AR 4020
EXHIBIT R6

Memorandum

To: Phil Colarusso, EPA-New England

From: Liz Strange, Bob Raucher, David Allen, Dave Mills, Dave Cacela, and Tom Ottem, Stratus Consulting Inc.

cc: Shari Goodwin, Tetra Tech, Inc.

Date: 9/16/03

Subject: Responses to Comments on EPA-New England's July 22, 2002 Determination on the New Draft NPDES Permit for the Brayton Point Station, Somerset, MA

Background

On July 22, 2002, EPA-New England (EPA) presented its determination regarding thermal discharges and cooling water intake structure requirements for the new Draft National Pollution Discharge Elimination System (NPDES) permit being developed under Clean Water Act, 33 U.S.C. §§ 1251 et seq. (CWA) for the Brayton Point Station (BPS) in Somerset, Massachusetts (available at http://www.epa.gov/NE/braytonpoint/index.html). This memorandum concerns the part of the determination relating to § 316(b), which requires that "the location, design, construction, and capacity of cooling water intakes structures reflect the best technology available for minimizing environmental impacts." Such impacts include the impingement and entrainment (I&E) of aquatic organisms by a facility's intake structure.

During the period established for comment on the BPS § 316(b) determination, a number of comments were received concerning analyses conducted by Stratus Consulting on behalf of EPA, including evaluations of I&E at BPS and the potential economic benefits of reducing I&E. As requested by EPA, this memorandum provides responses to these comments.

Response to Comments on Production Foregone Calculations (comments provided on pages 75-77 of document 16/356652.1, page 25 of summary by Foley Hoag, LLP, and in Part II.2 of "LMS Response to EPA MA0003654 Determinations Document")

The permittee argued that production foregone must be calculated using fish weights that reflect the size of a fish at the beginning of an age category rather than at the midpoint of the category, as was done for EPA's production foregone calculations. While using initial weights may be preferable, such data were generally unavailable. Moreover, even when weight data were available, source documents often did not indicate the point in the stage that the weights represented. Because of these data limitations, EPA relied on weight-at-age data and assumed that the weights were for the midpoint of the age category. EPA believes that this approach is reasonable and notes that it does not produce significantly different benefits estimates.

In evaluating EPA's estimates of production foregone, it is important to note the role that estimates of production foregone play in the overall benefits analysis for Brayton Point. Commenting on behalf of the Brayton Point Station, Lawler, Matusky, & Skelly LLP (LMS) (Chapter II.2) describe production foregone as a "critical" component of EPA's analysis. This is not the case. EPA does not assign benefits to production foregone, per se. Rather, production foregone of forage species is valued indirectly with a trophic transfer model that relates foregone forage production to foregone harvest. In the trophic transfer model, estimates of production foregone among the harvested species are considered jointly with estimates of production foregone among the forage species. Therefore, LMS's Table II does not provide an estimate of the net effect on benefits estimates of EPA's method for estimating production foregone.

LMS (Chapter II.2) also suggests that EPA used estimates of size at age for certain life stages of some species that were erroneous. EPA acknowledges that some of the values employed were invalid because of various incorrect biological assumptions and/or clerical errors, and a re-analysis was conducted incorporating these changes (see attached). However, the practical effects of these changes was insignificant with respect to the benefits assessment, primarily for the reason noted above.

Responses to Comments on Stratus Consulting Review of RAMAS Winter Flounder Model Developed by LMS (comments provided in October 3, 2002, document by Professor Raymond Hilborn)

Under the direction of EPA, the objectives of Stratus Consulting's review of the RAMAS winter flounder model were (1) to describe if and how the model could be used to accomplish the modeling tasks established by the Brayton Point technical advisory committee, and (2) to determine if the model was suitable for running additional simulations using alternative assumptions. With these objectives in mind, the review focused on the main features of model structure, including primary state variables and control parameters, and model predictions. Stratus Consulting provided additional comments regarding the lack of agreement between model predictions and stock behavior. The review was not intended to address the full suite of biological considerations that are specific to winter flounder in Mount Hope Bay, nor did it attempt to settle questions about effects of the power station.

Dr. Hilborn takes issue with Stratus Consulting's suggestion that the model could have included several specific geographic and biological characteristics of Mount Hope Bay. Stratus Consulting's review made note of this because one of the initial factors that motivated the selection of the RAMAS modeling tool was the program's capability to model subpopulations by assigning region-specific suites of biological parameters and interregional migration rates. Since none of these features of the RAMAS tool were included in the LMS implementation, we thought it was important to point out that this aspect of the modeling study had not been conducted.

Dr. Hilborn states that the key prediction of the model is that in the absence of fishing and plant effects the population would increase rapidly. We agree that the model predicts an increase in abundance in the absence of fishing and plant effects. The Stratus Consulting report notes this fact, on page 8 ("Model Predictions"), on page 9 ("Optimal Scenario"), and in Figure 4.

Dr. Hilborn also states that harvest rates post-2000 are not 0 and that therefore the model should be re-run with actual harvest rates. The biological parameters in the model, including harvest rates, were determined by the Brayton Point technical advisory committee. As noted in Stratus Consulting's report (page 6), the model implementation in RAMAS uses the parameter entitled "harvest rate" to represent two types of mortality: the conditional mortality rate due to plant operations and fishing mortality. In the RAMAS implementation, the two types of mortality are combined and represented as a single parameter. As such, it is important to indicate clearly whether the proposition to set harvest rates to 0 is intended to represent cessation of fishing, cessation of plant operations, or both. In the post-2000 period modeled by LMS, harvest rate is nonzero because the conditional mortality rate due to plant operations is assumed to continue despite cessation of fishing mortality. The question about the utility of additional model runs using different parameters could be a topic for review by the technical advisory committee.

Dr. Hilborn argues that the model review should have compared model predictions with actual observations. We agree that model verification could have included comparison of model predictions with field observations. However, the review was not intended to provide model verification. The model structure and biological parameters were determined by the technical advisory committee, and therefore the main objective of Stratus Consulting's review was to inspect the implementation of the model in RAMAS, not to comment on the biological validity of the model itself. As noted above, the review was limited in scope and was intended to (1) describe if and how the RAMAS model could be used to accomplish the modeling tasks of the technical advisory committee, and (2) to determine if the model was suitable for running additional simulations using alternative assumptions.

Finally, we agree with Dr. Hilborn that the model predicts population stability in the absence of fluctuating harvest rates. Stratus Consulting's comments on this feature (page 8 of the review) do not express "surprise" at this outcome. Indeed, the feature is not at all surprising because during the post-2000 period the model reflects a constant fishing mortality rate of zero.

Responses to Comments on the HRC Analysis (comments provided on page 30 of summary by Foley Hoag, LLP, pages 6 and 30-34 of comments by Dr. Robert Stavins, and page 89 of document 16/356652.1)

A number of comments were received regarding the habitat-based replacement cost (HRC) analysis of I&E losses at Brayton Point. Major comments were:

> With this method EPA is making one of the gravest errors of economics, confusing benefits and costs. (page 30 of Foley Hoag, LLP and page 6 of comments by Dr. Robert Stavins)
>
> Use of this method has no support in EPA's "Guidelines for Preparing Economic Analyses." (page 89 of document 16/356652.1)

The comments objecting to the use of the HRC as a valuation technique stem from a well-established distinction in economics between costs and values. In economics, the cost of a resource is measured in terms of the goods and services committed to its production, while value is measured in terms of the goods and resources that individuals are willing to forego or exchange in order to obtain the resource (i.e., its opportunity cost). However, in the Brayton Point permit record EPA did not confuse costs and values in its consideration of the HRC analysis.

There is no a priori reason to expect that the cost of a resource has any bearing on its value; the two measures are determined by a separate set of actions. However, EPA agrees with Dr. Stavins's comment that when certain conditions are satisfied, costs do provide a measure of value. As Dr. Stavins notes:

> . . . 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. (pages 31-32 of comments by Dr. Robert Stavins)

Similarly, in a discussion of the use of replacement cost methods for estimating the benefits of improved ecological conditions, EPA's *Guidelines for Preparing Economic Analyses* notes that "willingness to pay is revealed by efforts made to substitute services provided by ecosystems" and states that replacement cost methods are justified

> . . . when individuals are proven willing to incur such replacement costs, through either their voluntary purchases or their support for public works projects. If so, the value of the service is at least as much as the replacement cost. (EPA. 2000. *Guidelines for Preparing Economic Analyses,* page 99)

Thus, both Dr. Stavins and EPA's *Guidelines* note that if replacement costs are voluntarily incurred, they provide information about the value of the resource or ecological services to be obtained or produced. There is substantial evidence that this condition is satisfied for the habitat-based replacement costs developed for Brayton Point:

(1) Replacement cost estimates for submerged aquatic vegetation were based in Narragansett Bay project under the direction of Save the Bay. The project was completed with volunteer labor and donated equipment and services. Thus, the voluntary criteria is satisfied.

(2) Replacement cost estimates for artificial reefs were based on a reef project that was completed as partial compensation for the *North Cape* oil spill in Rhode Island. Because resource trustees were not constrained in their choice of restoration options, it can be assumed that selection of this restoration action was made voluntarily.

(3) Replacement cost estimates for fish passageways were based on projects proposed for the Blackstone River in Rhode Island and general estimates provided by the U.S. Fish and Wildlife Service design center in Massachusetts. It is assumed that these costs reflect voluntary actions because site selection was left to the discretion of the agencies involved (i.e., the sites were not mandated for action).

(4) Replacement costs for tidal wetlands were obtained from the Buzzards Bay National Estuary Program, which stated that the majority of tidal wetland projects in the Buzzards Bay area have been completed voluntarily (J. Costa, Buzzards Bay National Estuary Program, to Dave Mills of Stratus Consulting, 2002).

In additon, EPA considered the HRC analysis in its Brayton Point permit determination primarily to compare the costs of various technology options for reducing I&E at Brayton Point with the cost of replacing lost organisms through habitat restoration. The relationship between HRC costs and values is irrelevant in this context.

Responses to Comments on EPA's Impingement and Entrainment Baseline (comments provided on page 78 of Brayton Point Station document, page 75 of document 16/356652.1, page 2 of comments by Dr. Ivar Strand, page 28 of summary by Foley Hoag, LLP, and pages 20-21 of comments by Dr. Robert Stavins)

EPA chose to consider 1974-1983 as a baseline period for its analysis of Brayton Point I&E for several reasons, including the availability of comprehensive I&E loss records and complex issues regarding the status of fishery stocks in the region. The most recent records of entrainment losses at Brayton Point are for winter flounder only. Moreover, because the Mount Hope Bay winter flounder population is currently severely depressed, rates for the current period are likely to underestimate potential future entrainment rates once the population has recovered. Thus, EPA chose to use I&E data for the 1974-1983 period to develop estimates of current entrainment rates for healthier populations of Mount Hope Bay fish species.

Commenters also argued that use of this baseline is inconsistent with EPA's use of values based on current markets (see page 28 of summary by Foley Hoag, LLP, page 2 of comments by

Dr. Ivar Strand, and pages 20-21 of comments by Dr. Robert Stavins). However, as noted above, EPA used the historical data to estimate potential current I&E rates for healthier populations, not to evaluate historical conditions. Therefore, EPA sees no inconsistency.

Responses to Comments on Timing of Benefits (comments provided on page 27 of summary by Foley Hoag, LLP, pages 1-3 of comments by Dr. Ivar Strand, pages 84-85 of document 16/356652.1, and pages 21-23 of comments by Dr. Robert Stavins)

Some commenters expressed concern that EPA did not consider the timing of benefits in its Brayton Point assessment. When sufficient information is available on the schedule for technology implementation and the ages when fish species enter the fishery, EPA agrees that benefits analyses should account for (1) the delay until a technology is implemented, and (2) the delay until fish that avoid I&E as a result of technology implementation enter the fishery. To the degree possible, EPA is planning to take these factors into account in future analyses for the 316(b) national rulemaking. In EPA's notice of data availability (NODA) for the proposed rule, published in the Federal Register on March 19, 2003, EPA presents benefits estimates that take into account the delay until fish avoiding I&E are harvested (see 68 FR 13521 available at http://frwebgate.access.gpo.gov/cgiin/getdoc.cgi?dbname = 2003_register&docid = fr19mr03-29). EPA has also used discounting principles in its revised analyses for the BPS permit.

EPA notes that the significance of accounting for a delay in benefits will depend on the discount rate that is used for discounting the benefit path. At a 3% rate, which is often used by EPA in its benefits analyses, the consequence of the delay will be relatively small.

Responses to Comments on Commercial Fishing Benefits (comments provided on page 82 of document 16/356652.1, pages 24-27 of comments by Dr. Robert Stavins, and page 6 of comments by Dr. Ivar Strand)

There were several comments about EPA's assumption that producer surplus is 40 to 70% of the increase in gross revenues to commercial fishermen resulting from reductions in I&E losses. Commenters suggested that a range of 15% to 40% may be more appropriate. Commenters also objected to EPA's assumption that the total economic surplus arising from an increase in commercial catch will be 4.5 times greater than the producer surplus. EPA has revised the commercial fishing methodology to assume that producer surplus is 0% to 40% of the change in gross revenues and that there is no additional total economic surplus if increases in harvest are not large enough to create changes in price. The new methods are detailed in document entitled "Chapter A13: Methods for Estimating Commercial Fishing Methods," which is provided in the docket for the Phase II NODA (available from the Water Docket, Environmental Protection Agency, Mailcode: 4101T, 1200 Pennsylvania Avenue, NW, Washington, DC, 20460, Attention Docket ID No. OW-2002-0049).

Responses to Comments on Recreational Fishing Benefits (comments provided on pages 82-83 of document 16/356652.1, pages 23-24 of comments by Dr. Robert Stavins, pages 3-5 of comments by Dr. Ivar Strand, and page 28 of summary by Foley Hoag, LLP)

Commenters make one general criticism and one specific criticism of the benefits transfer methods used for the Brayton Point recreational fishing benefits analysis. The general criticism is that the studies used to estimate the value of recreationally caught fish do not adequately represent conditions in Mount Hope Bay. However, EPA is not aware of any relevant studies for Mount Hope Bay. Moreover, EPA believes that its use of results from multiple studies to develop a range of values is a more defensible approach than relying on the results of any single study.

A specific criticism is that tautog has been misclassified as a small game fish instead of a bottom fish, thereby inflating tautog's recreational value. EPA agrees that tautog is more appropriately classified as a bottom fish and has revised its analyses accordingly. In any event, EPA notes that even if the value of tautog was is overstated, it is insignificant in terms of overall recreational benefits, given that the average annual recreational losses of tautog due to impingement at Brayton Point were valued at $380-$1,005 and losses due to entrainment were valued at $9,313-$24,642 (see Chapter F4 of EPA's Brayton Point benefits case study conducted for the 316(b) Phase II rulemaking available at http://www.epa.gov/waterscience/316b/casestudy/chf4.pdf).

Responses to Comments on Use of the "50% Rule" to Estimate Nonuse Benefits (comments provided on page 84 of document 16/356652.1, page 6 of comments by Dr. Ivar Strand, page 29 of summary by Foley Hoag, LLP, and page 28 of comments by Dr. Robert Stavins)

Some commenters objected to the use of the "rule of thumb" that nonuse values are greater than or equal to 50% of recreational use values. The 50% rule was noted and first applied by Myrick Freeman in his report for the Council on Environmental Quality (CEQ, 1979) and later examined in greater depth in Fisher and Raucher (1984), and has been used in a number of EPA rulemakings as a way to account for nonuse benefits when other information is unavailable. EPA has recently reviewed more recent literature on nonuse-to-use ratios, and, for the 316(b) Phase II NODA, EPA conducted a regression-based meta-analysis of relevant studies to develop a valuation function for nonuse benefits based on the use value of the resource and other resource characteristics (see 68 FR 13521 available at http://frwebgate.access.gpo.gov/cgiin/getdoc.cgi?dbname = 2003_register&docid = fr19mr03-29). Information presented in the NODA indicate that nonuse values may be significantly greater than 50% of recreational use values. Thus, the 50% rule is better replaced with more sophisticated methods. Therefore, EPA has prepared such an analysis for the Brayton Point permit.

Responses to Comments on Use of Hatchery-Based Replacement Costs to Value Forage Fish

Some commenters objected to EPA's use of hatchery-based replacement costs to value forage fish because of the distinction between cost and value discussed above in the section on HRC. While EPA recognizes that costs are not the same as values, EPA also notes that the American Fisheries Society, which developed the hatchery-based replacement costs used by EPA, suggests that such costs can be used as a "proxy for value" when other information is unavailable (see 1993 AFS document entitled "Sourcebook for Investigation and Valuation of Fish Kills"). However, because of concerns expressed about the use of both hatchery-based and habitat-based replacement costs, EPA is not using such costs to value forage fish in future analyses for the 316(b) national rulemaking.

Literature Cited

AFS (American Fisheries Society). 1993. Sourcebook for Investigation and Valuation of Fish Kills. American Fisheries Society, Bethesda, MD.

Fisher, A. and R. Raucher. 1984. Intrinsic benefits of improved water quality: Conceptual and empirical perspectives. Advances in Applied Micro-Economics 3:37-66.

Freeman, A. M. 1979. The Benefits of Air and Water Pollution Control: A Review and Synthesis of Recent Estimates. A report prepared for the Council on Environmental Quality. December 1979.

U.S. EPA (United States Environmental Protection Agency). 2000. Guidelines for Preparing Economic Analyses. EPA 240-F-00-002, Office of Policy, Economics, and Innovation, November 2000.

Prepared by Stratus Consulting 9/16/03 for EPA Region 1.
Stratus Consulting contacts (303.381.8000) Liz Strange, Dave Cacela, Tom Ottem

Sheet Contents
commercial: estimates of commercial losses (as pounds and dollars) and associated discount rates @ 3% and 7% per annum

The results presented here are various commercial fishing loss metrics derived from records of I&E losses at Brayton Point 1974-1983. All values are mean annual totals.

Details of the methods are provided in Chapter A5 of Part A of Regional Study Document prepared for the Agency's CWA 316(b) rulemaking. Life history data and data sources are provided in Appendix C1 of Part C the 316(b) Phase II Regional Analysis.

The results provided are similar to results that were previously delivered to EPA Region 1 in April 2003. These results differ from the previous results because of several methodological changes that were implemented in response to public comments on the original proposal, and other reasons corresponding to changes in intended reporting that are anticipated for the final Phase II rule in February 2004. Several of the most significant methodological changes are itemized below:

Previously, 100% of impinged fish were assumed to be age one. Now, impinged fish are assumed to range from "age 0" ("juvenile") up to age 5, in relative proportions determined by species-specific survival rates.

Previously, all loss records were adjusted to accommodate the unknown precise age within an age class. This adjustment is no longer applied to losses in the juvenile stages.

Certain growth parameters, notably weight-at-age of eggs and early life stages, were revised to correct previous values that were unreasonable or erroneous.

The trophic transfer efficiency coefficient is reduced to 0.10 from 0.20. (The value of forage species via trophic transfer is included in the loss estimates.)

All life history paramter values are taken from the 2001 Brayton permit application.

prepared 9/16/03 using scripts: intake.execute.regions.brayton.only.ssc & comyield.brayton.only.ssc

On 9/19/2003, the following minor revisions were made to the 9/16/2003 analysis:

All monetary values were converted from $2001 to $2002.
Compliance is assumed to be achieved in 2008 (a 4-year lag for construction of cooling towers).
Discounting to account for the time required to achieve compliance is now applied to the benefits only.
Reduction in both I&E from installing cooling towers is expected to be 96%.

Tom Ottem
Stratus Consulting Inc.

Commercial Fishing Losses and Benefits at Brayton Point

losstype	species	Current Loss (pounds)	Current Gross Revenue Loss (2002$) Undiscounted	Discounted at 3%	Discounted at 7%
ent	atlantic.menhaden	1,329	78	71	64
ent	scup	74	76	79	67
ent	silver.hake	14	14	5	5
ent	tautog	1,181	1,204	1,305	917
ent	weakfish	82	84	73	64
ent	white.perch	0	0	0	0
ent	windowpane	85	87	143	116
ent	winter.flounder	30,815	38,132	32,538	26,740
ent	Total current loss	33,581	39,675	34,215	27,973
ent	Consumer surplus loss - low	0	0	0	0
ent	Consumer surplus loss - high (40% of current revenue loss)	13,432	15,870	13,686	11,189
ent	Expected % reduction attributable to rule	96.0%	96.0%	96.0%	96.0%
ent	Benefits - low	0	0	0	0
ent	Benefits - high	12,895	15,235	13,139	10,742
imp	atlantic.menhaden	50	3	3	3
imp	butterfish	17	10	10	9
imp	silver.hake	38	15	13	12
imp	tautog	2	2	1	1
imp	weakfish	4	3	3	3
imp	white.perch	0	0	0	0
imp	windowpane	4	7	6	5
imp	winter.flounder	228	282	248	212
imp	Total current loss	343	322	284	244
imp	Consumer surplus loss - low	0	0	0	0
imp	Consumer surplus loss - high (40% of current revenue loss)	137	129	114	97
imp	Expected % reduction attributable to rule	96.0%	96.0%	96.0%	96.0%
imp	Benefits - low	0	0	0	0
imp	Benefits - high	132	124	109	94
imp+ent	**Total current loss**	**33,924**	**39,997**	**34,499**	**28,217**
imp+ent	**Consumer surplus loss - low**	**0**	**1**	**2**	**3**
imp+ent	**Consumer surplus loss - high (40% of current revenue loss)**	**13,569**	**15,999**	**13,800**	**11,287**
imp+ent	**Benefits - low**	**0**	**1**	**2**	**3**
imp+ent	**Benefits - high**	**13,027**	**15,359**	**13,248**	**10,835**
imp+ent	**Benefits discounted assuming compliance in 2008 - low**	**0**	**0**	**0**	**0**
imp+ent	**Benefits discounted assuming compliance in 2008 - high**	**13,027**	**15,359**	**11,728**	**8,105**

.benefits.comyield.brayton.ssc Mon Sep 15 11:52:03 MDT 2003 C:\projects\intake4\intake6.ie.results\brayton.only.sept15\brayton\Mon.Sep.15.2003.allbenefits.brayton.csv

Commerci

losstype
ent
ent
ent
ent
ent
ent
ent
ent
ent
ent
ent
ent
ent
ent

imp
imp
imp
imp
imp
imp
imp
imp
imp
imp
imp
imp
imp
imp

imp+ent
imp+ent
imp+ent
imp+ent
imp+ent

imp+ent
imp+ent

.benefits.cc

Prepared by Stratus Consulting 9/16/03 for EPA Region 1.
Stratus Consulting contacts (303.381.8000) Liz Strange, Dave Cacela, Tom Ottem

Sheet Contents
commercial: estimates of commercial losses (as pounds and dollars) and associated discount rates @ 3% and 7% per annum
recreational: estimates of foregone recreational catch

The results presented here are various loss metrics derived from records of I&E losses at Brayton Point 1974-1983. All values are mean annual totals.

Details of the methods are provided in Chapter A5 of Part A of Regional Study Document prepared for the Agency's CWA 316(b) rulemaking. Life history data and data sources are provided in Appendix C1 of Part C the 316(b) Phase II Regional Analysis.

The results provided are similar to results that were previously delivered to EPA Region 1 in April 2003. These results differ from the previous results because of several methodological changes that were implemented in response to public comments on the original proposal, and other reasons corresponding to changes in intended reporting that are anticipated for the final Phase II rule in February 2004. Several of the most significant methodological changes are itemized below:

Previously, 100% of impinged fish were assumed to be age one. Now, impinged fish are assumed to range from "age 0" ("juvenile") up to age 5, in relative proportions determined by species-specific survival rates.

Previously, all loss records were adjusted to accommodate the unknown precise age within an age class. This adjustment is no longer applied to losses in the juvenile stages.

Certain growth parameters, notably weight-at-age of eggs and early life stages, were revised to correct previous values that were unreasonable or erroneous.

The trophic transfer efficiency coefficient is reduced to 0.10 from 0.20. (The value of forage species via trophic transfer is included in the loss estimates.)

All life history paramter values are taken from the 2001 Brayton permit application.

prepared 9/16/03 using scripts: intake.execute.regions.brayton.only.ssc & comyield.brayton.only.ssc

The table below is excerpted from a table prepared by EPA's Office of Science and Technology (OST) for the North Atlantic portion of the Regional Analysis for the Final Section 316(b) Phase II Existing Facilities Rule
It details the assumptions made by OST to allocate the estimated fishery yield lost due to I&E between the commercial and recreational fisheries in the North Atlantic. Values may vary slightly from those used at proposal for several reasons:

1) The recreational landings data used to calculate these values at proposal did not include catch-and-release harvest by recreational fishermen. Thus, previously recreational landings were underestimated and the assumed % recreational values were too low. This has been changed.
2) For consistency, all of the % commercial and % recreational calculations are now based on landings from 1993 to 2001, rather than 1991 to 2001.
3) As noted in the table, for some species OST assumed an equal split between recreational and commercial fisheries rather than the calculated values.

Percentage of Total Impacts Occurring to the Commercial and Recreational Fisheries and Commercial Value per Pound for Species Impinged and Entrained at North Atlantic Facilities

Species Group	Percent Impact to Recreational Fishery[a,b]	Percent Impact to Commercial Fishery[a,b]	Commercial Value per Pound[c]
Atlantic Menhaden	0.0%	100.0%	$0.06
Bluefish	89.1%	10.9%	$0.28
Scup[d]	50.0%	50.0%	$1.04
Silver Hake	0.0%	100.0%	$0.37
Tautog	92.2%	7.8%	$1.08
Weakfish	14.6%	85.4%	$0.88
White Perch	78.8%	21.2%	$0.79
Windowpane	0.0%	100.0%	$1.65
Winter Flounder[d]	50.0%	50.0%	$1.21

Notes:
Includes only those species impinged and entrained at Brayton Point.
a. Based on landings from 1993-2001.
b. Calculated using recreational landings data from NMFS (2003a, http://www.st.nmfs.gov/recreational/queries/catch/snapshot.html)
c. Calculated using commercial landings data from NMFS (2003b).
d. A 50:50 split was assumed because landings, which largely occur in the ocean, are not considered to be an accurate indicator of impact for these species, which are largely caught near-shore.

Recreational Fishing Losses at Brayton Point

losstype	species	Current Loss (# fish)	Multiplicative Factors to Apply Discounting 3% Discount Rate	7% Discount Rate
ent	scup	74.20	0.87	0.73
ent	tautog	3,480.13	0.71	0.46
ent	weakfish	11.33	0.91	0.81
ent	white.perch	0.05	0.89	0.77
ent	winter.flounder	24,823.14	0.88	0.75
imp	tautog	5.15	0.73	0.49
imp	weakfish	0.53	0.94	0.87
imp	white.perch	1.12	0.92	0.83
imp	winter.flounder	183.73	0.91	0.80

scaled.reclosses comyield.brayton.ssc Tue Sep 16 17:39:21 MDT 2003 C:\projects\intake4\intake6.ie.results\brayton.only.sept15\brayton\recloss2.csv

These results act as the inputs to the RUM model developed by Abt to estimate recreational benefits in the North Atlantic.