs are set forth and discussed in detail in the Draft Permit materials and elsewhere in this document.

EPA also wishes to underscore here that (a) cost-benefit comparisons do not enter into permit determinations regarding limits needed to comply with CWA § 316(a) or State water quality standards, (b) costs only need be "considered" in developing BAT discharge limits, and (c) a "wholly disproportionate cost" (to benefits) test is used when applying CWA § 316(b). Neither a precise quantification of costs and benefits nor a strict cost-benefit analysis is required in applying any of these standards.

76. Comment
Save The Bay stated that, to date, all parties' assessments of the "benefits" of reduced cooling water intake are "incomplete" and "underestimate the impacts on the Mount Hope Bay estuary as well as [the] indirect economic and use values" that would be achieved by making the improvements proposed by the Draft Permit. Save The Bay further stated that the permittee grossly underestimated the negative impacts of BPS on the bay and, therefore, the benefits of reducing the plant's cooling water withdrawals and thermal discharges. It also commented that the comparisons that have been done of the costs and benefits of actions needed to comply with the proposed permit limits are unfairly skewed against the permit because they have involved comparing the **complete** costs that would be incurred by the permittee if it installed closed-cycle cooling technology with an **incomplete** set of benefits. Save The Bay also stated that the benefits of these improvements have been calculated based on fish loss data collected by the permittee that focus only on a subset of species harmed by the plant's impingement and entrainment and that this "grossly underestimates total losses." It stated that invertebrates, such as lobsters, mussels, crabs, shrimp, or clams, are not considered despite their commercial value, just as forage species losses are not considered despite their importance and value. Save The Bay also commented that the economic analysis conducted by Mark Gibson of the RI DEM focused only on "ex-vessel" losses for a narrow subset of affected species. (1133)

Response
EPA agrees that all monetized estimates of the benefits of the reduced environmental impacts required by the permit are uncertain, incomplete, and (most likely) underestimates of the full, monetized value of these improvements. In light of these issues, EPA considered a variety of benefit estimates for the Draft Permit and also undertook nonmonetary and qualitative assessments of benefits. In the response to comments, EPA has also made some improvements to its benefits estimates for use in the development of the permit. These revised benefits estimates are presented and discussed elsewhere in this document. Of course, despite the improvements, the benefits estimates remain unavoidably incomplete and uncertain, and (most likely) underestimate the full value of the resources that would be preserved/protected by compliance with the permit. One of the reasons that the estimates are incomplete and most likely

underestimate benefits is that EPA did not value the benefits of reduced thermal discharge, attributed no value to organisms other than fish, and did not capture the benefits of all the fish that will be restored to the ecosystem as a result of the permit. EPA's benefits analyses also contain many points of conservatism that should tend to prevent overestimation. In light of all this, EPA continues to assess multiple approaches to estimating monetized benefits as well as nonmonetary and qualitative assessments of benefits.

EPA agrees that the permittee has underestimated the negative impacts of BPS on the bay and that this has contributed to its underestimate of the benefits of reducing the plant's cooling water withdrawals and thermal discharges. EPA has discussed these negative impacts in the Draft Permit materials and elsewhere in this document, including responses to comments. Some additional points should also be noted in this regard. The permittee failed to provide any benefits analysis with its permit application. It presented only a bottom-line benefits figure, with no presentation concerning how that number was developed. In its comments on the Draft Permit, the permittee for the first time actually provided an estimate of benefits. EPA has reviewed this analysis and believes that it substantially underestimates benefits. The Agency notes that the permittee includes no non-use values for the resources that would be protected as a result of the permit and disagrees with EPA's assessment of such values. Furthermore, the permittee undertakes no qualitative consideration of benefits and provides little comment on the substance of EPA's qualitative assessment of benefits.

It should also be underscored that EPA's monetized benefits estimates are derived simply from the number of fish estimated to be lost to the power plant intake; they do not depend on any particular conclusion regarding the power plant's role in the collapse of the Mount Hope Bay fishery, or even that the fishery has collapsed. Thus, EPA's calculation of monetized benefits is not affected by disputes over these issues. Of course, estimates of how many fish the plant takes via the intake affect EPA's benefits estimates, and the permittee has questioned EPA's estimates of the number of fish taken. EPA has considered these comments and concluded that the estimates were reasonable, but that some revisions in response to these comments would also be reasonable and appropriate. The permittee's comments on those and other issues are addressed, and any revisions made have been explained elsewhere in this document.

EPA agrees that its monetized benefits estimates do not consider invertebrates but it has tried to consider forage species in its non-use value estimates. In addition, EPA's non-monetized benefits assessments try to take into account the full ecological benefits of converting BPS to closed-cycle cooling.

EPA agrees with the commenter that with respect to the costs and benefits the Agency has compared in applying the wholly disproportionate cost test, the cost estimates are more complete than the benefits estimates. Some of the considerations left out of the benefits estimates are detailed above, whereas the cost estimates do not appear to omit elements of similar significance. This should not affect the final permit determinations, however, because despite potentially underestimating the benefits, EPA has determined that the costs of complying with the permit are **not** wholly disproportionate to these benefits. The Agency also notes that, like the benefits figures, the cost figures, though more complete, are still just **estimates**. They are affected by predictions about many unknown factors and will not be perfectly accurate. Cost issues are discussed elsewhere in this document.

EPA has discussed Mark Gibson's economic analysis in the Draft Permit materials.

77. Comment

Save The Bay stated that the permittee's comparison of estimated fish losses at the plant to large regional fish stocks is inappropriate and misleadingly attempts to downplay the significance of those losses. It commented that one should, instead, compare the losses to populations in Mount Hope Bay specifically.

Save The Bay also stated that the permittee's proposed "Enhanced Multi-Mode" system would eliminate 70 percent of Mount Hope Bay's winter flounder population as well as a large percentage of other species, while "production foregone," including vertebrates and phytoplankton, would "greatly exceed" 54 million pounds per year. Save The Bay commented that these amounts exceed allowances given to fishing sectors despite the fact that the power plant would be "wasting" the organisms so that they would provide no value or benefit to people or the ecosystem. (1133)

Response
EPA has addressed these comments elsewhere in this document.

78. Comment
Save The Bay commented that even the Habitat Replacement Cost (HRC) figures developed by EPA underestimate the cost to the public of BPS's pollution and the benefits of ending that pollution. It also stated that regardless of the permittee's complaints about the HRC analysis, the HRC analysis actually attempts to quantify the environmental cost to the resources harmed by the power plant and that this is important because the plant causes direct and indirect adverse effects on users of the Mount Hope Bay estuary. (1133)

Response
EPA agrees that BPS's cooling system operations cause direct and indirect harm to the Mount Hope Bay estuary, to the habitat it provides, and to the public that owns and enjoys it. The HRC analysis is an attempt to estimate the cost that would be involved if the public tried to restore those natural resources with environmentally sound restoration measures. (Of course, the ultimate success of any such restoration measures would be uncertain, and it is preferable, where possible, to avoid such harms in the first place rather than to inflict them and then try to offset them with restoration programs of uncertain efficacy.)

79. Comment
The CLF commented that EPA appropriately assessed the environmental benefits of closed-cycle cooling by considering three different methods of analysis (i.e., referred to as the "benefits transfer" analysis, the "per-person recreational and non-use value" analysis, and the HRC analysis), and by conducting a qualitative assessment of the benefits. CLF states that the so-called "benefits transfer" (BT) method that EPA used grossly underestimates the full ecosystem benefits of conversion to closed-cycle cooling for all four units because, among other things, it focuses on landed fish only and fails to capture the "ecological value of billions of fish and invertebrates that serve as essential components of the aquatic food web" but may have no direct commercial/recreational value. CLF states that the so-called "per-person analysis" applies "more credible empirically-based adjustment factors to recreational use values across an appropriate population, and more fully captures non-use values associated with closed-cycle cooling." CLF also states that the so-called HRC analysis also appropriately provides relevant information for consideration. Recognizing that the HRC analysis provides restoration costs, rather than "benefits" from a willingness to pay measurement, CLF comments that the HRC results are still relevant, useful, and appropriate for consideration in evaluating benefits in light of the absence of readily available, accurate benefit valuation techniques for the full range of values of an aquatic ecosystem, especially those ecosystem function values not derivable from marketplaces (i.e., "non-market goods"). In this regard, CLF also reiterates that CWA § 316(b) does not require a strict cost-benefit analysis and that costs only need to be "considered" in a general sense. CLF also notes that the HRC method is derived from replacement cost methods consistently upheld by courts in natural resources damages cases. CLF notes that EPA's analyses demonstrate that the costs of installing closed-cycle cooling for all four generating units at the plant are not wholly disproportionate to the benefits of doing so. (1132)

Response
EPA agrees with the commenter that EPA's analyses demonstrate that the costs of complying with the permit's cooling water intake limitations by installing closed-cycle cooling for all four generating units at BPS are not wholly disproportionate to the benefits of doing so. EPA also agrees that CWA § 316(b) does not require a strict cost-benefit analysis or that costs and/or benefits be estimated precisely. CWA § 316(b) requires only that costs and benefits be "considered" in a general sense to ensure that costs are not impracticable and that the costs of compliance are not wholly disproportionate to the benefits. EPA has gone far beyond the minimum requirements in its consideration of costs and benefits.

With respect to the comments addressing specific benefits analyses by EPA, the Agency offers the following responses. EPA agrees that the BT analysis discussed in the Draft Permit materials substantially underestimates the full benefits that would result from compliance with the limits proposed in the Draft Permit. EPA discussed this analysis in § 7.6.3b of the Draft Permit materials. EPA also agrees that the "per-person analysis" produces a more "credible" assessment of values, including non-use values which ought to be considered and assessed. While believing this analysis provides a reasonable, appropriate assessment, EPA has made some improvements to it in response to comments received on the Draft Permit. EPA also agrees that the HRC results are helpful to consider in evaluating benefits as long as it is understood what the figures do and do not represent so that their relevance is appropriately delineated. EPA properly considered the HRC figures in the Draft Permit materials. See July 2002 Permit Determinations Document, § 7.6.3b(iii). In response to comments, however, EPA has also produced a revised analysis converting the HRC results to willingness to pay measures. EPA's revised analyses, prepared in response to comments, are presented and discussed elsewhere in this document.

EPA also agrees with the commenter that techniques for **fully** valuing the complete range of values of an aquatic ecosystem do not exist, and that this problem is especially acute for ecosystem function values not derivable from marketplaces (i.e., "non-market goods"). With respect to the comment concerning the "ready availability" of methods of valuation, EPA agrees that some methods are likely to be too expensive and time-consuming to be relied upon in an individual permitting context owing to the nature of the processes involved and the special expertise needed to undertake them. For example, EPA has determined it would be too costly and time-consuming to conduct a site-specific contingent valuation study of relevant non-use values to support the development of the BPS permit. Nevertheless, EPA determined that it could undertake appropriate "benefits transfer"[27] analyses to assess non-use values in a more cost- and time-efficient manner. This might not, however, be possible for every permit because of budget and time constraints. It also might not be needed or appropriate owing to the issues and data constraints presented by individual cases. EPA's analyses in this regard include, as mentioned above, the per person analysis and the HRC analysis, as revised. Of course, as discussed elsewhere, these benefits transfer analyses are still incomplete in various ways. In response to all these issues, EPA also conducted an appropriate quantitative and qualitative nonmonetized assessment of the value of the resources at issue.

80. Comment
One commenter stated that cost-benefit analysis should not be regarded as providing the sole basis for determining the conditions to be included in the BPS NPDES permit or other regulatory decisions. This commenter noted that the permittee's economic consultant, Robert Stavins, had actually made this point himself in a 1984 paper. The commenter quoted with approval the following language from this paper:

[27] Please note that we use the term "benefits transfer" in its generic sense here, as opposed to its earlier use to refer to a specific analysis of commercial and recreational fishing values that was conducted for the Draft Permit. See Economic Guidelines, p. 59. In retrospect, it would have been preferable to give that earlier analysis a different label to avoid any confusion.

> [t]here are numerous limitations to benefit-cost analysis as an aid in decision-making, and those limitations indicate that the benefit-cost criterion ought not to be used as either a necessary or a sufficient criterion for project investment. Public-policy decisions regarding the use of the nation's scarce natural resources are ultimately political decisions, and should remain so.

This commenter also cited with approval additional criticisms of cost-benefit analysis made by Stavins in this paper to the effect that conventional cost-benefit analysis might exclude relevant externalities, discounting calculations might lead to ignoring future consequences, and considerations of equity are often omitted from consideration. The commenter further stated that economic theory and legal precedent demonstrate that important benefits need not, and cannot always, be monetized, and that this is another reason why decisions cannot always rest solely on quantitative cost-benefit analysis.

Response

EPA believes that in developing a CWA permit, it should consider costs and benefits in a manner consistent with applicable statutes, regulations, and Agency policy. EPA believes that its analyses of costs and benefits for the BPS permit are consistent with the applicable legal requirements. Indeed, it has gone beyond the minimum legal requirements to consider costs and benefits, but has considered them in the appropriate context and given them appropriate weight in its evaluation. EPA also agrees that in the context of developing this CWA permit, all important benefits cannot be fully monetized but should be considered in other, nonmonetary ways. Both Congress and the courts have recognized the inability to monetize the full benefits or values provided by ecological resources. The limitations inherent in quantitative monetary cost-benefit analyses support EPA's qualitative assessment of the benefits of permit compliance and the exercise of reasonable Agency discretion in making determinations under CWA § 316(b)'s wholly disproportionate cost test.

81. Comment

One commenter discussed at some length EPA's present inability to monetize all environmental benefits or harms and the significance that this has for cost-benefit analysis and the development of the NPDES permit for BPS. This commenter noted that economic theory and legal materials recognize that all important environmental benefits, such as the benefits of reduced harm to aquatic ecosystems, cannot always be monetized. The commenter stated that this poses a "fundamental dilemma" for the use of cost-benefit analysis as **the** determinative factor in making policy decisions. According to the commenter, this is because cost-benefit analysis is intended to weigh the relevant costs of a proposal against its benefits, and, to provide a "meaningful" and "accurate picture of net benefits to society," the calculation of costs and benefits must be "equally complete," but they rarely are. The commenter analogizes to a corporate balance sheet that would provide a distorted picture if it weighed **all** income against only **some** corporate expenses. The commenter states, however, that when environmental protection issues are being considered, comparisons of costs and benefits are likely to be biased against environmental protection because the monetized costs of preventing environmental harm are relatively complete while many categories of environmentally important benefits are not monetized. This is because the costs typically involve market expenditures for activities (construction, installation, and operation of equipment) that have well-defined, readily researched market prices. This also partly explains why, according to the commenter, economic theory and legal precedent indicate that environmental policy decisions cannot always rest solely on quantitative cost-benefit analysis and that all important benefits need not be monetized to be considered in decision making. (1130)

Response

EPA agrees that all important environmental benefits, such as the benefits of reduced harm to aquatic ecosystems, cannot always be monetized. EPA also agrees that this could provide a real problem for

NPDES permit decision-making if permit decisions were determined solely by monetized cost-benefit analysis. In accordance with the requirements of the CWA, EPA's permit determinations were not, however, driven solely by monetary cost-benefit analysis. As discussed in EPA's Draft Permit materials, and elsewhere in this document, EPA's thermal discharge determinations under CWA § 316(a) are not based on cost-benefit considerations. Similarly, any EPA determinations related to State water quality standards and the requirements of CWA §§ 301(b)(1)(C), 401(a)(1), 401(a)(2), and 401(d) were not based on cost-benefit considerations. EPA's determinations under CWA § 316(b) involved the application of the "wholly disproportionate cost test" and included quantitative and qualitative nonmonetized assessments of the benefits of compliance with proposed intake conditions.

In assessing costs and benefits, EPA also agrees that it might often be easier to develop monetary cost estimates than to develop monetary benefits estimates. This is so for the reasons noted by the commenter. It might also be so because permittees are likely to be more willing or able to develop estimates of the potential cost of complying with stringent permit requirements than they are to estimate the benefits of doing so. For example, in this case the permittee provided detailed cost estimates with its December 2001 CWA § 316(b) Demonstration, but did not provide any detailed benefits estimates. It is also important to remember, however, that not only do benefits figures often represent estimates, but cost figures often do as well. Certainly this was the case for the BPS permit analysis. This is not a problem as long as it is properly taken into account in reaching a final decision.

82. Comment

One commenter stated that with respect to the BPS NPDES permit, EPA has engaged in a comparison of "relatively complete costs and substantially incomplete benefits." The commenter further stated that EPA's analysis identifies "numerous categories of benefits of reduced cooling water intake that have not been monetized," and that although "[i]t would be impossible in practice to estimate all of the omitted values," some benefits analyses have estimated broader sets of values than those considered by EPA for this permit (or in developing national regulations under CWA § 316(b)). The commenter pointed out that EPA's "benefits transfer" estimate for recreational value includes "only losses in recreational fishing," whereas EPA benefits analyses for the metal products and machinery regulations estimated separate recreational benefits for "fishing, other boating, wildlife watching and other near water activities." In addition, the commenter stated that recreational fishing provided only 25 percent of the total recreational benefits and that peer review has since resulted in even higher estimates for recreational benefits. The commenter then stated that these data suggest that if similar relationships held for cooling water intake reductions, then recreational benefits would need to be multiplied by a factor of four or more to reflect total recreational benefits, though the data to determine the magnitude of other recreational benefits are not presented by EPA for cooling water intakes. The commenter also stated that EPA's benefits analysis is incomplete because it values only a fraction of the commercially and recreational valuable species affected by the power plant. Specifically, the commenter stated that EPA counts only the fraction of fish that would have been caught by fishermen in the absence of impingement and entrainment mortality, thus ignoring all the ones that would "get away" based on historical catch rates. Given "catch rates" estimated at 12 percent for impinged fish and 7 percent for entrained fish, the commenter stated that "the great majority of the most valuable species" are not valued despite the fact that the "nonlanded fraction" have "obvious ecological value." As an example, the commenter states that these fish are the source of fish caught in future years (i.e., the source of future recreational/commercial value). The commenter stated that existing data do not allow calculation of the present value of the future reproduction of nonlanded fish but that a reasonable estimate would be that they are worth more than zero but less than the landed fish. The commenter then provides a calculation based on the "conservative" assumption that the nonlanded fish are worth 25 percent of the landed fish and concludes that using this value would almost triple the value of impingement losses (34 percent versus 12 percent) and more than quadruple the value of entrainment losses (30 percent versus 7 percent). (1130)

Response

EPA concedes that its benefits analysis looks only at fishing benefits. While it might have been possible to develop benefits estimates for other recreational uses of the affected resources that might benefit from the environmental improvements required by the permit, given the data limitations EPA believes that focusing on fishing effects was reasonable. Clearly, the fishing-related (use and non-use) benefits are the most directly related to the permit conditions in question. EPA also recognizes that most of the fish entrained or impinged were left out of the commercial and recreational use value analyses. However, EPA did evaluate, albeit conservatively, the non-use values of the unlanded fish. EPA also qualitatively assessed the benefits of permit compliance. The Agency believes its analyses were conservative (i.e., tend to produce low estimates) but not unreasonable based on the information available to it. The commenter's points regarding relatively small changes to EPA's analysis that would yield much higher values tend to confirm the conservativeness of the Agency's analyses. In the end, even if the analyses were **too** conservative and significantly understated the values of permit compliance, it is of no import because EPA found that the cost of complying with permit conditions that reflect the BTA for minimizing adverse environmental impacts would not be wholly disproportionate to their benefits.

83. Comment

One commenter stated that monetizing non-use values is critical to any attempt to place a monetary value on the benefit of preserving environmental resources and for any use of cost-benefit analysis to guide environmental protection decisions. He also noted that non-use values are recognized by both court decisions and economic theorists. This commenter further stated that one cannot capture the true, full public willingness to pay for environmental services by monetizing benefits unless non-use values are included. The commenter then stated that while "in theory" it might be preferable to calculate non-use values by performing contingent valuation studies asking the relevant population about their willingness to pay for protection of certain natural resources, such studies require substantial time and expense and often cannot be carried out. As a result, the commenter continued, analysts often face the problem of estimating non-use values without a new study specific to their situation.

This commenter noted that EPA faced this type of problem in developing the Draft NPDES Permit for BPS and praised the work that EPA and its consultant Abt Associates did to address it. He noted that EPA and Abt Associates "faithfully followed a classic model for [conducting] such [an] analysis" as was presented in a study issued by the Environmental Defense Fund (EDF) concerning the costs and benefits of a proposed hydroelectric development on the Tuolumne River in California. The commenter noted that the principal author of this EDF paper was Robert Stavins, currently an economic consultant hired by the permittee. The commenter stated that the EDF paper noted many environmental impacts that should be recognized in a qualitative sense but which could not be monetized. The commenter further stated that the monetization of non-use values was the key factor that resulted in the EDF paper's cost-benefit analysis favoring a decision to leave the resource in its natural state. The commenter explained that because the EDF analysts had no site-specific non-use values for the Tuolumne River, they extrapolated from published studies, using literature values to develop a ratio of non-user to user value. The commenter further explained that the EDF analysis estimated the local (California) population interested in the resource based on in-state Sierra Club membership, estimated the out-of-state interested population based on Sierra Club membership outside of California, and estimated a lower ratio of non-use to use values for the non-California members and applied that ratio to only 50 percent of those non-California members. With respect to the acceptance of this methodology, the commenter noted that this EDF analysis has been "widely circulated," is used as a "case study" in a graduate school program, and is still in use in the curriculum of economics departments at a number of universities around the country. The commenter stated that the analysis prepared by Abt Associates for EPA substantially tracks the methodology from the EDF paper on the Tuolumne and provides a reasonable estimate of the monetary value of non-use benefits from at least some of the environmental improvements to be provided by BPS's

compliance with the limits proposed in the Draft NPDES Permit. The commenter points out that, as with the Tuolumne analysis, for Mount Hope Bay the non-use values account for most of the recreational value of the site and the results are large enough so that a cost-benefit analysis favors the pollution control proposed by the permit.

The commenter further notes with approval that Abt Associates also performed a "reasonableness analysis" as a check on the first analysis (using households within certain distances from Narragansett Bay rather than environmental group memberships) and that its results further supported the conclusion that substantial non-use values justify the proposed pollution controls. (1130)

Response

EPA agrees with the comments concerning the significance of non-use values in assessing the full value of environmental improvements.[28] Obviously, to the extent possible, such non-use values should be quantified when one is undertaking a monetary cost-benefit assessment. In light of the impossibility of fully quantifying such benefits, however, it is also appropriate to consider benefits qualitatively. EPA also agrees that site-specific contingent valuation studies are one method of assessing non-use values for a particular action but that this approach can be costly and time-consuming and cannot always be undertaken by permitting agencies.[29] EPA determined that such an approach would be infeasible and was not necessary for developing the BPS permit and is presently unaware of any other specific CWA § 316(b) permit action in support of which EPA undertook such an analysis.

In the absence of a site-specific study, EPA believes it is appropriate to undertake "benefits transfer" analyses,[30] and EPA undertook multiple such analyses (e.g., the "per-person analysis," the related "meta-analysis") and considered all the results obtained. EPA believes the methods it has used to support development of the Draft Permit were reasonable and appropriate. It has also made certain improvements to its benefits transfer analysis in response to comments (see, e.g., meta-analysis). The revised analyses are presented and discussed elsewhere in this document. EPA acknowledges the comments regarding the reasonableness of its "per person" non-use benefits analysis that was related to the approach taken in the EDF-Tuolumne River economic analysis. EPA feels that these comments bolster the reasonableness of the approach taken. EPA also, of course, acknowledges the permittee's argument that the Agency's analysis is unsound. The company hired the "principal author" of the EDF analysis, Robert Stavins, who now critiques his earlier work and argues that it used an unaccepted methodology. EPA continues to believe, however, that the analysis is reasonable and proper for consideration, although it is certainly imperfect. It also notes the comments above indicating that the "EDF analysis has been 'widely circulated,' is used as a 'case study' in a graduate school program, and is still in use in the curriculum of economics departments at a number of universities around the country." EPA also notes that the Preface to the EDF paper states that it uses "widely accepted economic methodologies." In any event, using this "per person" analysis as its starting point, EPA has made a number of revisions in response to comments from Stavins to produce its meta-analysis. These revised analyses continue to support the Final Permit conditions and are discussed in detail elsewhere in these responses to comments.

84. Comment

One commenter stated that many environmental benefits cannot be monetized and yet can, and should, be considered in a qualitative sense in making public policy decisions. (1130)

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[28] See Economic Guidelines at pp. 67, 69–71.

[29] See Economic Guidelines at p. 59.

[30] See *Id.*

Response
EPA agrees with this comment, and the Agency has indeed undertaken a qualitative assessment of the benefits of permit compliance.[31]

85. Comment
One commenter stated that none of the results of the various economic analyses of benefits should be regarded as decisive by themselves. He stated that the exact amounts are uncertain and many important benefits are "fundamentally unmonetizable" and, therefore, are left out of the monetized values, resulting in underestimates. He further stated, however, that despite these issues, the reasonable benefits estimates developed by EPA, in addition to those prepared by the commenter himself, yield potentially very large benefit levels that are comparable to, or larger than, the estimates of the cost of installing technology to comply with the conditions of the Draft NPDES Permit. The commenter stated that decisions about use of the nation's scarce natural resources are ultimately political decisions and cost-benefit analyses should not, in any event, provide the sole basis for making either the BPS permit decision, or other regulatory decisions. This commenter further stated that the uncertainty of the benefits calculations and the range of plausible values shows "there is no single perfect methodology" and that it was appropriate for EPA to consider multiple methods as well as qualitative judgments. He noted that there are a range of opinions among individual economists regarding the merits of various methods and these opinions might change over time. He concluded that EPA "has made a thoughtful decision in this case, protecting an important public interest at reasonable cost to society; there is nothing in 'economic science' that proves their decision was wrong." (1130)

Response
EPA agrees with these comments as they relate to its permit decision.[32]

Response # IV.86	**Document #'s**: 1121

Comment
One commenter show strong support for the Draft Permit and attached his article, published in the September 19, 2002, issue of the *Sakonnet Times*. The article describes the station's destructive effects on marine life and asks that the station comply with § 316(b) of the CWA by installing closed-cycle cooling.

Response
This comment and the newspaper article have been reviewed and considered. EPA's CWA § 316(b)-based permit limits are consistent with the comment.

Response # IV.87	**Document #'s**: 1131

Comment
Another commenter discusses the many stressors on Mount Hope Bay and while supporting EPA in requiring the Station to reduce water withdrawal and thermal loading, the commenter also believes that it is unreasonable to require that the entire plant be converted to closed-cycle cooling.

[31] See Economic Guidelines at pp. 59, 64, 66, 175–78.

[32] See Economic Guidelines at p. 178.

Response
EPA has considered the other possible stressors on aquatic life in Mount Hope Bay. We do not believe that the existence of these other stressors means that Brayton Point Station should not be required to reduce its own impacts on the bay in compliance with the Clean Water Act. Furthermore, other entities have taken steps to address the other significant stressors on Mount Hope Bay. Commercial and recreational fishermen have already been required to make significant sacrifices in an attempt to allow winter flounder stocks to recover. Proposed future restrictions will require fishermen to significantly reduce their catches even further. The City of Fall River is being required to upgrade its sewage treatment and increase its control of combined sewer overflows at a cost of well over $115 million dollars. Of course, the steps taken by other parties do not by themselves indicate that BPS must undertake similar efforts. Rather, BPS must do what is required by the CWA. In this instance, the CWA requires that BPS make sufficient reductions in thermal discharge to assure the protection and propagation of the balanced, indigenous population of fish, shellfish and wildlife of Mount Hope Bay, and that it achieve cooling water intake capacity limits that reflect the Best Technology Available for minimizing adverse environmental impacts.

Response #'s: IV.88	**Document #'s**: 1152

Comment
The commenter requests that EPA consider including the following restrictions on the permit's allowance for 122 hours of once-through cooling operations:

"1) reduce the flow and thermal discharge rates to those specified in MOAII

2) limit its use to failure of the closed cycle cooling system and periods of excessive fogging or icing,

3) limit the number of consecutive blocks of time once-through cooling may be used and

4) prohibit its use during summer and biologically sensitive periods."

Response
EPA has considered the commenter's suggested additional permit limitations on the use of the 122 hours of once-through cooling and has adopted the following:

1) EPA will require that the facility report the use, and the reasons for, once-through cooling to EPA;

2) EPA has prohibited the use of once-through cooling during the winter flounder spawning season (February through May).

EPA has decided not to adopt the other suggestions. At this time, it is not possible for EPA to predict, and therefore quantify the biological impact of, the exact number of once-through hours that the company will use. EPA notes however, that the company has an upper limit which bounds the number of hours and, therefore, expects the company will use them conservatively (i.e., not all at once). EPA also notes that this issue may be revisited when the permit is renewed.

Response # IV.89	**Document #'s**: 1196, 1221

Comment
One commenter believes that the increase in cooling water use and the decrease in winter flounder populations are two isolated pieces of information and that they shouldn't be considered as a cause and effect relationship. The commenter indicates that stressor identification is important and lists several other potential stressors to Mount Hope Bay including low dissolved oxygen levels, chemical loadings,

temperature changes, physical injury or disease causing bacteria and viruses. Furthermore, she states that all these factors can be influenced by: fishing, predation, urban runoff, boating activity, wastewater treatment discharges, leaking septic systems or industrial discharges. She adds that all "pertinent data should be considered and weighed, and alternative conclusions should be scientifically assessed before being ruled out."

Response
EPA did consider alternative explanations for the decline of winter flounder in Mount Hope Bay, which is also discussed elsewhere in this response to comments document. EPA realizes that a correlation in time does not equal cause and effect, but no other potential cause has been identified that matches the timing, the magnitude and duration of this impact.

EPA also notes that the CWA does not require EPA to prove that any one party "caused" the decline. Rather, EPA is faced with drafting a permit that satisfies CWA § 316(a), § 316(b) and applicable water quality standards.

Response # IV.90	**Document #'s**: 1230

Comment
One commenter supports the draft permit and was disturbed that "entrainment and the resulting destruction of uncounted larvae and juvenile fish" had not yet been addressed at the public hearing. The commenter asks directly "What is the value of that lost resource?" because he had not heard any "testimony on those economics". The commenter cites both the scientific data and observations of commercial and recreational fisherman as documenting the decline in fish populations.

Response
EPA's permit dramatically reduces flow of cooling water from BPS, this will result in a corresponding decline in entrainment and impingement losses. EPA's analyses did quantify these losses and estimated the number of adult fish that would result from entrainment and impingement. EPA used a variety of methods to estimate the economic benefit of the entrainment and impingement losses. These are discussed in great detail elsewhere in this document.

Response #: IV.91	**Document #**:1003, 1004 1168, 1170

Comment
EPA received comments from four commenters regarding potential environmental/health side effects of using cooling towers at BPS. Potential side effects mentioned include higher relative humidity, mist containing salt, warm moist air containing pollutants, additional respiratory illnesses, growth of mold and algae, fogging and icing of nearby roadways, disposal of heat to the atmosphere (creating a "heat island over the area"), changes in weather patterns, contribution to global warming, addition of an unsightly industrial building, and noise pollution. (1003, 1004, 1168, and 1170).

Response
EPA has carefully considered the environmental impacts associated with cooling towers and has concluded that these impacts are either inherently minimal or can be minimized using existing available technologies. The discussion below presents some basic facts about cooling tower emissions and then individually addresses each of concerns raised in the comment above. Some of these comments are also addressed elsewhere in these responses to comments as well as in Chapters 7 and 4 of EPA's July 22, 2002, Permit Determinations Document.

Cooling towers emit two different forms of water: drift (also called mist) and vapor plume (also called the visible plume or condensation). An important distinction between drift and the visible plume is that for former contains the same chemicals and solids present in the circulating water, whereas the latter is pure water vapor (i.e., not containing any pollutants or salt).

Drift from cooling towers is not likely to have a significant adverse impact on the surrounding community for several reasons. First, drift falls mostly within the immediate vicinity of the towers. Second, the towers will need to be permitted using Best Available Control Technology (BACT) (see discussion of air pollution issues), which would most likely be highly efficient baffles called drift (or mist) eliminators. This technology would nearly eliminate the entrained water droplets (and salt) that would have been emitted into the atmosphere by the cooling tower. The permittee also notes it would use highly efficient drift eliminators. In addition, the distance to the nearest receptors would also minimize any impacts from particulate matter emissions. The Texas Natural Resource Conservation Commission's Guidelines for Cooling Towers indicate that:

> [t]he use of drift eliminators in the design of the cooling tower will also reduce the impact of particulate matter emissions. Normally particulate matter emissions . . . are a concern only when the cooling tower is located within 200 feet of an off-plant receptor.

The permittee indicates that it would locate any cooling towers in a north-central area of the site.[33] The nearest residences to this north-central area are approximately 1,900 feet to the east in Somerset and approximately 1,900 feet to the west across the Lee River in Gardners Neck in Swansea.[34] Finally, all air emissions must meet Prevention of Significant Deterioration (PSD) and BACT standards under the Clean Air Act (CAA). For further information, please see EPA's responses to air pollution comments.[35]

Vapor plumes emitted by cooling towers are also unlikely to have any significant effect on the areas more than 200 feet away from the plant because, depending on weather conditions, plumes generally disperse and mix with surrounding air masses before reaching the ground. A study recently completed for EPA's assessment of BPS explains the normal behavior of a vapor plume as follows:

> [a]s soon as it contacts the outside air the exhaust from the cooling tower will begin to cool and as it does, it's ability to hold water vapor is reduced, and virtually all cooling towers will be seen to have some condensed plume of water vapor at the exhaust. As the plume travels downwind it mixes with surrounding air and eventually comes to equilibrium with the surrounding air. If the surrounding air has a fog already, then the plume will contribute to that fog but will be virtually indistinguishable from the surrounding air. However, in most cases, there is no existing fog and as the plume comes to equilibrium with the surrounding air the plume re-evaporates and no condensed moisture is present. So in most cases, the plume condenses immediately after exiting the

[33] See December 2001 USGen NE 316(a) and (b) Demonstration, Vol. IV, App. H, Figures 3.3-1, 2.2-1; NEPCO January 15, 1998 NPDES Permit Application, Figure 1.

[34] See Figure 7.3-1, "Brayton Point, Somerset, MA, Distances from Proposed Cooling Towers to Sensitive Receptors (EPA, January 24, 2002).

[35] It is also worth noting that under current EPA regulations, the cooling towers would use a phosphate-based water treatment program. Phosphates are not hazardous air pollutants and are not known to cause adverse health effects. 40 CFR 63.4.

> cooling tower and then re-evaporates at some downwind point. Most of the time the condensed plumes remain aloft and evaporate before contacting the ground.[36]

The dispersion and mixing effects described could possibly have aesthetic or health-related implications, but while the plume might be visible close to the cooling tower exhaust point, it will not typically reach ground level. Additionally, the above-mentioned study[37] also explained:

> there are special types of cooling towers that offer plume mitigation. Essentially these towers include some dry cooling within the tower itself that heats the plume prior to exhaust. This additional heat boosts the plume height, raises the temperature of the plume so that the relative humidity falls below 100 percent and can minimize the length and width of the plume.

EPA also discussed this type of cooling tower (known as "hybrid" or "wet/dry" cooling towers) in Chapters 7 and 4 of its July 22, 2002, Permit Determinations Document. EPA has investigated this technology, and its cost, and believes it could be used at BPS if needed to alleviate any vapor plume-related concerns (whether related to aesthetic or traffic safety issues).

Another result of the vapor plume dispersing and mixing with surrounding air is that it will not result in net higher relative humidity observed in the air over the towns in the vicinity of the plant, and will not change local weather patterns. Therefore, associated health impacts such as increases in mold, moist air, asthma, and additional respiratory illnesses are also not expected to occur. It is also worth noting that air pollutant emissions from coal combustion, which many commenters expressed health concerns about, will also be reduced as a result of BPS's compliance with new Massachusetts air regulations.

Similarly, dispersion and mixing of air masses also mean that the proposed cooling towers will not "create a heat island over the area." Heat is rapidly dissipated in the vicinity of the power plant and no adverse environmental effects are expected. Furthermore, heat dissipated to the atmosphere from cooling towers is not considered a contributing factor to global warming.

Other health-related concerns have been expressed regarding whether there are possible illnesses associated with cooling tower emissions. Some potential adverse human health effects have been identified from exposure to microorganisms associated with certain types of cooling tower applications. These naturally occurring microorganisms include *Salmonella* sp., *Shigella* sp., *Pseudomonas aeruginosa*, and *Legionella* sp. The most common bacterial infection associated with cooling systems is Legionnaire's Disease (LD), but no documented outbreaks have been linked to cooling tower air emissions. LD is caused by the bacterium *Legionella pneumophila* and was first discovered in 1976 at the American Legion convention at the Bellevue-Stratford Hotel in Philadelphia. It affects up to 100,000 people per year in the United States.[38] Symptoms often resemble pneumonia and in some cases LD can be fatal. Fifty-four reported outbreaks of the disease throughout the world indicate, however, that the

[36] Kirk, Winges, An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station, MFG, Inc., July 2003.

[37] Ib*Id.*

[38] Considerations to Prevent Growth and Spread of *Legionella* in HVAC Systems found at <www.facilitymanagement.com/articles/arthvac5.html>.

cause is almost exclusively from indoor heating, ventilation, and air-conditioning (HVAC) systems used by large building complexes such as hotels, hospitals, offices, and factories. Other reported cases were linked to sources such as commercial spa baths and humidifiers. EPA could not locate any documented cases of LD where the potential cause was a power plant cooling tower. This is not surprising because power plant cooling towers vent to the open atmosphere rather than affecting a building's internal air conditioning system. Furthermore, the energy generation industry maintains its heat transfer efficiency and reduces fuel consumption by the use of biocides in power plant heat exchangers, condensers, and cooling towers.

In addition, the proximity of most power plants to public receptors is usually more than 200 feet (which, as previously stated, is outside the average zone of impact for drift). Generally, to the extent that any risk of adverse health effects is posed, it is only to the workers who clean the towers and condensers, and "[o]ccupational health questions are currently resolved using proven industrial hygiene principles to minimize worker exposures to these organisms in mists of cooling towers."[39] Potential adverse health effects on the public from thermally enhanced microorganisms could possibly be an issue for plants that use cooling ponds, lakes, or canals and that discharge to small rivers, but this does not apply to the BPS scenario.

Furthermore, it should be understood that the drift eliminators to be used at BPS will reduce the escape of spray from the towers. Again, the mist should not be confused with the vapor plumes or evaporated water that are seen rising above the cooling towers. These plumes are recondensed water vapor and do not contain disease-causing bacteria. EPA concludes that no additional mitigation measures are expected to be warranted other than the application of accepted industrial hygiene procedures. As stated previously, cooling towers have been used at numerous power plants without health problems.

Regarding the traffic safety concerns expressed by the commenters, evidence from site-specific data as well as other plants indicates that the cooling tower vapor emissions are unlikely to cause significant increases in fog and ice. As indicated, typically a vapor plume will dissipate after traveling a short distance due to dispersion and evaporation.[40] The permittee's analysis estimated that in an average year, there are 343 hours of natural "background fog and ice" (336 hours of fog and 7 hours of ice) near the plant, and that the 20-cell cooling tower array would add 7 hours of "plume-induced fog and ice" (6 hours of fog and 1 hour of ice). This represents only a 2 percent increase over background conditions.[41] Moreover, based on an assessment of site-specific design considerations for cooling towers at BPS, EPA

[39] Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437 Vol. 1), 4.3.6 Human Health, U.S. Nuclear Regulatory Commission, May 1996.

[40] See EPA TDD 2001 - New Facilities, p. 3-33; Badger Power EIS, at 54; Public Service Commission of Wisconsin/Wisconsin Department of Natural Resources, Final Environmental Impact Statement, Badger Generating Company, LLC, Electric Generation and Transmission Facilities (June 2000, 9340-CE-100), Executive Summary, p. 6; "AES Londonderry Highlights" (AES, Inc., January 18, 2002), p. 6.

[41] December 2001 USGenNE 316(a) and (b) Demonstration, Vol. III (Tab: Section 308 Information Request Submittal - 9/10/01, Report on Fogging and Icing Effects Associated with Cooling Towers at Brayton Point Station (September 2001), Appendix B, p. 1 (Table: Hours of Plume Induced Fogging and Icing Summary)

concludes that both the permittee's vapor emission rate and hence cooling tower plume impacts are overestimated.[42]

Experience at other sites supports EPA's conclusion. Cooling tower technology, including cooling using salt and brackish water, has been installed at numerous plant locations throughout the United States and the world. The practical experience of operating towers, has shown that fogging and icing of nearby roadways is minimal. To the extent it is a problem, however, EPA has considered a number of different feasible approaches for abating the concern, and these approaches could be combined by the permittee to achieve an optimal configuration.

Commenters have also expressed concern about the aesthetic impact of the cooling towers themselves. When considering the current appearance of BPS, a huge industrial facility with large buildings, tall smoke stacks, and electrical transmission lines on the site, the addition of mechanical-draft cooling towers would not be out of character with the surroundings at the plant.[43] Also, further assessments have been made that indicate the number of cooling tower cells needed for cooling may be reduced from 72 cells to "just over 60,"[44] or perhaps even less. EPA does not believe that this concern should be regarded as a significant and unacceptable impact when weighed against the environmental benefits of retrofitting the cooling towers.

In response to comments regarding potential noise impacts, EPA further evaluated noise impacts, including conducting on-site noise investigation. From this evaluation, EPA concludes that if further noise mitigation is needed, "cooling towers can be installed using technology known to the industry without violating the Massachusetts regulation and at a level that would be acceptable in most jurisdictions."[45] It might potentially require noise mitigation measures beyond simply low noise fans, but this would be well within the current state of the art for the industry.[46] Ultimately, state noise standards will have to be met and the MA DEP will determine whether and what mitigation is needed.

In summary, EPA has considered the adverse environmental impacts from cooling towers and concludes that these impacts are either minimal or can be managed using available technologies.

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[42] Kirk, Winges, An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station, MFG, Inc., July, 2003.

[43] See Public Service Commission of Wisconsin/Wisconsin Department of Natural Resources, Final Environmental Impact Statement, Badger Generating Company, LLC, Electric Generation and Transmission Facilities (June 2000, 9340-CE-100), Executive Summary, p. 6.

[44] Kirk, Winges, An Evaluation of Cooling Tower Plume Studies Done for the Brayton Point Generating Station, MFG, Inc., July, 2003.

[45] Hatch, Brayton Point Power Station Cooling Towers Noise Impact Assessment, September 29, 2003.

[46] The Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437 Vol. 1), 4.3.7 Noise Impacts, U.S. Nuclear Regulatory Commission, May 1996, stated the following general points regarding noise at power plants: "Natural-draft and mechanical-draft cooling towers emit noise of a broadband nature, whereas transformers emit noise of a specific tonal nature .... Because of the broadband character of the cooling towers, the noise associated with them is largely indistinguishable and less obtrusive than transformer noise or loudspeaker noise. Transformer noise is distinct because of its specific low frequencies. These low frequencies are not attenuated with distance and intervening materials as much as higher frequencies are; thus, low frequencies are more noticeable and obtrusive. However, at most sites employing cooling towers, transformer noise is masked by the broadband cooling tower noise."

Response #: IV.92	**Document #**:1177

Comment
One commenter asked the company to "... consider using 30 cooling towers ..." as an alternative to the company's proposed 20-cell tower.

Response
EPA understands this comment to suggest that the company could expand its multi-mode cooling tower design to incorporate more cells, thereby providing cooling capacity for more operating units. As previously stated, EPA is basing this permit on the entire station closed-cycle cooling system and does not believe that modifications to the enhanced multi-mode system would provide the reduction of heat and flow needed to satisfy the CWA.

Response #: IV.93	**Document #**:1210

Comment
One commenter questioned the use of cooling towers for saltwater and stated that "... the technology should be proven before we implement it ...."

Response
Cooling tower technology, including cooling towers using salt and brackish water, has been installed at numerous plant locations throughout the United States and the world. The use of cooling tower technology at these plants demonstrates that it is both available and effective for use at power plants. For more detailed discussion of the availability and appropriateness of cooling tower technology, see EPA's responses regarding best available technology elsewhere in this document.

Response #'s: IV.94	**Document #'s**: 1148

Comment
One commenter supported the Draft Permit but asked EPA to reconsider dry cooling as BAT for thermal discharges and BTA under § 316(b). The commenter acknowledged that EPA briefly considered dry cooling but the analysis was abbreviated and not carried forward for more detailed analysis. The commenter listed several reasons for EPA to reconsider dry cooling:

1. The land use pattern is likely to remain industrial for the long term (>50 yr) and should be considered for the "long-term amortization schedule as part of the feasibility and wholly disproportionate cost analysis."
2. The Mystic and Fore River plants have expanded and retrofitted using dry cooling, and both are in estuarine locations.
3. Neither USGen NE nor EPA has determined that dry cooling is infeasible at the site.
4. If wet cooling is approved, it will likely result in "attendant consequences on regulatory agencies, taxpayers, and the Mount Hope Bay ecosystem."
5. Any siting of new steam electric generating stations in estuarine areas would probably be limited to facilities with dry cooling only.

Response
EPA believes that its analysis for dry cooling at BPS was adequate for the purpose of setting both CWA § 316(b) intake limits and §§ 301/304 BAT effluent discharge limits. EPA has not pursued analysis of dry cooling further in response to comments.

EPA agrees that the land use pattern is likely to remain industrial but notes that it based its cost on the expected useful life of the equipment. EPA agrees that the above-mentioned facilities have been expanded and use dry cooling, but disagrees that the facilities have "retrofitted" existing generating units with once-through cooling systems with dry cooling. Instead, these facilities involved installation of new units with dry cooling at the sites of existing power plants.

While EPA agrees that that Agency has not actually determined that dry cooling would be impracticable at BPS, we also have not been able to determine that it would be practicable. This is because we have been unable to find a single example of a power plant converting existing generating units from open-cycle cooling to entirely closed-cycle cooling using dry cooling technology. Furthermore, we recognize that such a conversion would be a significantly more complex engineering task than a conversion to closed-cycle cooling using mechanical draft wet cooling towers, would likely pose more difficult problems related to space constraints at the site, and would be much more expensive.

EPA disagrees that any siting of new facilities in estuarine locations would necessarily be limited to dry-cooled facilities. As an example, the recently permitted Newington Power Plant in Newington, New Hampshire, is located adjacent to an estuary and uses wet cooling towers. As EPA has explained, the use of wet mechanical draft cooling towers can achieve an approximately 95 percent reduction in water use as compared to an open-cycle cooling system.

Response #'s: IV.95-110	**Document #'s**: 1132, 1133, 1150, 1175

96. Comment

One commenter stated that EPA did not show that allowing BPS to switch to once-through cooling for 122 hours per year—thereby allowing up to 6.8 billion gallons per year of additional water withdrawal over that which is allowed by the 56 MGD limit associated with closed-cycle cooling—would minimize adverse environmental impacts as required by CWA § 316(b). The commenter further stated that while EPA appears to have concluded that this allowance would not significantly increase entrainment and impingement, the Draft Permit provides no estimate of what the increased losses would be. The commenter stated that the allowance of an additional 6.8 billion gallons of withdrawal per year over the 56 MGD limit "raises questions" about whether CWA § 316(b)'s BTA requirements have been met or whether, instead, the proposed limits are too lenient. The commenter also stated that fogging and icing concerns related to closed-cycle cooling did not warrant such a variation from the general intake flow limit and that these concerns could be addressed, if necessary, under standard permit bypass conditions (citing 40 CFR § 122.41(m)). The commenter states the view that the Draft Permit "creates a set of perverse incentives for the applicant" that will likely lead to BPS switching to once-through cooling more than is necessary, at a potential cost to the fishery. (1132)

Response

The 122 hours of once-through cooling comes from the § 316(a) variance-based thermal discharge limits and what EPA has determined is sufficient to assure the protection and propagation of the BIP. EPA believes that the additional 122 hours (5 days) of once-through cooling per year would not significantly increase entrainment and impingement in light of the large reduction the permit requires, and that adverse environmental impacts will still be minimized. In addition, in response to comments from the RI DEM, EPA has included as a condition in the permit the restriction that once-through cooling may not be used during the winter flounder spawning season (February through May). This will help reduce the entrainment affects of any once-through cooling operations. EPA has also noted that the 122 hours of once-through cooling will have the added advantage of giving BPS a potential additional option of dealing with cooling tower plume hazards, if any, that might develop (albeit not during the winter flounder spawning season). These hours may be sufficient to offset the plume-based hazard predicted by the permittee, except during the winter flounder spawning season. It should be noted that EPA questions

the permittee's prediction of the hazard and believes the permittee is overstating it, as is discussed elsewhere in this document. Finally, EPA does not believe that the bypass regulations (40 CFR § 122.41(m)) would properly apply to a situation such as this, where the potential problem is foreseen and can be dealt with either technologically (with plume abatement towers) or by shutting units down if no other choice exists. Of course, if a shutdown itself would cause problems meeting the bypass standard, then the bypass regulations might apply.

97. Comment

Several commenters agreed with EPA's legal assessment of BTA in the Permit Determinations Document. (1132, 1175) They noted that CWA § 316(b) requires that the design, construction, location, and capacity of cooling water intake structures reflect the BTA for minimizing adverse environmental impact. One commenter noted that in its preamble to the 1976 regulations for BTA, EPA interpreted § 316(b) as requiring EPA to "select the most effective means of minimizing ... adverse effects." (1132) The commenter further noted that EPA also reads an economic element into availability analysis—citing House Report comments on the 1972 CWA amendments that BTA "is intended to be interpreted to mean the best technology available commercially at an economically practicable cost"—and states that EPA thoroughly addressed this element in its BTA analysis. (1132)

Response

EPA agrees with these comments, but would add that EPA has also interpreted CWA § 316(b) to authorize the application of a wholly disproportionate cost test in assessing the appropriateness of the costs to be incurred by a regulated entity (or entities) to comply with BTA-based cooling water intake structure requirements. These issues are discussed in detail in EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document.

98. Comment

Several commenters agreed with EPA's determination that closed-cycle cooling constitutes BTA at the station and is the only option that would adequately minimize environmental impacts. (1132, 1133) One commenter noted that closed-cycle cooling is clearly an available technology, as demonstrated by the many existing once-through plants that have converted to closed-cycle cooling. (1132) Another stated that even the intake and discharge of a closed-cycle cooling system would necessitate a variance from State water quality standards. (1133) While these commenters supported the permit limits based on the availability of closed-cycle cooling, they did raise questions regarding whether the Draft Permit's proposed CWA § 316(b) requirements were too lenient largely because of the allowance given for 122 hours per year of once-through cooling and because the permit did not require the use of gray water to further minimize water withdrawals.

Response

EPA agrees with the commenters that, based on the facts of this particular case, intake capacity limitations based on changing BPS's once-through cooling system to closed-cycle cooling using wet cooling towers reflect the BTA for minimizing adverse impacts from the operation of the cooling water intake structure. The permittee's own § 316(b) demonstration documents indicate the feasibility/availability of such a retrofit at BPS for all or some of the generating units. For example, the permittee's proposed Enhanced Multi-Mode cooling system involves the retrofit of BPS's cooling system to a partially closed-cycle system, while the permittee also set forth an approach to converting the open-cycle cooling system to closed-cycle using mechanical draft wet cooling towers for all four generating units.

Furthermore, EPA has learned that retrofits from open-cycle to closed-cycle cooling systems have been accomplished at a number of existing power plants. Several of these systems are discussed in EPA's July 22, 2002, Permit Determinations Document. EPA has also learned of additional retrofits of open-cycle

cooling systems to closed-cycle cooling systems that are planned or under way at other existing power plants. For example, EPA knows of conversions from once-through, open-cycle cooling to closed-cycle cooling using mechanical draft wet cooling towers that are planned or under way for all generating units at the following power plants: Georgia Power (Yates Plant); Georgia Power (McDonough Plant); and Wateree Station (South Carolina). In addition, EPA has also learned of two plants in Indiana that have retrofitted "helper cooling towers" to their formerly entirely once-through cooling systems: Cinergy Cayuga and the Hoosier Energy—Ratts power plant. There might, of course, be other plants that have undergone such conversions in the United States or elsewhere, but these are the plants EPA has been able to identify.

EPA recognizes that the permittee has argued that these examples are distinguishable from the case of BPS and do not support the conclusion that such a conversion would work at BPS. The permittee's comments in this regard are addressed in detail elsewhere in this document, but will be briefly addressed here as well. EPA agrees that the facts related to these facilities are not uniformly identical to those at BPS. This will always be the case, however, as no two plants are **exactly** alike. EPA has determined that the plants are similar enough to BPS in critical respects to establish that a conversion from once-through to closed-cycle cooling is generally **available** and would be the **best** performing technology for reducing adverse environmental effects by virtue of the very substantial reduction in intake flow that could be achieved. EPA's July 22, 2002, Permit Determinations Document discusses this in more detail. See also Chapter 4 of the document (discussion of BAT for controlling thermal **discharges**). EPA has also determined that such conversion is specifically feasible at BPS, and the permittee has not provided any compelling arguments to the contrary.

The issues raised regarding State water quality standards, the once-through cooling allowance, and the use of gray water for cooling are discussed elsewhere in this document.

99. Comment

Two commenters noted that consideration of costs is not of key importance in determining BTA under 316(b) and that EPA is obligated to select the "most effective means of minimizing adverse effects." (1132, 1133) One commenter stated that EPA correctly applied the "wholly disproportionate" test in its 316(b) analysis. The commenter pointed out that in the absence of any statutory or regulatory requirement to consider costs, EPA has developed the "wholly disproportionate test," which requires only a general consideration of costs. The commenter pointed to the legislative history indicating that Congress intended the CWA to force new technologies on existing pollution sources and expressly rejected any economic hardship exemptions, noting that Congress accepted the possibility that compliance with the statute could even lead to the loss of jobs and plant closures for power plants. The commenter concluded that any consideration of costs is clearly secondary to the statutory mandate to require BTA to minimize environmental impacts. (1132)

Response

EPA agrees that it has properly applied the "wholly disproportionate cost test" under CWA § 316(b). EPA also agrees that this cost test requires only a general consideration of costs, rather than a detailed, strict cost-benefit test. This test is discussed in detail in EPA's July 22, 2002, Permit Determinations Document.

Nevertheless, in developing this permit, EPA has gone well beyond the minimum necessary consideration of costs and benefits. Other assessments of costs and benefits in the application of the wholly disproportionate cost test under CWA § 316(a) that EPA has seen have been far less detailed. See, e.g., *In re Public Service Company of New Hampshire (Seabrook Station, Units 1 and 2)*, 10 ERC 1257, 1261 (NPDES Permit Application No. NH 0020338, Case No. 76-7; June 17, 1977) (Decision of the Administrator); *In the Matter of Florida Power Corporation, Crystal River Power Plant, Units 1, 2 and*

3, Citrus County, Florida (Findings and Determinations Pursuant to 33 U.S.C. § 1326; NPDES Permit No. FL 0000159), p. 8. Still, although EPA considered costs and benefits in greater detail for the BPS permit than is required under CWA § 316(b), the Agency nevertheless properly weighed this information when applying the wholly disproportionate cost test and making § 316(b) determinations for the permit.

EPA agrees with the commenter that Congress generally intended CWA technology standards to be "technology-forcing" mechanisms that would reduce adverse environmental impacts to the extent achievable with the use of certain levels of available technology. EPA further agrees that Congress understood that there would likely be some adverse economic ramifications, at least for some facilities, from this technology-oriented approach, but that Congress also concluded that environmental improvements would be achieved more quickly as a result and that this was a worthwhile trade-off. See, e.g., *Environmental Protection Agency* v. *National Crushed Stone Association*, 449 U.S. 64, 71 (1980).

EPA also agrees with the commenter that, as a general matter, cost was not intended to be the principal driving force behind a § 316(b) determination. Use of the wholly disproportionate cost test, as opposed to a strict cost-benefit analysis, indicates that the consideration of cost was not to be considered the preeminent factor in setting BTA-based limitations under CWA § 316(b).

Yet, the fact remains that cost **is** relevant to making a § 316(b) determination, as EPA has interpreted that provision of the law. As stated above, EPA applies a wholly disproportionate cost test. Application of this test **could** result in a decision not to impose limitations based on the BTA if its costs would be wholly disproportionate to its benefits. In any event, EPA has applied this economic test to the BPS permit and concluded that the costs of meeting cooling water intake structure capacity limits that reflect BTA for minimizing adverse environmental impact are **not** wholly disproportionate to the benefits of doing so.

Finally, it should also be noted that EPA has also interpreted CWA § 316(b) "best technology available" standard to require consideration of whether the costs of compliance would be economically practicable. In the preamble to the 1976 proposed Final CWA § 316(b) regulations, EPA stated the following:

> No comparison of monetary costs with the social benefits of minimizing adverse environmental impacts, much less a formal, quantified "cost/benefit" assessment, is required by the terms of Act. The statute directs the Agency to insure that enumerated aspects of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. Once such adverse effects have been identified (or, in the case of new structures, predicted) then the effort must be to select the most effective means of minimizing (i.e., "reducing to the smallest possible amount or degree") those adverse effects. The brief legislative history of section 316(b) states that the term "best technology available" contemplates the best technology available commercially at an economically practicable cost. As with the statute, this language does not require a formal or informal "cost/benefit" assessment. Rather, the term "available commercially at an economically practicable cost" reflects a Congressional concern that the application of "best technology available" should not impose an impracticable and unbearable economic burden on the operation of any plant subject to section 316(b). Since the regulations require a case-by-case determination of the best available technology, consideration of the economic practicability of installing that technology must necessarily be conducted on a similarly individualized basis.[41 Fed. Reg. 17388

(April 26, 1976) (Final CWA § 316(b) regulations later withdrawn by EPA after remand by Federal court on procedural grounds)] The economic practicability consideration is discussed in more detail in EPA's July 22, 2002, Permit Determinations Document. EPA has determined that cooling system upgrades capable of enabling BPS to comply with the proposed permit limits based on BTA are not economically impracticable.

100. Comment

Several commenters supported EPA's assessment of the benefits of closed-cycle cooling under 316(b), noting that the statute does not require a strict cost-benefit analysis and supporting EPA's use of the "wholly disproportionate cost" test. (1132, 1133) One commenter believed that EPA appropriately assessed the environmental value of a healthy ecosystem in Mount Hope Bay by multiple methods, including the "benefits transfer" analysis (which underestimated the full ecosystem benefits of closed-cycle cooling), the "per-person recreational and nonuse value" analysis (which more fully captured nonuse values of closed-cycle cooling), and the "habitat-based restoration cost" (HRC) analysis. The commenter concluded that in the absence of readily available, accurate benefit valuation techniques for the full range of values of the aquatic ecosystem, HRC—which is derived from replacement cost methods consistently upheld by courts in natural resources damages cases—is a useful and appropriate method for evaluating benefits under 316(b). (1132) Another commenter believed that the HRC analysis might actually underestimate the public costs of pollution from BPS. (1133)

Response

EPA generally agrees with the comments, with the following clarifications and qualifications.

All of the methods of monetizing the benefits of the environmental improvements that would result from compliance with the new permit result in imperfect estimates. It is simply not possible to measure those benefits completely and with total accuracy. This is especially true when it comes to trying to develop monetary estimates of the nonuse value of these ecological improvements. Thus, all of EPA's benefits values are estimates. The same is true of the benefits values proposed by the permittee in its comments on the Draft Permit. (It should be noted that the permittee provided no analysis of benefits with its CWA § 316(b) demonstration documents, though it cited certain benefits values with no explanation of how they were derived. The permittee also did not develop any estimates of nonuse values.)

In response to this problem of unavoidable uncertainty about the "correct" benefits figures, EPA took several steps that it believes are reasonable and appropriate. EPA considered benefits from a qualitative perspective, consistent with sound economic principles. In addition, the Agency considered both use values and nonuse values from a number of analytical perspectives. EPA did not ignore values that are likely to exist simply because it is difficult to calculate them. EPA used various methods to produce a range of values and to judge the likely reasonableness of this range. The Agency provided values from what it referred to as "the benefits transfer analysis" as well as from what it referred to as the "per-person recreational and nonuse value" analysis. Both analyses were conservatively conducted, and the Agency explained the limitations of each. In addition, EPA conducted an analysis to test the reasonableness of the per-person recreational and nonuse values, and the analysis confirmed that values were reasonable.

Finally, EPA also conducted a Habitat Restoration Cost (HRC) analysis based on the Habitat Equivalency Analysis (HEA) method often used in natural resource damages cases. EPA explained that while the HRC analysis did **not** provide a direct estimate of total benefits values, the analysis did provide useful information to consider. First, by generating an estimate of what environmentally sound restoration efforts would cost the public to restore the fish lost to the intake, the HRC figures provide a useful point of comparison with the cost to the permittee of installing the BTA. Second, EPA indicated

that the HRC figures might be useful for gauging the reasonableness of other estimates, since some limited information suggested that these values would likely be less than a total value estimate. The permittee argues that HRC values are just as likely to overstate total benefits values. EPA agrees that it is possible that they will do so, though the information EPA cited in its July 22, 2002, Permit Determinations Document suggests otherwise. EPA certainly does not want to make too much of this point, however, and did not rely on it for its conclusions. Elsewhere in this document, EPA responds in more detail to the permittee's comments on the HRC values. EPA should also state that it agrees with the present commenter that the HRC values might understate the "public costs of pollution." As the text of the HRC analysis explained, its calculations were conservative (i.e., would tend to understate HRC values) in a number of respects.

EPA did not conduct a full-blown, site-specific contingent valuation study to assess nonuse values for the resources in question because the Agency did not have the money or time to complete such an analysis. Nor is such an analysis needed here. As discussed in EPA's July 22, 2002, Permit Determinations Document, the consideration of costs (and benefits) necessary to apply the wholly disproportionate cost test under CWA § 316(b) need not be precise, and a detailed cost-benefit analysis is not required. Furthermore, while the permittee suggests in some of its comments that a contingent valuation study is the only acceptable means to estimate nonuse values, EPA believes there are also other reasonable, cost-feasible ways to estimate such values, such as the per-person nonuse value analysis that the Agency conducted. This approach is a type of "benefits transfer" analysis.[47]

Despite the fact that EPA was not required to develop precise cost and benefit estimates, EPA also made certain improvements to its benefits analyses in response to specific criticisms that the permittee presented in its comments. These improved analyses help to provide a modified range of benefit values. These revised values, however, continue to support the conclusion that the costs of meeting the permit limits are **not** wholly disproportionate to the benefits that would result.

EPA's original benefits analyses for the Draft Permit are discussed in detail in EPA's July 22, 2002, Permit Determinations Document as well as elsewhere in this document, while EPA's modified benefits analyses are discussed in more detail elsewhere in this document.

101. Comment

One commenter stated that, contrary to what the permittee urges EPA to do, EPA is barred from relying on a cost-benefit analysis to determine permit requirements necessary to satisfy CWA § 316(b).

Response

EPA agrees that under the language of CWA § 316(b) and EPA's existing interpretations of the provision, the Agency would be barred from setting permit limitations under § 316(b) based solely on a strict cost-benefit analysis. At the same time, as EPA has explained in detail in the July 22, 2002, Permit Determinations Document and elsewhere in this document, EPA has long interpreted CWA § 316(b) to authorize the Agency to apply the wholly disproportionate cost test. This does, of course, involve a consideration of costs and benefits, but it does not require a strict cost-benefit test. As is also discussed in EPA's July 22, 2002, Permit Determinations Document, the Agency has not changed its interpretation of § 316(b) to bar **all** consideration of costs and benefits in response to the case of *Whitman* v. *American Trucking Association*, 531 U.S. 457 (2001).

[47] It should be noted that, as discussed above, EPA used the phrase "benefits transfer analysis" to refer to one of the specific benefits analyses that EPA carried out for the Draft Permit. This was probably a poor choice of labels in that "benefits transfer" more generally refers to the class of analytical approaches that try to use values from studies in the literature to serve as part of the basis for value estimates in other specific cases.

102. Comment

One commenter stated that the environmental benefits of reducing cooling water intake had not been adequately assessed. The commenter noted that: (1) complete costs to be incurred by the permittee are being compared to a restricted subset of benefits, a comparison that greatly underestimates the value of Mount Hope Bay and the total impacts of BPS's operations; (2) the company erroneously compared the estimated losses at the plant to the broader regional stock rather than the populations in the specific waterbody at issue; (3) only a subset of the species impacted by entrainment and impingement are valued, and this results in an underestimate of the benefits of reduced impacts; and (4) RI DEM employee Mark Gibson's 2002 estimate of "ex-vessel" losses due to BPS's operations also underestimates natural resource damages caused by BPS because the analysis leaves out many important factors, as Gibson acknowledges. The commenter concluded that, as a result, the comparisons of costs and benefits that have been presented are inadequate and are skewed to understate the benefits. (1133)

Response

It should be remembered that CWA § 316(b) does not require either a strict or precise cost-benefit analysis. Consideration of costs and benefits using reasonable approaches to developing estimates is sufficient for EPA's § 316(b) determination for the permit.

EPA has determined that, as is often the case, there is significant uncertainty surrounding the estimates of both the cost of upgrading the BPS cooling system to meet the new permit limitations, and the monetized value of the environmental benefits to be achieved from these improvements. Neither monetized benefit values nor future costs can be predicted with total completeness and accuracy. While some elements of a cost estimate more readily lend themselves to precise prediction (such as the cost of a particular piece of equipment), the reality is that the assessment of the cost over time of making technological and associated operational changes at a power plant is a predictive exercise that unavoidably depends on the use of assumptions, predictions, and models regarding facts and the relationships between facts that may or may not accurately reflect reality. For example, cost estimates in this case depend not only on estimates of the cost of equipment, but also on estimates of construction needs, labor costs, discount rates, future electricity prices, and many other factors.

The fact that the permittee has submitted very detailed estimates of the costs of retrofitting closed-cycle cooling at BPS, and very little information concerning benefit estimates (no nonuse value estimates and no detailed estimates whatsoever in its CWA § 316(b) demonstration), should not lead one to forget that these cost figures are still just imperfect estimates. Of course, it may **become** possible to more accurately quantify the cost of installing a new technology **after** it has been put in place and operated over time, whereas benefits figures will forever be imperfect estimates. Yet, that does not change the fact that the costs EPA is dealing with here are still imperfect, predictive estimates. Even the permittee has indicated that its costs were proffered with an estimated +/- 25 percent degree of accuracy; and this stated range of error is itself only a rough estimate.

In light of all this, EPA has tried to review both cost and benefit figures with an appropriately critical eye. The Agency has considered the cost and benefit estimates provided by the permittee and any other parties (such as Mark Gibson's benefits analysis), and has developed its own independent estimates using multiple appropriate methods. From this work, the Agency has estimated a reasonable range of values for both costs and benefits. Taking these figures into account together with a qualitative (i.e., nonmonetary) assessment of the aquatic environmental benefits of complying with the permit, along with a consideration of other relevant factors, such as nonwater environmental effects and energy effects that might arise from the installation of a closed-cycle cooling system, EPA has concluded that the costs of complying with the permit's CWA § 316(b)-based requirements are not wholly disproportionate to the benefits. Cost and benefit estimates and analyses are presented and discussed in detail in EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document.

Turning to the more specific comments summarized above, EPA offers the following responses. First, EPA agrees that its benefits estimates are incomplete in several important ways and that, as a result, these estimates would tend to understate benefit values. For example, as the commenter mentions, no benefit is calculated for some of the fish that would be saved by the plant complying with the proposed permit limits. In its benefits analyses, EPA has tried to identify factors in the analysis that are likely to yield an underestimate of benefits. EPA has also tried to identify factors that might tend to yield an overstatement of benefits. On balance, EPA believes its estimates are likely to be reasonably conservative (i.e., most likely would tend to understate benefits). In addition, in light of the unavoidable inability to fully calculate benefits, EPA has considered benefits from a qualitative perspective as well. Second, EPA also agrees that Mark Gibson's ex-vessel benefits analysis only attempts to quantify a small segment of the total benefits, as Gibson recognizes himself.

Third, EPA agrees that the effect of BPS's intake should be assessed in terms of estimated losses as compared to the populations that should exist in the specific source waterbody at issue (i.e., Mount Hope Bay), rather than solely in terms of a comparison of estimated losses at the plant to the broader regional stock. The permittee emphasizes the latter comparison, and EPA did in fact consider it, but we agree with the commenter that relying on it alone would mask the actual magnitude of the adverse environmental impact of the power plant's impact on the specific receiving water, which is relevant under CWA § 316(b) and applicable water quality standards.

103. Comment

One commenter agreed with EPA's conclusions regarding costs to PG&E, and further noted that societal costs are minimal because: (1) while increased costs might cut into PG&E's profits, it is unlikely that there would be any impact at all on consumers; (2) BPS's costs are consistently so much lower than the market price that the plant is extremely profitable and will continue to be so even after new controls are installed; and (3) the New England electricity supply is adequate even without BPS. The commenter stated that BPS's owners have been making "extra" profits for decades by operating under a variance and violating State water quality standards, while harming the environment. The commenter also stated that with a closed-cycle system the plant would make further profits due to the "Avoided Load Loss" during peak demand conditions. The commenter noted that if EPA was to consider any of BPS's cost arguments, it also should recognize the costs incurred by the State of Rhode Island—costs to its environment, to commercial fishing, to the recreational industry—all while BPS used the State's natural resources free of charge. (1132) The commenter stated that fishing is a major economic driver in Rhode Island, generating 4,687 jobs and $758 million in direct sales and a total economic impact of $1.7 billion. The commenter also stated that the City of Fall River has undertaken a $150 million CSO project to help restore the bay, and the City supports the permit to address the impacts of the major source of pollution in the bay. The commenter concluded that it was "time for PG&E to do its part." Accordingly, the commenter concluded that the costs associated with closed-cycle cooling are "clearly not disproportionate to the significant benefits associated with the restoration" of the Mount Hope Bay ecosystem.

Response

The commenter agreed with EPA's assessment of the cost to the permittee of complying with the permit. EPA notes that it has made some adjustments to its cost estimates based on comments received, and the revised cost estimates are discussed in detail elsewhere in this document. This has resulted in some increase in the range of compliance cost estimates, but these changes have not been so significant as to change EPA's final permitting determinations under CWA § 316(b).

The commenter also stated that the **cost to society** would be "minimal" were the permittee to incur the compliance costs. How one assesses the cost to society, of course, depends on how one defines those costs. The commenter stated that while the compliance costs might reduce the permittee's profits, it would have little effect on consumer electric rates. EPA agrees that it is appropriate for the Agency to

consider the possible effect of compliance costs on consumer electric rates. Thus, EPA undertook a detailed analysis of the issue for the Draft Permit, and concluded that the effect was small and did not alter its conclusions regarding BTA-based intake limitations under CWA § 316(b).[48] While the permittee has at times conceded that the compliance costs would not cause any significant consumer rate impacts—only profit impacts—the permittee did submit comments questioning some aspects of the Agency's consumer rate. These are responded to elsewhere in this document. Having considered the comments received, EPA has concluded that its rate analysis was reasonable and appropriate. EPA has, however, produced somewhat modified estimates of consumer rate effects. These modifications occur largely because EPA's compliance cost estimates have been revised to some degree. The new rate effect estimates are discussed in detail elsewhere in this document. It is sufficient to say here that EPA continues to conclude that the consumer rate impacts will be small and do not alter the Agency's conclusion regarding CWA § 316(b) limitations.

EPA also proposed a "social cost" analysis that translated the estimated cost of compliance to the permittee to a cost-to-society framework consistent with economic theory. EPA has also revised its social cost analysis in response to comments, most especially the revised technology cost estimates. In this context, EPA does not agree that there are no social costs of complying with the CWA § 316(b) requirements, but it believes these costs are **not** wholly disproportionate to the benefits to society of doing so.

The commenter agreed with EPA's conclusion that the cost of complying with the permit limitations is likely to cut into BPS's profits, but that this should not be so severe as to lead to the shutdown of the plant. The commenter further agreed that BPS's low-cost generation makes it highly profitable under the current deregulated electricity market, and that it should remain highly profitable even after incurring expenses for complying with the NPDES permit. BPS itself appears to agree that the costs of compliance will reduce profits but not lead to a shutdown. BPS argues, however, that the plant will suffer economically more than EPA concluded because the Agency has underestimated the expense of the cooling system improvements and overestimated BPS's profitability. EPA addresses these comments elsewhere in this document, but notes here that while the Agency has made some revisions to its calculations in response to comments, it continues to conclude that the necessary compliance measures are technologically and economically feasible and their costs are not wholly disproportionate to their benefits.

Third, the commenter stated that New England's electric supply would remain adequate even without the electricity provided by BPS. EPA believes that it is not necessary to resolve this issue for the permit, because the permit should not result in the closure of the power plant. Indeed, the permittee did not argue that it would. That being said, it does appear that there is presently adequate electric capacity to meet the region's demand even if BPS were to shut down. See ISO New England CELT Report and Press Release (April 2003) (AR 3171). Furthermore, since many power plant expansion proposals have been put on hold or terminated due to the adequacy of the region's electricity supply, if BPS shut down, and more

[48] In its "Initial Decision" re Permit No. NC0007064 concerning the Brunswick Station power plant in North Carolina, EPA Region 4 determined that the cost of retrofitting the power plant with cooling towers was not wholly disproportionate to the benefits of doing so where installing cooling towers would result in an average 2.5 percent increase in residential consumer electric rates, but as a result of flow restrictions would achieve a 96 percent reduction in adverse impacts. See *In the Matter of Carolina Power and Light Company (Brunswick Steam Electric Plant, Units 1 and 2)* [(National Pollutant Discharge Elimination System Permit No. NC 0007064)] (Decision by EPA Region 4) (November 7, 1977). See also May, J. and van Rossum, M., "The Quick and the Dead: Fish Entrainment, Entrapment, and the Implementation and Application of Section 316(b) of the Clean Water Act," 20 Vt. L. R. 373, 412 (1995).

electricity was needed in the region, new generating capacity could likely be brought on line to meet that need.

Still, a closure of BPS would be a very significant occurrence in many respects because BPS is a large plant that provides relatively inexpensive electricity to the grid. As a result, its three coal-burning units are baseload generators. If these units shut down and were replaced by more expensive generation, it would likely raise consumer rates to some extent. Some idea of the effect can be gleaned from EPA's analysis of the temporary rate effect that would occur from temporary unit shutdowns during construction for cooling system retrofits. Making this type of rate impact permanent, however, would extend this effect over time, resulting in a much greater potential effect, though the impact would not necessarily be so significant as to render the proposed permit limits inappropriate. The overall effect would depend on the price of the generation that replaced BPS's generation. A closure of the power plant would also obviously harm the plant's employees and, as is discussed elsewhere in this document, would eliminate a major source of tax revenue to the Town of Somerset. At the same time, the long-term effect on the Town would depend on what replaced the facility on the peninsula. Finally, a closure would also result in a substantial reduction in air pollutant emissions in the region, since BPS is the region's largest single facility emitter of ozone-forming pollutants, particulates, and greenhouse gases. Such reductions might provide public health and environmental benefits, and would create room for other emission sources to increase their emissions without preventing the state from meeting CAA standards.

In any event, EPA does not believe there is a realistic likelihood that achieving compliance with the NPDES permit will cause BPS to be closed. Therefore, there is no need to assess these issues further.

EPA agrees that if one posits that BPS should have been required to install these cooling system improvements in the past, then one can say BPS has reaped an "economic benefit" from being allowed to delay the expenditure. This is discussed in EPA's July 22, 2002, Permit Determinations Document. At the same time, however, past permit limits did not expressly command that that BPS make these cooling system improvements. EPA also agrees that its current understanding of the plant's contribution to damaging the ecology of Mount Hope Bay, including its fish populations, indicates that the plant has harmed the environment and the natural resources of the United States, the Commonwealth of Massachusetts, and Rhode Island. This has included killing fish and harming habitat in order to make electricity, which is not a beneficial use of those public resources. EPA recognizes the economic importance of fishing to the Rhode Island economy.

EPA agrees that with cooling towers in place, BPS would be able to generate more electricity during peak demand (i.e., hot summer months) without causing permit violations. This should result in increased profits at those times. However, while this will offset the costs of installing cooling towers to some extent, EPA's analysis indicates these profits will be more than offset by the cost of installing and operating the cooling towers. Thus, the cooling tower installation would still be a net loss of profits for the company. The permittee's analysis of this issue essentially agreed with these general points. EPA's detailed analysis in this regard is presented in EPA's July 22, 2002, Permit Determinations Document and is further discussed elsewhere in this document.

Like the commenter, EPA has also noted the steps taken by parties other than BPS to improve the environmental condition of the Mount Hope Bay ecosystem. These steps have included fishing restrictions and greater water pollution control by parties such as the City of Fall River. These steps do not by themselves indicate that BPS is required to do anything in particular; BPS must do what it is required to do by the CWA. However, it is pertinent to recognize and acknowledge that other factors contributing stress to the Mount Hope Bay ecosystem are being addressed.

EPA also agrees with the commenter that the costs of complying with the permit proposed by EPA are not wholly disproportionate to its benefits.

104. Comment
One commenter concluded that while EPA was correct in deciding the overall BTA standard, it erred under 316(b) in not fully assessing the "gray water" option (i.e., using treated wastewater effluent for cooling water) for minimizing adverse environmental impact. The commenter conceded that the marginal benefits of this option might not justify the potential detriments, but believed that more analysis is necessary to determine the benefits of using a gray water system. The commenter pointed out that a gray water system could reduce the intake flow by 20 MGD (about 2 percent of the entire daily flow). (1132)

Response
The commenter agreed with EPA's overall BTA determination and indicated that EPA's judgment, as discussed in EPA's July 22, 2002, Permit Determinations Document, that the possible detriments of bringing gray water to BPS for cooling water purposes would not justify the potential detriments of trying to develop that project, might be correct. Nevertheless, the commenter pointed out that gray water from Fall River could reduce intake water needs by approximately 20 MGD and argued that EPA did not consider the gray water issue fully and must evaluate it further.

EPA believes that it discussed the "gray water option" in reasonable and appropriate detail in § 7.3.4a(i)(B) of its July 22, 2002, Permit Determinations Document. EPA continues to believe that it is not clear that the gray water option would be feasible, and does not believe that it warrants more detailed analysis at this time. It also should be remembered that this is not an option that the permittee is capable of implementing at BPS on its own. It would need to reach an agreement with a nearby source of a large amount of gray water—most likely the City of Fall River POTW—in order to make this approach possible. Such an agreement would need to be negotiated, and environmental permitting issues related to any proposed cross-bay pipeline for transporting the gray water would need to be resolved. Even assuming all these issues could be resolved, reaching such resolution could take significant time. It would also take time to construct the pipeline to deliver the gray water. All of this could potentially add significant delay to implementation of cooling system improvements.

Therefore, EPA is not prepared to set CWA § 316(b) intake limits based on a determinion that using gray water in conjunction with cooling towers constitutes the BTA for minimizing adverse environmental impacts. At the same time, of course, EPA is in no way **prohibiting** or otherwise precluding the permittee from pursuing this option. If the permittee wishes to pursue the option and can do so while complying with applicable laws, EPA is not standing in its way. (As stated in the July 22, 2002, Permit Determinations Document, however, EPA does believe that further analysis of any potential public health effects from cooling tower air emissions arising from the use of gray water would be warranted.)

105. Comment
One commenter stated that the permittee's February 2001 submittal to EPA did not even attempt to demonstrate that the facility would meet the requirements of § 316(b) and that even the information provided by the permittee as late as December 2001 did not provide the required § 316(b) demonstration. The commenter noted that the permittee refused to determine whether its proposal reflected BTA for minimizing adverse environmental impacts, as required by the CWA, and instead limited its review to technology that would reduce its heat and flow to pre-1984 levels. (1133)

Response
EPA agrees that the permittee's February 2001 submittal was inadequate with respect to providing a CWA § 316(b) demonstration. Issues that needed to be addressed were not addressed in either that

submission or the later May 2001 "Partial 316(a) and (b) demonstration" document. It was not until its December 2001 submission that the permittee finally addressed the CWA § 316(b) issues in any detail.

106. Comment
One commenter noted that there is no support for the permittee's argument that its operations must result in "actual substantial harm" in order for there to be an "adverse environmental impact" under CWA § 316(b). The commenter stated that there is, nonetheless, ample evidence that BPS's operations are causing actual and substantial harm. (1133)

Response
EPA largely agrees with these comments. EPA's views on these issues are discussed further in the Agency's July 22, 2002, Permit Determinations Document and elsewhere in this document.

107. Comment
One commenter charged that the cost arguments raised by the permittee and others are legally irrelevant and factually unsupported because consumer rate effects are not relevant to the factors that EPA is required to consider in establishing permit conditions. Even if they were relevant, however, they do not merit consideration here because the cost of pollution controls will not be automatically passed on to consumers, since BPS will rarely set the energy clearing price. This commenter hired an expert consulting firm which conducted an analysis concluding that the cost of pollution controls to comply with the Draft Permit conditions would not impact BPS's overall profitability. The commenter also stated that PG&E-NEG's overall financial instability is irrelevant to the profitability of BPS and the setting of permit requirements for the plant. (1150) Commenters further stated that New Englanders have no interest in "encouraging PG&E to use BPS as a cash cow to plug financial holes in other far-flung operations," (1150) and that massive corporations like the permittee "must not offset losses for operating other power plants against Mount Hope Bay." (1133)

Response
EPA believes that cost arguments are relevant in the development of case-by-case CWA § 316(b) cooling water intake requirements as well as in the development of case-by-case CWA § 301 technology-based thermal discharge requirements. The manner in which costs must be considered for each is discussed in Chapters 7 and 4, respectively, of EPA's July 22, 2002, Permit Determinations Document, as well as elsewhere in this document. EPA also believes that consideration of consumer electric rate effects can be a relevant consideration in assessing costs while applying the wholly disproportionate cost test under the CWA § 316(b). This is also discussed in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document as well as elsewhere in this document.

EPA agrees with the comment suggesting that the costs of compliance in this case will not have a particularly significant consumer rate effect, and that this rate effect should not alter the permit limitations. In response to comments, EPA has somewhat increased its earlier consumer rate effect estimates, but these revisions do not change the ultimate conclusion. Consumer rate effects are also discussed in more detail in Chapter 7 of EPA's July 22, 2002, Permit Determinations Document, as well as elsewhere in this document.

EPA does not believe that it needs to respond to the details of the report by the commenter's consultant. This report concluded that the cost of pollution controls to comply with the Draft Permit conditions would not impact BPS's overall profitability. EPA has also concluded that the cost of making the cooling system improvements needed to comply with the permit are affordable and are not wholly disproportionate to the benefits of such compliance. As a result, the permittee will be required to comply with the permit's limitations (i.e., the performance standards in the permit) and will need either to install the expected cooling tower system or to implement some other lawful plan for complying with the

permit's limits. EPA has also concluded that BPS should remain a profitable plant even after incurring the costs of complying with this permit. However, it should be noted that, beyond consideration of whether costs are impracticable, whether or not a plant retains some specific level of profitability is not a necessary condition for imposing particular CWA § 316(b) limitations. Therefore, while noting that the commenter's consultant's analysis generally agrees with EPA's conclusion that the plant will remain profitable even after incurring the costs of compliance, EPA does not believe it needs to respond to the details of the analysis with respect to exactly how profitable BPS will be. It is enough for the Agency to acknowledge that the analysis agrees with EPA's conclusion that the costs of compliance are not impracticable.

EPA essentially agrees with the comment that PG&E-NEG's overall financial instability is irrelevant to setting permit requirements for the plant. As a baseload, coal-burning facility, BPS should be able to profitably generate and sell electricity in New England regardless of problems at other plants within the PG&E-NEG business family or problems with other aspects of PG&E-NEG's business (e.g., energy trading). The bottom line is that the facility must meet CWA standards and the cost of doing so appears to be practicable. It is irrelevant under the CWA whether these costs are incurred by the current owners of the facility or by some new owner after the plant has been sold.

EPA also agrees with the comment that losses in other aspects of the company's business cannot be a legitimate excuse for damaging the environment of Mount Hope Bay in contravention of CWA standards.

108. Comment
One commenter expressed concern that the Draft Permit allows the permittee considerable flexibility in seeking exceptions from full utilization of the closed-cycle cooling system, including time for periodic exceedances of thermal discharge limits. The commenter urged EPA to require that any exception be subject to a demonstration of need by the permittee. (1133)

Response
EPA has discussed this issue elsewhere is these responses to comments. Here we only add that the permit does **not** allow "periodic exceedances of thermal discharge limits." The limits contemplate a stated number of hours of open-cycle cooling.

109. omment
Several commenters stated that EPA has broad discretion in considering costs under § 316(b). One of these commenters further stated that in the context of applying the "wholly disproportionate cost test" under CWA § 316(b), EPA does not have to determine the water quality impact of effluent controls or the economic impact of controls on any specific plant. The commenter cited "*Chemical Manufacturers Assn.* v. *U.S. EPA*, 870 F.2d 177, 204 (5th Cir. 1989) (citing 1972 CWA Leg. Hist. at 170)," in support of the point. (1133)

Response
EPA agrees that the Agency has considerable discretion in considering costs under CWA § 316(b). EPA must, of course, act in a manner consistent with the CWA and with the standards of the Administrative Procedures Act (i.e., the Agency's consideration must neither be arbitrary nor capricious, nor otherwise inconsistent with applicable law). Consistent with the Agency's interpretation of CWA § 316(b), the Region has applied the wholly disproportionate cost test in developing this permit. Within the parameters described above, however, EPA also has considerable discretion in determining how to assess costs and benefits, and then how to assess their relative weights in drawing a conclusion regarding whether or not the costs are wholly disproportionate to the benefits.

As to the second portion of the comment, EPA agrees with it in some respects, but disagrees with it in other respects. EPA agrees that the CWA does not require it to assess the water quality impacts of implementing BAT technology standards for thermal discharges. The Agency believes, however, that it **does** need to assess the environmental effects of implementing BTA requirements under CWA § 316(b). This is because CWA § 316(b) requires that the construction, location, design, and capacity of cooling water intake structures "reflect the best technology available for minimizing adverse environmental impacts." This standard necessarily requires the evaluation of the environmental effects of different technology options to determine whether adverse impacts have been minimized. By contrast, the adequacy of effluent discharge limitations are to be judged according to the specific applicable technology standard (i.e., BCT, BPT, BAT, or new source standards) **and** the technology's ability to achieve or make technologically and economically feasible progress toward achieving the statutory goal of **eliminating** pollutant discharges without the Agency's having to assess the environmental import (i.e., water quality benefit) of achieving the reduced discharge of each specific pollutant. See 33 U.S.C. § 1311(b)(2)(A). Effluent technology standards are discussed in detail in Chapter 4 of the EPA's July 22, 2002, Permit Determinations Document and elsewhere in this document.

EPA agrees that, in developing national technology standards under CWA § 316(b), the Agency is not required to evaluate the environmental effects at individual plants, but rather can assess the effects that would ensue at a national level. At the same time, however, when EPA is implementing § 316(b) on a case-by-case, BPJ basis, EPA interprets the statute to require the assessment of environmental effects at the case-specific level. It is clear to the Agency that this is the appropriate application of the law. The alternative—i.e., that the Agency would attempt to assess environmental effects on a national basis—would clearly make no sense in the context of a case-by-case application of § 316(b). This view is consistent with that stated by EPA in the preamble to EPA's final § 316(b) regulations issued in 1976. 41 Fed. Reg. 17388 (April 26, 1976) (these regulations were later remanded to EPA on procedural grounds).

The same analysis largely holds with respect to the consideration of costs as well. In other words, when developing national technology standards under CWA § 316(b), the Agency is not required to evaluate costs at particular plants, but rather can assess economic issues at the national level. (Note: the manner in which costs must be considered under CWA § 316(b) is discussed in detail in EPA's July 22, 2002, Permitting Determinations Document in Chapter 7 as well as elsewhere in this document.) At the same time, however, when EPA is implementing § 316(b) on a case-by-case, BPJ basis, EPA interprets the statute to require the assessment of costs at the case-specific level. In addition, EPA's regulations for setting effluent limitations on a case-by-case basis indicate the same thing, 40 CFR § 125.3(d)(3)(v). By analogy, this also supports EPA's view regarding setting case-by-case § 316(b) limitations. Again, it seems clear to the Agency that this is the appropriate application of the law, and that the alternative—i.e., assessing costs at the national level—would make no sense in the context of the case-by-case application of § 316(b).

Finally, it should be noted that the *Chemical Manufacturers* case, and the legislative history cited therein, deals with the development of § 301 effluent discharge limitations on a national basis, rather than § 316(b) intake limits, and rather than case-by-case limits of any sort. Therefore, this case does not contradict EPA's analysis of these issues.

110. Comment

One commenter noted that in applying BPJ to determine BTA, EPA has broad discretion to conclude that closed-cycle cooling is widely available and economically achievable, even if costs are not completely (or partially) passed on to ratepayers. The commenter added that EPA is barred from complying with the permittee's request to directly compare costs and benefits of pollutant reduction in determining BTA, and that EPA must focus on considering the best technology available in light of the statutory goal to restore and maintain the physical and biological integrity of the nation's waters. (1133)

Response
Having considered the comments on the Draft Permit, EPA continues to conclude that the facts demonstrate that retrofitting an existing power plant with closed-cycle cooling using mechanical draft wet cooling towers is an "available" technology, and that cooling water intake structure capacity (or flow) limitations based on the use of this technology "reflect the best technology available for minimizing adverse environmental impact" from cooling water intake structures. 33 U.S.C. § 1326(b). EPA also continues to conclude that the facts demonstrate that implementation of this technology **at BPS** is technologically and economically achievable. EPA believes that these conclusions are borne out by its analyses in the July 22, 2002, Permit Determinations Document and elsewhere in this document, and that these conclusions have not been refuted by the public comments received.

EPA agrees that these conclusions are not altered by whether or not the permittee would be able to pass all or some of its compliance costs on to electric consumers. The ability or inability to pass on compliance costs is not a specific criterion for setting CWA technology standards. That being said, the fact is that while utilities in a regulated electricity market could generally recover such compliance costs by passing them on to consumers through electric rate hikes, this is not necessarily the case in the deregulated markets that now prevail in most of New England. Nevertheless, EPA has concluded that the relatively wide profit margins enjoyed by BPS in the New England market by virtue of its relatively cheap production costs mean that it can afford the costs of complying with the NPDES permit and still remain profitable. Again, this is discussed in more detail in the July 22, 2002, Permit Determinations Document and elsewhere in this document.

EPA agrees with the commenter that the Agency should make its CWA § 316(b) determinations consistent with, and in light of, the CWA's overarching statutory purpose of restoring and maintaining the physical and biological integrity of the nation's waters. EPA discussed this consideration in the July 22, 2002, Permit Determinations Document. At the same time, however, as EPA has also explained in the July 22, 2002, Permit Determinations Document and discussed elsewhere in this document, the Agency applies a "wholly disproportionate cost" test in setting CWA § 316(b) permit limitations. While this clearly does not require either a precise or strict cost-benefit analysis, it does require consideration of costs and some weighing of costs and benefits. This issue is discussed in more detail in the July 22, 2002, Permit Determinations Document and elsewhere in this document.

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Comment
One commenter stated that under CWA § 316(b) EPA should focus on benefits and harms to the environment rather than on the permittee's ability or inability to pay for pollution abatement measures. This commenter further stated that cost should not be a key factor in setting requirements under § 316(b) and that EPA is obliged to select the "most effective means of minimizing adverse effects" with only a reasonable estimate of costs.

Response
EPA's view of the role of cost considerations in setting intake limitations under CWA § 316(b) is set forth in Chapter 7 of the July 22, 2002, Permit Determinations Document and elsewhere in this document. EPA's position is that only a reasonable estimate of costs is needed; a precise estimate is **not** required, and EPA applies a wholly disproportionate cost test that considers costs in relation to the benefits of a particular technology option. EPA has also interpreted CWA § 316(b) to require consideration of economic practicability, as discussed in the July 22, 2002, Permit Determinations Document and elsewhere in this document.