

# Appendix to Chapter D2

This appendix presents the results of the UMRA analysis for the other five options considered for Phase III existing facilities, combined with the proposed option for new offshore oil and gas extraction facilities. For all options, results only include those Phase III existing facilities that are (1) non-baseline closures and (2) subject to national categorical requirements under the option. See the main body of this chapter for a description of data sources and methodologies used in these analyses.

In Table D2A-1 below, the other evaluated options for Phase III existing facilities, combined with the proposed option for new offshore oil and gas extraction facilities, are presented in order of increasing stringency and/or applicability (e.g., the largest number of facilities would be subject to the national requirements under Option 6, compared to any of the other evaluated options).

<b>Table D2A-1: Summary of UMRA Costs for Other Evaluated Options (in millions, 2003\$)</b>						
<b>Sector</b>	<b>Total Annualized Cost</b>			<b>Maximum One-Year Cost</b>		
	<b>Facility Compliance Costs</b>	<b>Government Implementation Costs</b>	<b>Total</b>	<b>Facility Compliance Costs</b>	<b>Government Implementation Costs</b>	<b>Total</b>
<i>Option 3 for Existing Facilities / Proposed Option for New OOGF Facilities</i>						
Government Sector (excl. Federal)	\$1.0	\$0.9	\$1.9	\$1.8	\$4.5	\$6.3
Private Sector	\$61.9	n/a	\$61.9	\$712.2	n/a	\$712.2
<i>Option 4 for Existing Facilities / Proposed Option for New OOGF Facilities</i>						
Government Sector (excl. Federal)	\$0.8	\$0.8	\$1.6	\$1.7	\$4.6	\$6.4
Private Sector	\$66.0	n/a	\$66.0	\$722.9	n/a	\$722.9
<i>Option 2 for Existing Facilities / Proposed Option for New OOGF Facilities</i>						
Government Sector (excl. Federal)	\$1.4	\$1.0	\$2.4	\$2.4	\$5.6	\$7.9
Private Sector	\$70.5	n/a	\$70.5	\$730.7	n/a	\$730.7
<i>Option 1 for Existing Facilities / Proposed Option for New OOGF Facilities</i>						
Government Sector (excl. Federal)	\$1.5	\$1.1	\$2.6	\$2.4	\$5.6	\$8.1
Private Sector	\$72.3	n/a	\$72.3	\$737.2	n/a	\$737.2
<i>Option 6 for Existing Facilities / Proposed Option for New OOGF Facilities</i>						
Government Sector (excl. Federal)	\$1.8	\$1.7	\$3.5	\$2.8	\$7.6	\$10.5
Private Sector	\$91.7	n/a	\$91.7	\$922.3	n/a	\$922.3

Source: U.S. EPA Analysis, 2004.

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# Chapter D3: Other Administrative Requirements

## INTRODUCTION

This chapter presents several other analyses conducted in developing this proposed rule. These analyses address the requirements of Executive Orders and Acts applicable to Phase III regulation.

### D3-1 EXECUTIVE ORDER 12866: REGULATORY PLANNING AND REVIEW

Under Executive Order 12866 (58 FR 51735, October 4, 1993), the Agency must determine whether the regulatory action is “significant” and therefore subject to OMB review and the requirements of the Executive Order. The order defines a “significant regulatory action” as one that is likely to result in a rule that may:

- ▶ have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities; or
- ▶ create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; or
- ▶ materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- ▶ raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, EPA determined that this proposed rule is a “significant regulatory action.” As such, this action was submitted to OMB for review. Changes made in response to OMB suggestions or recommendations are documented in the public record.

### D3-2 PAPERWORK REDUCTION ACT OF 1995

The Paperwork Reduction Act of 1995 (PRA) (superseding the PRA of 1980) is implemented by the Office of Management and Budget (OMB) and requires that agencies submit a supporting statement to OMB for any information collection that solicits the same data from more than nine parties. The PRA seeks to ensure that Federal agencies balance their need to collect information with the paperwork burden imposed on the public by the collection.

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The definition of “information collection” includes activities required by regulations, such as permit development, monitoring, record keeping, and reporting. The term “burden” refers to the “time, effort, or financial resources” the public expends to provide information to or for a Federal agency, or to otherwise fulfill statutory or regulatory requirements. PRA paperwork burden is measured in terms of annual time and financial resources the public devotes to meet one-time and recurring information requests (44 U.S.C. 3502(2); 5 C.F.R. 1320.3(b)).

Information collection activities may include:

- ▶ reviewing instructions;
- ▶ using technology to collect, process, and disclose information;
- ▶ adjusting existing practices to comply with requirements;
- ▶ searching data sources;
- ▶ completing and reviewing the response; and
- ▶ transmitting or disclosing information.

Agencies must provide information to OMB on the parties affected, the annual reporting burden, the annualized cost of responding to the information collection, and whether the request significantly impacts a substantial number of small entities. An agency may not conduct or sponsor, and a person is not required to respond to, an information collection unless it displays a currently valid OMB control number.

EPA’s estimate of the information collection requirements imposed by the proposed Phase III regulation are documented in the Information Collection Request (ICR) which accompanies this regulation (U.S. EPA, 2004).

### **D3-3 EXECUTIVE ORDER 13132: FEDERALISM**

Executive Order 13132 (64 FR 43255, August 10, 1999) requires EPA to develop an accountable process to ensure “meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.” Policies that have federalism implications are defined in the Executive Order to include regulations that have “substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.”

Under section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments or unless EPA consults with State and local officials early in the process of developing the regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the regulation.

This proposed rule does not have federalism implications. It would not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Rather, this proposed rule would result in minimal administrative costs on States that have an authorized NPDES program. EPA expects the following annual burden for States to collectively administer one of the three proposed options:

- ▶ 50 MGD for All Waterbodies option: 16,972 hours with a cost of \$754,804 (\$747,981 in labor costs and \$6,823 in non-labor costs);
- ▶ 200 MGD for All Waterbodies option: 4,677 hours with a cost of \$201,092 (\$198,932 in labor costs and \$2,160 in non-labor costs);
- ▶ 100 MGD for Certain Waterbodies option: 6,528 hours with a cost of \$286,597 (\$284,624 in labor costs and \$1,973 in non-labor costs).

It is noted that States do not incur any burden hours and costs to administer the proposed rule for the new offshore oil and gas extraction facilities because the EPA Regions administer their permits; these facilities are therefore

outside the jurisdiction of the States. In addition, EPA has identified zero Phase III existing facilities that are owned by Federal, State or local government entities therefore the annual impacts on these facilities is zero.

The proposed national cooling water intake structure requirements would be implemented through permits issued under the NPDES program. Forty-five States and one territory are currently authorized pursuant to section 402(b) of the CWA to implement the NPDES program. In States not authorized to implement the NPDES program, EPA issues NPDES permits. Under the CWA, States are not required to become authorized to administer the NPDES program. Rather, such authorization is available to States if they operate their programs in a manner consistent with section 402(b) and applicable regulations. Generally, these provisions require that State NPDES programs include requirements that are as stringent as Federal program requirements. States retain the ability to implement requirements that are broader in scope or more stringent than Federal requirements. (See section 510 of the CWA.)

EPA does not expect this proposed rule to have substantial direct effects on either authorized or nonauthorized States or on local governments because it would not change how EPA and the States and local governments interact or their respective authority or responsibilities for implementing the NPDES program. This rule establishes national requirements for Phase III facilities with cooling water intake structures. NPDES-authorized States that currently do not comply with the proposed regulations based on this rule might need to amend their regulations or statutes to ensure that their NPDES programs are consistent with Federal section 316(b) requirements. (See 40 CFR 123.62(e).) For purposes of this rule, the relationship and distribution of power and responsibilities between the Federal government and the State and local governments are established under the CWA (e.g., sections 402(b) and 510); nothing in this rule alters that. Thus, the requirements of section 6 of the Executive Order do not apply to this rule.

Although section 6 of Executive Order 13132 does not apply to this rule, EPA did consult with State governments and representatives of local governments in developing definitions and concepts relevant to the section 316(b) rulemaking and this proposed rule:

- ▶ During the development of the proposed section 316(b) rule for new facilities (Phase I), EPA conducted several outreach activities through which State and local officials were informed about the section 316(b) rulemaking effort. These officials then provided information and comments to the Agency. The outreach activities were intended to provide EPA with feedback on issues such as adverse environmental impact, BTA, and the potential cost associated with various regulatory alternatives.
- ▶ EPA has made presentations on the section 316(b) rulemaking effort in general at eleven professional and industry association meetings. EPA also conducted two public meetings in June and September of 1998 to discuss issues related to the section 316(b) rulemaking effort. In September 1998 and April 1999, EPA staff participated in technical workshops sponsored by the Electric Power Research Institute on issues relating to the definition and assessment of adverse environmental impact. EPA staff have worked with numerous States such as New York, New Jersey, California, Rhode Island, and Massachusetts and regions such as Region 1 and Region 9. EPA further organized a meeting of technical experts (May 23, 2001) and a Symposium on Technologies for Protecting Aquatic Organisms from Cooling Water Intake Structures (BTA symposium, May 6-7, 2003).
- ▶ EPA met with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) and, with the assistance of ASIWPCA, conducted a conference call in which representatives from 17 States or interstate organizations participated.
- ▶ EPA met with OMB and utility representatives and other Federal agencies (the Department of Energy, the Small Business Administration, the Tennessee Valley Authority, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service and the Department of Interior's U.S. Fish and Wildlife Service).

- ▶ EPA received more than 130 comments on the Phase I proposed rule and Notice of Data Availability (NODA). State and local government representatives from the following States submitted comments: Alaska, California, Florida, Louisiana, Maryland, Michigan, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, and Texas. In addition, EPA received more than 170 comments on the Phase II proposed rule and NODA, including comments from State and local government representatives from Arkansas, Alabama, Indiana, Tennessee, and Rhode Island. In some cases these comments have informed the development of the Phase III rulemaking effort.
- ▶ On May 23, 2001, EPA held a day-long forum to discuss specific issues associated with the development of regulations under section 316(b). At the meeting, 17 experts from industry, public interest groups, States, and academia reviewed and discussed the Agency’s preliminary data on cooling water intake structure technologies that are in place at existing facilities and the costs associated with the use of available technologies for reducing impingement and entrainment. Over 120 people attended the meeting.

In the spirit of this Executive Order and consistent with EPA policy to promote communications between EPA and State and local governments, the preamble to this proposed rule specifically solicits comment from State and local officials.

#### **D3-4 EXECUTIVE ORDER 13175: CONSULTATION AND COORDINATION WITH INDIAN TRIBAL GOVERNMENTS**

Executive Order 13175 (65 FR 67249, November 6, 2000) requires EPA to develop an accountable process to ensure “meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.” “Policies that have tribal implications” is defined in the Executive Order to include regulations that have “substantial direct effects on one or more Indian Tribes, on the relationship between the Federal government and the Indian Tribes, or on the distribution of power and responsibilities between the Federal government and Indian Tribes.” This proposed rule does not have tribal implications. It would not have substantial direct effects on tribal governments, on the relationship between the Federal government and Indian Tribes, or on the distribution of power and responsibilities between the Federal government and Indian Tribes, as specified in Executive Order 13175. EPA’s analyses show that no facility subject to Phase III regulation is owned by tribal governments. This proposed rule does not affect Tribes in any way in the foreseeable future. Accordingly, the requirements of Executive Order 13175 do not apply to this rule.

#### **D3-5 EXECUTIVE ORDER 13045: PROTECTION OF CHILDREN FROM ENVIRONMENTAL HEALTH RISKS AND SAFETY RISKS**

Executive Order 13045 (62 FR 19885, April 23, 1997) applies to any rule that (1) is determined to be “economically significant” as defined under Executive Order 12866 and (2) concerns an environmental health or safety risk that EPA has reason to believe might have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health and safety effects of the planned rule on children and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency. This proposed rule is a significant rule as defined under Executive Order 12866. However, it does not concern an environmental health or safety risk that would have a disproportionate effect on children. Therefore, it is not subject to Executive Order 13045.

#### **D3-6 EXECUTIVE ORDER 13211: ACTIONS CONCERNING REGULATIONS THAT SIGNIFICANTLY AFFECT ENERGY SUPPLY, DISTRIBUTION, OR USE**

Executive Order 13211, (“Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use” (66 FR 28355, May 22, 2001)) requires EPA to prepare a Statement of Energy Effects when undertaking regulatory actions identified as “significant energy actions.” For the purposes of Executive Order 13211, “significant energy action” means:

“any action by an agency (normally published in the Federal Register) that promulgates or is expected to lead to the promulgation of a proposed rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking:

- (1) (i) that is a significant regulatory action under Executive Order 12866 or any successor order, and
  - (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or
- (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs (OIRA) as a significant energy action.”

For those regulatory actions identified as “significant energy actions,” a Statement of Energy Effects must include a detailed statement relating to (1) any adverse effects on energy supply, distribution, or use (including a shortfall in supply, price increases, and increased use of foreign supplies) and (2) reasonable alternatives to the action with adverse energy effects and the expected effects of such alternatives on energy supply, distribution, and use.

This rule is not a “significant energy action” as defined in Executive Order 13211 because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. The proposed rule does not contain any compliance requirements that would:

- ▶ reduce crude oil supply in excess of 10,000 barrels per day;
- ▶ reduce fuel production in excess of 4,000 barrels per day;
- ▶ reduce coal production in excess of 5 million tons per day;
- ▶ reduce electricity production in excess of 1 billion kilowatt hours per day or in excess of 500 megawatts of installed capacity;
- ▶ increase energy prices in excess of 10 percent;
- ▶ increase the cost of energy distribution in excess of 10 percent;
- ▶ significantly increase dependence on foreign supplies of energy; or
- ▶ have other similar adverse outcomes, particularly unintended ones.

Of the potential significant adverse effects on the supply, distribution, or use of energy (listed above) only a few apply to this proposed rule. Regulation of Electric Generators, through increases in the cost of generating electricity and shifts in the types of generators employed, might affect (1) the production of coal, (2) the production of electricity, (3) the amount of installed capacity, (4) energy prices, and (5) the dependence on foreign supplies of energy. Regulation of new offshore oil and gas facilities might affect (1) the production of oil and gas, (2) energy prices, and (3) the dependence on foreign supplies of energy. While facilities in the Manufacturing industry segments generate electricity, their contribution to the overall supply of electricity is insignificant (less than 0.02%); therefore, compliance with the 316(b) Phase III regulation by this industry segment would not perceptibly affect the supply, distribution, or use of energy.

Potential energy effects associated with the regulation of existing Electric Generators and new offshore oil and gas extraction facilities are described in the following two subsections.

### **D3-6.1 Existing Electric Generators**

The three proposed options for Electric Generators have design intake flow (DIF) applicability thresholds for national categorical requirements of 50 MGD or greater, 100 MGD or greater, and 200 MGD or greater. Since Electric Generators with a DIF of 50 MGD or greater were covered by the final Phase II rule, no Phase III

Generator would be subject to the national requirements under the three proposed options; therefore there would be no impacts on any measures of energy supply, distribution, or use under the proposed rule.

To assess potential energy effect of alternative evaluated options for Electric Generators, EPA used the results from its electricity market model analysis (see the Appendix to *Chapter B5: Economic Impact Analysis for Electric Generators*). EPA compared the post-compliance scenario (after the implementation of Phase III compliance requirements) with Base Case 2 (including Phase II compliance costs but excluding Phase III compliance costs). This comparison allows EPA to identify the incremental market-level effects of Phase III regulation, beyond the effects of Phase II regulation. It should be noted that this analysis was only conducted for Option 6, the most inclusive option with the highest regulatory costs and potential for energy effects. Therefore, the potential energy effects of all other options evaluated by EPA would be lower.

#### ❖ *Production of coal*

EPA estimates that Option 6 would decrease the annual use of coal for electricity generation by 53.8 trillion Btu (TBtu), or 0.25%. This reduction converts to 2.66 million tons of coal per year or 7,286 tons of coal per day.<sup>1</sup> Assuming that a reduction in the use of coal for electricity generation results in a similar reduction in coal production, EPA concludes that Option 6 would not have a significant impact on the national production of coal as defined by the thresholds listed above.

#### ❖ *Production of electricity*

EPA's electricity market analysis did not allow for an explicit consideration of the changes in the production of electricity. However, based on the small effects on installed capacity and electricity prices, EPA concludes that Option 6 would not reduce electricity production in excess of 1 billion kilowatt hours per day.

#### ❖ *Installed capacity*

None of the evaluated options contain requirements that would permanently reduce installed capacity, for example through parasitic losses or auxiliary power requirements. However, the rule does contain requirements that may lead to one-time temporary downtimes of up to nine weeks of steam electric generators subject to Phase III regulation. EPA estimates that under Option 6 approximately four facilities, accounting for 145 megawatts (MW) of generating capacity, would experience such downtimes. However, EPA's analyses indicate that these downtimes would not have a significant adverse effect on the supply, distribution, or use of energy (see the Appendix to *Chapter B5: Economic Impact Analysis for Electric Generators*). In addition, EPA estimates that Option 6 would lead to only 173 MW in incremental permanent capacity closures, well below the 500 MW impact threshold.

#### ❖ *Energy prices*

Option 6 would not significantly affect energy prices in either the long run or the short run. EPA estimates that, in the long run, energy prices would rise by less than 1% in all but one North American Electric Reliability Council (NERC) regions. The Electric Reliability Council of Texas (ERCOT) is estimated to have the largest increase in electricity prices with 1.1% in 2010 and 5.2% in 2013. No other region would experience energy price increases of more than 0.2% as a result of Phase III regulation.

#### ❖ *Dependence on foreign supplies of energy*

EPA's electricity market analysis did not allow for an explicit consideration of effects on foreign imports of energy. However, Electric Generators which are generally not subject to significant foreign competition. (Only Canada and Mexico are connected to the U.S. electricity grid, and transmission losses are substantial when electricity is transmitted over long distances.) In addition, the effects on installed capacity and electricity prices, are estimated to be small. EPA therefore concludes that Option 6 would not significantly increase dependence on foreign supplies of energy.

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<sup>1</sup> This conversion assumes an average energy content of 10,115 Btu per pound of coal (U.S. DOE, 2000).

### **D3-6.2 New Offshore Oil and Gas Extraction Facilities**

This rule applies only to new offshore oil and gas extraction facilities and not existing ones. Hence the rule would have no impact on existing production of oil and gas, energy prices, installed capacity, nor would it significantly increase dependence on foreign supplies of energy. EPA's analysis identified no barriers to entry or energy effects. EPA therefore concludes that the proposed rule would not significantly affect new offshore oil and gas production, energy prices, or dependence on foreign supplies of energy.

Based on these analyses for potentially regulated existing and new facilities, EPA concludes that this proposed rule would have minimal energy effects at a national and regional level. As a result, EPA did not prepare a Statement of Energy Effects.

### **D3-7 NATIONAL TECHNOLOGY TRANSFER AND ADVANCEMENT ACT OF 1995**

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) of 1995, Pub L. No. 104-113, Sec. 12(d) directs EPA to use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (e.g., materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standard bodies. The NTTAA directs EPA to provide Congress, through the Office of Management and Budget (OMB), explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rule does not involve such technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards.

### **D3-8 EXECUTIVE ORDER 12898: FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS**

Executive Order 12898 (59 FR 7629, February 11, 1994) requires that, to the greatest extent practicable and permitted by law, each Federal agency must make achieving environmental justice part of its mission. E.O. 12898 provides that each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures such programs, policies, and activities do not have the effect of (1) excluding persons (including populations) from participation in, or (2) denying persons (including populations) the benefits of, or (3) subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin.

Today's proposed rule requires that the location, design, construction, and capacity of cooling water intake structures (CWIS) at Phase III facilities reflect the best technology available for minimizing adverse environmental impact. For several reasons, EPA does not expect that this proposed rule would have an exclusionary effect, deny persons the benefits of the participation in a program, or subject persons to discrimination because of their race, color, or national origin. In fact, because EPA expects that this proposed rule would help to preserve the health of aquatic ecosystems located in reasonable proximity to Phase III facilities, it believes that all populations, including minority and low-income populations, would benefit from improved environmental conditions as a result of this rule.

### **D3-9 EXECUTIVE ORDER 13158: MARINE PROTECTED AREAS**

Executive Order 13158 (65 FR 34909, May 31, 2000) requires EPA to "expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment." EPA may take action to enhance or expand protection of existing marine protected areas and to establish or recommend, as

appropriate, new marine protected areas. The purpose of the Executive Order is to protect the significant natural and cultural resources within the marine environment, which means “those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction, consistent with international law.” EPA expects that the Proposed Section 316(b) Rule for Phase III Facilities would advance the objective of Executive Order 13158.

Marine protected areas (MPAs) include designated areas with varying levels of protection, from fishery closure areas, to aquatic National Parks, Marine Sanctuaries, and Wildlife Refuges (NOAA, 2002). The Departments of Commerce and the Interior are developing an inventory of MPAs in the U.S. that are protected and managed under Federal, State, Territorial, Tribal, or local laws. This list has not been completed, but it currently includes 32 Federal sites in the New England region, 31 in the Middle Atlantic region, 43 in the South Atlantic region, 45 in the Gulf of Mexico region, 12 in the Caribbean region, 15 in the Great Lakes region, and 46 in the U.S. West Coast region. Examples of marine protected areas include the Great Bay National Wildlife Refuge in New Hampshire, the Cape Cod Bay Northern Right Whale Critical Habitat in Massachusetts, the Narragansett Bay National Estuarine Research Reserve in Rhode Island, Everglades National Park and the Tortugas Shrimp Sanctuary in Florida, and the Point Reyes National Seashore in California.

Marine protected areas can help address problems related to the depletion of marine resources by prohibiting, or severely curtailing, activities that are permitted or regulated by law outside of marine protected areas. Such activities include oil exploration, dredging, dumping, fishing, certain types of vessel traffic, and the focus of section 316(b) rulemaking, the impingement and entrainment of aquatic organisms by cooling water intake structures.

Impingement and entrainment affects many kinds of aquatic organisms, including fish, shrimp, crabs, birds, sea turtles, and marine mammals. Aquatic environments are harmed both directly and indirectly by impingement and entrainment of these organisms. In addition to the harm that results from the direct removal of organisms by impingement and entrainment, there are the indirect effects on aquatic food webs that result from the impingement and entrainment of organisms that serve as prey for predator species. There are also cumulative impacts that result from multiple intake structures operating in the same local area, or when multiple intakes affect individuals within the same population over a broad geographic range.

Decreased numbers of aquatic organisms resulting from the direct and indirect effects of impingement and entrainment can have a number of consequences for marine resources, including impairment of food webs, disruption of nutrient cycling and energy transfer within aquatic ecosystems, loss of native species, and reduction of biodiversity. By reducing the impingement and entrainment of aquatic organisms, this proposed rule would not only help protect individual species but also the overall marine environment, thereby advancing the objective of Executive Order 13158 to protect marine areas.

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# Chapter E1: Summary of Social Costs

## INTRODUCTION

This chapter presents EPA’s estimates of the costs to society associated with the options evaluated for the proposed rule for Phase III facilities. The **social costs** of regulatory actions are the **opportunity costs** to society of employing scarce resources to reduce environmental damages. The social costs of regulation include both monetary and non-monetary outlays made by society. Monetary outlays include the resource costs of compliance, government administrative costs, and other adjustment costs, such as the cost of relocating displaced workers. Non-monetary outlays, some of which can be assigned monetary values, include losses in consumers’ and producers’ surplus in affected product markets, the adverse effects of involuntary unemployment, possible loss of time (e.g., delays in investment decisions), and possible adverse impacts on the rate of innovation.

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EPA’s estimates of social costs for the evaluated section 316(b) Phase III options include three components:

1. direct costs of complying with the regulation within each regulated industry segment,
2. cost to State governments in administering the regulation, and
3. cost to the Federal government in administering the regulation.

This chapter presents the social cost analysis for the three proposed options for existing facilities: the “50 MGD for All Waterbodies” option (“50 MGD All”), the “200 MGD for All Waterbodies” option (“200 MGD All”), and the “100 MGD for Certain Waterbodies” Option (“100 MGD CWB”). These options differ with regard to (1) their design intake flow (DIF) applicability thresholds: 50, 100, and 200 MGD, respectively; and (2) the type of waterbodies to which they would apply: the options with the 50 and 200 MGD applicability thresholds would apply to all waterbody types while the option with the 100 MGD applicability threshold would apply only to facilities withdrawing cooling water from certain waterbody types (i.e., an ocean, estuary, tidal river/stream or one of the Great Lakes). Facilities meeting these applicability criteria would be required to meet similar performance standards to those required in the final 316(b) Phase II rule, including a 80-95% reduction in impingement mortality and a 60-90% reduction in entrainment. Facilities not meeting these applicability criteria would continue to be subject to permit requirements based on the Director’s Best Professional Judgment (BPJ). As a result, the number of facilities that would be required to meet the national requirements would vary among the three proposed options. Of the three options presented here, the 100 MGD for Certain Waterbodies Option would apply national categorical requirements to the smallest number of facilities, with the 200 MGD for All Waterbodies Option and 50 MGD for All Waterbodies Option applying to successively larger numbers of facilities.

This chapter also presents social costs for new offshore oil and gas extraction facilities (also abbreviated as “new OOG facilities”). The proposed requirements for this industry segment are based on a 2 MGD DIF applicability threshold and would apply to an estimated 124 new offshore oil and gas extraction facilities.

## E1-1 COSTS OF COMPLIANCE BY REGULATED INDUSTRY SEGMENT

The compliance costs used to estimate total social costs differ in their consideration of taxes from those in *Part B: Economic Analysis for Phase III Existing Facilities*, and *Part C: Economic Analysis for Phase III New Offshore Oil and Gas Extraction Facilities*, which were calculated for the purpose of estimating the private costs and

impacts of the evaluated options. For the impact analyses, compliance costs are measured according to their effect on the financial performance of the regulated facilities and firms. The analyses therefore explicitly consider the tax deductibility of compliance outlays.<sup>1</sup> In the analysis of costs to society, however, these compliance costs are considered on a pre-tax basis. The costs to society are the full value of the resources used, whether they are paid for by the regulated facilities or by all taxpayers in the form of lost tax revenues.

EPA included no costs for facilities that were assessed as baseline closures or that are subject to permit specifications based on best professional judgement (BPJ), instead of the proposed rule's national categorical requirements. However, EPA's estimates do include compliance costs for facilities estimated to close because of the rule.<sup>2</sup> This approach may overstate the social costs of compliance, to the extent that the net economic loss to society in facility closures is less than the estimated cost to society of compliance.<sup>3</sup>

To assess the cost to society of complying with Phase III regulation, EPA estimated the costs to facilities for the labor, equipment, materials, and other economic resources needed to comply with each evaluated option. In this analysis, EPA assumed that the market prices for labor, equipment, materials, and other compliance resources represent the opportunity costs to society for use of those resources in regulatory compliance.

For the analysis of installation downtime in the Electric Generators and Manufacturers segment, EPA assumed that the cost of society is equal to the increase in production cost for providing the electricity or other replacement goods and services not provided by the facilities that incur downtime in reaching compliance with the 316(b) Phase III regulation. For both Electric Generators and Manufacturers, this cost is approximated as the lost revenue from installation downtime *less* the variable cost of producing the electricity or other goods and services not produced due to the installation downtime. Implicit in this assumption is that the variable production cost of replacing the electricity or other lost goods and services is essentially the same as the price received for the sale of the electricity or other goods and services not produced by the facilities incurring the installation downtime. For electricity, this assumption is consistent with the electricity market concept that the variable production cost of the last generating unit to be dispatched is approximately the same as the price received for the last unit of production. For the goods and services not produced by affected Manufacturers facilities, the assumption is likewise consistent with a competitive market model of increasing marginal production cost, such that the production cost of the "last" or highest cost goods and services produced and sold in any period is approximately equal to the price received for those goods and services in the market. For Manufacturers – which do not necessarily produce and sell goods in as orderly markets as electric generators and where, as a result, the cost of producing replacement goods and services may be less than selling price – this assumption may overstate the cost to society of installation downtime. Absent specific knowledge of the overall production cost structure of the affected industries, EPA adopted this conservative assumption for its analysis of the social cost of Phase III regulation.

EPA estimates that the offshore oil and gas extraction industry segment would not incur cost from installation downtime because only new offshore oil and gas extraction facilities would be regulated under this proposed rule. The potential disruption in ongoing business operation estimated for existing Manufacturers and Electric Generators is not relevant for new facilities.

Finally, EPA assumes in its social cost analysis that none of the evaluated options would affect the aggregate quantity of goods and services sold to consumers by producers in the affected industry segments. The resource costs of compliance therefore manifest only as a reduction in the total of **producers' surplus** and **consumers'**

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<sup>1</sup> Because government facilities and cooperatives are not subject to income taxes, their costs are not adjusted for taxes.

<sup>2</sup> To the extent such impacts occur under any of the options analyzed.

<sup>3</sup> Including costs for regulatory closures yields an estimate of social costs assuming that all facilities, except those assessed as baseline closures, would incur the costs of regulatory compliance and continue to operate post-regulation. Calculating costs as if all facilities continue operating will overstate social costs if the social cost of compliance is greater than the net economic loss to society from facility closure. Whether this result will hold depends, in part, on the difference between social and private discount rates, and the marginal cost to society to replace the lost production of goods and services in closing facilities.

**surplus**, with no change in the quantity of goods and services produced and consumed. In the impact analyses, specific assumptions are made about the distribution of this effect between producers and consumers (i.e., the impact analyses of all analyzed section 316(b) Phase III industry segments – Manufacturers, Electric Generators, and new offshore oil and gas extraction facilities – assume that all compliance costs are absorbed by complying businesses with no increase in prices to consumers). However, for the social cost analysis, the distribution of this effect between producers and consumers is irrelevant. Given the very small impact of the options on total costs within the industry segments, EPA believes the assumption of no effect on total quantity of goods and services produced and consumed is reasonable.

Table E1-1 below summarizes total direct facility costs for the proposed rule new offshore oil and gas extraction facilities combined with the three proposed options for existing facilities. As described in *Chapter B1: Summary of Cost Categories and Key Analysis Elements for Existing Facilities* and *Chapter C1: Summary of Cost Categories and Key Analysis Elements for New Offshore Oil and Gas Extraction Facilities*, costs were first tallied on an as-incurred, year-by-year basis over the total time period of analysis, considering the latest year in which any affected facility is assumed to reach compliance (2014 for existing facilities, 2026 for new offshore oil and gas extraction facilities) and for a period of 30 years in which facilities are assumed to continue compliance, for the purposes of the social cost analysis. Thus, for the social cost analysis, the analysis period extends to 2055 for new facilities and to 2043 for existing facilities.<sup>4</sup> These profiles of costs by year were then discounted to the assumed year when this proposed rule would take effect, beginning of year 2007, at two values of the discount rate, 3% and 7%. These discount rate values reflect guidance from the Office of Management and Budget (OMB) regulatory analysis guidance document, Circular A-4 (OMB, 2003). After calculating the present value of these cost streams, EPA calculated their constant annual equivalent value (annualized value) using the annualization formula presented in Chapter B1, again using the two values of the discount rate, 3% and 7%.

**Table E1-1: Summary of Annualized Direct Costs by Regulated Industry Segments  
(in millions, 2003 \$)**

	50 MGD All (Existing) / 2 MGD All (New)		200 MGD All (Existing) / 2 MGD All (New)		100 MGD CWB (Existing) / 2 MGD All (New)	
	3%	7%	3%	7%	3%	7%
Existing Manufacturing Facilities						
Primary Manufacturing Industries	\$42.7	\$45.1	\$21.7	\$23.1	\$16.7	\$17.4
Other Industries	\$4.1	\$4.4	\$1.0	\$0.9	\$0.7	\$0.7
Existing Electric Generators	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
Total Existing Facilities <sup>a</sup>	\$46.8	\$49.5	\$22.6	\$24.0	\$17.5	\$18.1
New Oil & Gas Facilities	\$3.2	\$2.7	\$3.2	\$2.7	\$3.2	\$2.7
<b>Total Direct Facility Costs<sup>a</sup></b>	<b>\$50.0</b>	<b>\$52.2</b>	<b>\$25.9</b>	<b>\$26.7</b>	<b>\$20.7</b>	<b>\$20.8</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

<sup>4</sup> Tables E1-4 through E1-6 below present the time profiles of regulatory costs associated with each of the proposed options for existing facilities, combined with the proposed option for new offshore oil and gas extraction facilities.

## E1-2 STATE AND FEDERAL ADMINISTRATIVE COSTS

Social costs also include costs to State and Federal governments of administering the permitting and compliance monitoring activities under the proposed regulation. State and Federal permitting authorities incur costs to administer the rule, including labor costs to write permits and to conduct compliance monitoring and enforcement activities. *Chapter D2: UMRA Analysis* presents more information on State and Federal implementation costs.

EPA's estimate of State and Federal government cost for administering the proposed rule is comparatively minor in relation to the estimated direct cost of regulatory compliance. At a 3% discount rate, EPA estimates administrative costs of \$0.98 million (50 MGD All Option), \$0.54 million (200 MGD All Option), and \$0.57 million (100 MGD CWB Option). At a 7% discount rate, these costs amount to \$0.89 million (50 MGD All Option), \$0.45 million (200 MGD All Option), and \$0.48 million (100 MGD CWB Option).

**Table E1-2: Summary of Annualized Government Costs (in millions, 2003 \$)**

	50 MGD All (Existing) / 2 MGD All (New)		200 MGD All (Existing) / 2 MGD All (New)		100 MGD CWB (Existing) / 2 MGD All (New)	
	3%	7%	3%	7%	3%	7%
Existing Facilities:						
State Admin. Costs	\$0.55	\$0.55	\$0.12	\$0.12	\$0.15	\$0.16
Federal Admin. Costs	\$0.01	\$0.01	<\$0.01	<\$0.01	<\$0.01	<\$0.01
Total Existing Facilities Admin. Cost <sup>a</sup>	\$0.56	\$0.56	\$0.12	\$0.13	\$0.15	\$0.16
New OOGF Facilities:						
State Admin. Costs	n/a	n/a	n/a	n/a	n/a	n/a
Federal Admin. Costs	\$0.42	\$0.32	\$0.42	\$0.32	\$0.42	\$0.32
Total New OOGF Facilities Admin. Cost	\$0.42	\$0.32	\$0.42	\$0.32	\$0.42	\$0.32
<b>Total Gov. Admin. Costs<sup>a</sup></b>	<b>\$0.98</b>	<b>\$0.89</b>	<b>\$0.54</b>	<b>\$0.45</b>	<b>\$0.57</b>	<b>\$0.48</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

## E1-3 TOTAL SOCIAL COST

Table E1-3 combines the information presented above by industry segment and major cost category – direct facility costs and administrative costs – and reports the total social costs of the three proposal options, discounted at a 3% and 7% rate. At a 3% discount rate the estimated total annualized social costs are \$51.0 million for the 50 MGD All Option, \$26.4 million for the 200 MGD All Option, and \$21.3 million for the 100 MGD CWB Option. At a 7% discount rate the estimated total annualized social costs are \$53.1 million for the 50 MGD All Option, \$27.2 million for the 200 MGD All Option, and \$21.3 million for the 100 MGD CWB Option (all values in 2003\$).

As shown in Table E1-3, existing facilities account for the substantial majority of total social cost under all three proposal options. Since no Electric Generators would be subject to the national requirements under any of the three proposed options, Manufacturers account for all costs in the existing facilities segment. At a 3% discount rate, annualized pre-tax costs *per facility* in the Manufacturers segment amount to \$349,000 for the 50 MGD All option, \$920,000 for the 200 MGD All option, and \$929,000 for the 100 MGD CWB option. At a 7% discount

rate, annualized pre-tax costs in the Manufacturers segment amount to \$369,000 for the 50 MGD All option, \$974,000 for the 200 MGD All option, and \$962,000 for the 100 MGD CWB option. Because the 200 MGD option and the 100 MGD option apply national categorical requirements to a smaller number of facilities than the 50 MGD option, they result in a lower total national cost but a higher cost per regulated facility. Facilities that are subject to the national requirements of the 200 MGD option and the 100 MGD option incur the same compliance costs as under the 50 MGD option; however, the average costs per regulated facility are higher under the 200 MGD and 100 MGD options because only the higher flow, and therefore higher cost, facilities incur costs under these options. For facilities in the new offshore oil and gas extraction industry segment, *per facility* costs under the proposed rule are approximately \$30,000 at a 3% discount rate and \$24,000 at a 7% discount rate.

**Table E1-3: Summary of Annualized Social Costs (in millions, 2003 \$)**

	50 MGD All (Existing) / 2 MGD All (New)		200 MGD All (Existing) / 2 MGD All (New)		100 MGD CWB (Existing) / 2 MGD All (New)	
	3%	7%	3%	7%	3%	7%
Existing Facilities:						
Total Direct Facility Costs	\$46.8	\$49.5	\$22.6	\$24.0	\$17.5	\$18.1
Total Government Administrative Costs	\$0.6	\$0.6	\$0.1	\$0.1	\$0.2	\$0.2
Total Existing Facilities Social Cost	\$47.3	\$50.1	\$22.8	\$24.1	\$17.6	\$18.3
New OOGE Facilities:						
Total Direct Facility Costs	\$3.2	\$2.7	\$3.2	\$2.7	\$3.2	\$2.7
Total Government Administrative Costs	\$0.4	\$0.3	\$0.4	\$0.3	\$0.4	\$0.3
Total New OOGE Facilities Social Cost	\$3.7	\$3.0	\$3.7	\$3.0	\$3.7	\$3.0
<b>Total Social Cost</b>	<b>\$51.0</b>	<b>\$53.1</b>	<b>\$26.4</b>	<b>\$27.2</b>	<b>\$21.3</b>	<b>\$21.3</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

Tables E1-4 through E1-6, starting on the following page, provide additional detail on the compliance cost calculations. The tables compile, for each of the three proposed options for existing facilities and the proposed option for new offshore oil and gas extraction facilities, the time profiles of costs incurred by the regulated industry segments, administrative costs, and total costs. The tables also report the calculated present and annualized values of costs at 3% and 7% discount rates. Time profiles for other options evaluated for existing facilities are presented in the appendix to this chapter.

**Table E1-4: Time Profile of Compliance Costs for the 50 MGD for All Waterbodies Option for Existing Facilities and the Proposed Option for New OOGF Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOGF Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2007	\$3.2	\$0.0	\$0.2	\$3.3	\$1.9	\$0.0	\$1.9	\$5.2
2008	\$10.2	\$0.0	\$0.0	\$10.2	\$1.7	\$0.0	\$1.7	\$12.0
2009	\$15.4	\$0.0	\$0.0	\$15.4	\$1.8	\$0.0	\$1.8	\$17.2
2010	\$171.6	\$0.0	\$1.1	\$172.6	\$1.1	\$0.0	\$1.1	\$173.7
2011	\$178.4	\$0.0	\$2.1	\$180.5	\$1.6	\$0.0	\$1.6	\$182.2
2012	\$73.4	\$0.0	\$1.1	\$74.4	\$1.9	\$0.5	\$2.4	\$76.8
2013	\$109.9	\$0.0	\$0.9	\$110.8	\$2.2	\$0.1	\$2.4	\$113.2
2014	\$21.9	\$0.0	\$0.3	\$22.2	\$2.1	\$0.7	\$2.7	\$24.9
2015	\$22.2	\$0.0	\$0.4	\$22.7	\$1.8	\$0.3	\$2.0	\$24.7
2016	\$17.8	\$0.0	\$0.7	\$18.6	\$1.6	\$0.3	\$1.9	\$20.5
2017	\$18.2	\$0.0	\$0.4	\$18.6	\$4.1	\$0.5	\$4.6	\$23.2
2018	\$14.9	\$0.0	\$0.4	\$15.3	\$2.7	\$0.3	\$3.0	\$18.2
2019	\$18.8	\$0.0	\$0.2	\$19.0	\$3.7	\$0.5	\$4.2	\$23.2
2020	\$44.1	\$0.0	\$0.4	\$44.5	\$2.8	\$0.3	\$3.2	\$47.7
2021	\$81.0	\$0.0	\$0.7	\$81.7	\$2.8	\$0.4	\$3.2	\$85.0
2022	\$28.8	\$0.0	\$0.4	\$29.2	\$4.8	\$0.7	\$5.5	\$34.7
2023	\$57.9	\$0.0	\$0.4	\$58.2	\$2.9	\$0.4	\$3.3	\$61.5
2024	\$21.9	\$0.0	\$0.2	\$22.1	\$4.4	\$0.7	\$5.1	\$27.2
2025	\$22.2	\$0.0	\$0.4	\$22.7	\$3.0	\$0.4	\$3.4	\$26.1
2026	\$17.8	\$0.0	\$0.7	\$18.6	\$2.9	\$0.4	\$3.3	\$21.9
2027	\$18.2	\$0.0	\$0.4	\$18.6	\$4.9	\$0.7	\$5.6	\$24.2
2028	\$14.9	\$0.0	\$0.4	\$15.3	\$2.8	\$0.3	\$3.1	\$18.4
2029	\$18.8	\$0.0	\$0.2	\$19.0	\$4.1	\$0.7	\$4.7	\$23.7
2030	\$44.1	\$0.0	\$0.4	\$44.5	\$2.8	\$0.3	\$3.1	\$47.7
2031	\$81.0	\$0.0	\$0.7	\$81.7	\$2.8	\$0.3	\$3.1	\$84.9
2032	\$28.8	\$0.0	\$0.4	\$29.2	\$5.1	\$0.7	\$5.8	\$35.0
2033	\$57.9	\$0.0	\$0.4	\$58.2	\$2.8	\$0.3	\$3.1	\$61.4
2034	\$21.9	\$0.0	\$0.2	\$22.1	\$4.6	\$0.7	\$5.2	\$27.3
2035	\$22.2	\$0.0	\$0.4	\$22.7	\$2.8	\$0.3	\$3.1	\$25.8
2036	\$17.8	\$0.0	\$0.7	\$18.6	\$2.8	\$0.3	\$3.1	\$21.7

**Table E1-4: Time Profile of Compliance Costs for the 50 MGD for All Waterbodies Option for Existing Facilities and the Proposed Option for New OOG Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOG Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2037	\$18.2	\$0.0	\$0.4	\$18.6	\$3.9	\$0.7	\$4.6	\$23.2
2038	\$14.9	\$0.0	\$0.4	\$15.3	\$1.8	\$0.3	\$2.1	\$17.4
2039	\$14.2	\$0.0	\$0.2	\$14.4	\$3.0	\$0.6	\$3.6	\$18.0
2040	\$12.0	\$0.0	\$0.1	\$12.1	\$1.7	\$0.3	\$2.0	\$14.1
2041	\$6.2	\$0.0	\$0.1	\$6.3	\$1.7	\$0.2	\$1.9	\$8.2
2042	\$4.1	\$0.0	\$0.0	\$4.1	\$3.6	\$0.5	\$4.1	\$8.3
2043	\$0.5	\$0.0	\$0.0	\$0.5	\$1.6	\$0.2	\$1.8	\$2.4
2044					\$2.4	\$0.4	\$2.8	\$2.8
2045					\$1.5	\$0.2	\$1.7	\$1.7
2046					\$1.5	\$0.2	\$1.6	\$1.6
2047					\$2.1	\$0.3	\$2.4	\$2.4
2048					\$0.5	\$0.1	\$0.6	\$0.6
2049					\$1.0	\$0.2	\$1.3	\$1.3
2050					\$0.3	\$0.1	\$0.4	\$0.4
2051					\$0.2	\$0.1	\$0.3	\$0.3
2052					\$1.5	\$0.1	\$1.6	\$1.6
2053					\$0.1	\$0.0	\$0.2	\$0.2
2054					\$0.6	\$0.1	\$0.7	\$0.7
2055					\$0.0	\$0.0	\$0.1	\$0.1
<b>PV 3%</b>	<b>\$944.6</b>	<b>\$0.0</b>	<b>\$11.2</b>	<b>\$955.8</b>	<b>\$65.4</b>	<b>\$8.5</b>	<b>\$74.0</b>	<b>\$1,029.8</b>
<b>Annualized 3%</b>	<b>\$46.8</b>	<b>\$0.0</b>	<b>\$0.6</b>	<b>\$47.3</b>	<b>\$3.2</b>	<b>\$0.4</b>	<b>\$3.7</b>	<b>\$51.0</b>
<b>PV 7%</b>	<b>\$657.5</b>	<b>\$0.0</b>	<b>\$7.5</b>	<b>\$665.0</b>	<b>\$36.0</b>	<b>\$4.3</b>	<b>\$40.3</b>	<b>\$705.3</b>
<b>Annualized 7%</b>	<b>\$49.5</b>	<b>\$0.0</b>	<b>\$0.6</b>	<b>\$50.1</b>	<b>\$2.7</b>	<b>\$0.3</b>	<b>\$3.0</b>	<b>\$53.1</b>

Source: U.S. EPA Analysis, 2004.

**Table E1-5: Time Profile of Compliance Costs for the 200 MGD for All Waterbodies Option for Existing Facilities and the Proposed Option for New OOG Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOG Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2007	\$0.0	\$0.0	\$0.2	\$0.2	\$1.9	\$0.0	\$1.9	\$2.1
2008	\$1.4	\$0.0	\$0.0	\$1.4	\$1.7	\$0.0	\$1.7	\$3.1
2009	\$2.1	\$0.0	\$0.0	\$2.1	\$1.8	\$0.0	\$1.8	\$3.9
2010	\$129.1	\$0.0	\$0.0	\$129.1	\$1.1	\$0.0	\$1.1	\$130.2
2011	\$83.4	\$0.0	\$0.5	\$83.8	\$1.6	\$0.0	\$1.6	\$85.4
2012	\$12.1	\$0.0	\$0.1	\$12.3	\$1.9	\$0.5	\$2.4	\$14.6
2013	\$45.4	\$0.0	\$0.4	\$45.8	\$2.2	\$0.1	\$2.4	\$48.1
2014	\$7.4	\$0.0	\$0.1	\$7.5	\$2.1	\$0.7	\$2.7	\$10.2
2015	\$8.5	\$0.0	\$0.1	\$8.5	\$1.8	\$0.3	\$2.0	\$10.6
2016	\$7.4	\$0.0	\$0.2	\$7.5	\$1.6	\$0.3	\$1.9	\$9.5
2017	\$8.9	\$0.0	\$0.1	\$9.0	\$4.1	\$0.5	\$4.6	\$13.5
2018	\$7.4	\$0.0	\$0.1	\$7.5	\$2.7	\$0.3	\$3.0	\$10.5
2019	\$7.2	\$0.0	\$0.1	\$7.3	\$3.7	\$0.5	\$4.2	\$11.5
2020	\$12.7	\$0.0	\$0.0	\$12.7	\$2.8	\$0.3	\$3.2	\$15.9
2021	\$39.8	\$0.0	\$0.2	\$40.0	\$2.8	\$0.4	\$3.2	\$43.2
2022	\$14.6	\$0.0	\$0.1	\$14.6	\$4.8	\$0.7	\$5.5	\$20.1
2023	\$45.7	\$0.0	\$0.1	\$45.8	\$2.9	\$0.4	\$3.3	\$49.1
2024	\$7.3	\$0.0	\$0.1	\$7.4	\$4.4	\$0.7	\$5.1	\$12.5
2025	\$8.5	\$0.0	\$0.0	\$8.5	\$3.0	\$0.4	\$3.4	\$11.9
2026	\$7.4	\$0.0	\$0.2	\$7.5	\$2.9	\$0.4	\$3.3	\$10.9
2027	\$8.9	\$0.0	\$0.1	\$9.0	\$4.9	\$0.7	\$5.6	\$14.6
2028	\$7.4	\$0.0	\$0.1	\$7.5	\$2.8	\$0.3	\$3.1	\$10.6
2029	\$7.2	\$0.0	\$0.1	\$7.3	\$4.1	\$0.7	\$4.7	\$12.0
2030	\$12.7	\$0.0	\$0.0	\$12.7	\$2.8	\$0.3	\$3.1	\$15.9
2031	\$39.8	\$0.0	\$0.2	\$40.0	\$2.8	\$0.3	\$3.1	\$43.1
2032	\$14.6	\$0.0	\$0.1	\$14.6	\$5.1	\$0.7	\$5.8	\$20.4
2033	\$45.7	\$0.0	\$0.1	\$45.8	\$2.8	\$0.3	\$3.1	\$48.9
2034	\$7.3	\$0.0	\$0.1	\$7.4	\$4.6	\$0.7	\$5.2	\$12.7
2035	\$8.5	\$0.0	\$0.0	\$8.5	\$2.8	\$0.3	\$3.1	\$11.6
2036	\$7.4	\$0.0	\$0.2	\$7.5	\$2.8	\$0.3	\$3.1	\$10.7
2037	\$8.9	\$0.0	\$0.1	\$9.0	\$3.9	\$0.7	\$4.6	\$13.6

**Table E1-5: Time Profile of Compliance Costs for the 200 MGD for All Waterbodies Option for Existing Facilities and the Proposed Option for New OOG Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOG Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2038	\$7.4	\$0.0	\$0.1	\$7.5	\$1.8	\$0.3	\$2.1	\$9.6
2039	\$7.0	\$0.0	\$0.1	\$7.1	\$3.0	\$0.6	\$3.6	\$10.6
2040	\$6.7	\$0.0	\$0.0	\$6.8	\$1.7	\$0.3	\$2.0	\$8.8
2041	\$3.9	\$0.0	\$0.0	\$3.9	\$1.7	\$0.2	\$1.9	\$5.9
2042	\$3.0	\$0.0	\$0.0	\$3.1	\$3.6	\$0.5	\$4.1	\$7.2
2043	\$0.4	\$0.0	\$0.0	\$0.4	\$1.6	\$0.2	\$1.8	\$2.2
2044					\$2.4	\$0.4	\$2.8	\$2.8
2045					\$1.5	\$0.2	\$1.7	\$1.7
2046					\$1.5	\$0.2	\$1.6	\$1.6
2047					\$2.1	\$0.3	\$2.4	\$2.4
2048					\$0.5	\$0.1	\$0.6	\$0.6
2049					\$1.0	\$0.2	\$1.3	\$1.3
2050					\$0.3	\$0.1	\$0.4	\$0.4
2051					\$0.2	\$0.1	\$0.3	\$0.3
2052					\$1.5	\$0.1	\$1.6	\$1.6
2053					\$0.1	\$0.0	\$0.2	\$0.2
2054					\$0.6	\$0.1	\$0.7	\$0.7
2055					\$0.0	\$0.0	\$0.1	\$0.1
<b>PV 3%</b>	<b>\$457.2</b>	<b>\$0.0</b>	<b>\$2.5</b>	<b>\$459.7</b>	<b>\$65.4</b>	<b>\$8.5</b>	<b>\$74.0</b>	<b>\$533.6</b>
<b>Annualized 3%</b>	<b>\$22.6</b>	<b>\$0.0</b>	<b>\$0.1</b>	<b>\$22.8</b>	<b>\$3.2</b>	<b>\$0.4</b>	<b>\$3.7</b>	<b>\$26.4</b>
<b>PV 7%</b>	<b>\$318.7</b>	<b>\$0.0</b>	<b>\$1.7</b>	<b>\$320.3</b>	<b>\$36.0</b>	<b>\$4.3</b>	<b>\$40.3</b>	<b>\$360.6</b>
<b>Annualized 7%</b>	<b>\$24.0</b>	<b>\$0.0</b>	<b>\$0.1</b>	<b>\$24.1</b>	<b>\$2.7</b>	<b>\$0.3</b>	<b>\$3.0</b>	<b>\$27.2</b>

Source: U.S. EPA Analysis, 2004.

**Table E1-6: Time Profile of Compliance Costs for the 100 MGD for Certain Waterbodies Option for Existing Facilities and the Proposed Option for New OOGF Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOGF Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2007	\$0.4	\$0.0	\$0.2	\$0.6	\$1.9	\$0.0	\$1.9	\$2.5
2008	\$3.8	\$0.0	\$0.0	\$3.8	\$1.7	\$0.0	\$1.7	\$5.6
2009	\$3.9	\$0.0	\$0.0	\$3.9	\$1.8	\$0.0	\$1.8	\$5.7
2010	\$8.8	\$0.0	\$0.2	\$9.0	\$1.1	\$0.0	\$1.1	\$10.1
2011	\$138.9	\$0.0	\$0.8	\$139.7	\$1.6	\$0.0	\$1.6	\$141.4
2012	\$11.4	\$0.0	\$0.1	\$11.5	\$1.9	\$0.5	\$2.4	\$13.9
2013	\$34.9	\$0.0	\$0.4	\$35.3	\$2.2	\$0.1	\$2.4	\$37.7
2014	\$5.3	\$0.0	\$0.0	\$5.4	\$2.1	\$0.7	\$2.7	\$8.1
2015	\$8.2	\$0.0	\$0.1	\$8.3	\$1.8	\$0.3	\$2.0	\$10.4
2016	\$5.2	\$0.0	\$0.3	\$5.4	\$1.6	\$0.3	\$1.9	\$7.4
2017	\$6.5	\$0.0	\$0.1	\$6.6	\$4.1	\$0.5	\$4.6	\$11.2
2018	\$5.2	\$0.0	\$0.1	\$5.3	\$2.7	\$0.3	\$3.0	\$8.3
2019	\$5.2	\$0.0	\$0.0	\$5.2	\$3.7	\$0.5	\$4.2	\$9.5
2020	\$8.2	\$0.0	\$0.1	\$8.3	\$2.8	\$0.3	\$3.2	\$11.5
2021	\$41.1	\$0.0	\$0.3	\$41.4	\$2.8	\$0.4	\$3.2	\$44.6
2022	\$12.2	\$0.0	\$0.1	\$12.2	\$4.8	\$0.7	\$5.5	\$17.7
2023	\$35.3	\$0.0	\$0.1	\$35.4	\$2.9	\$0.4	\$3.3	\$38.7
2024	\$5.3	\$0.0	\$0.0	\$5.4	\$4.4	\$0.7	\$5.1	\$10.5
2025	\$8.2	\$0.0	\$0.1	\$8.3	\$3.0	\$0.4	\$3.4	\$11.7
2026	\$5.2	\$0.0	\$0.3	\$5.4	\$2.9	\$0.4	\$3.3	\$8.8
2027	\$6.5	\$0.0	\$0.1	\$6.6	\$4.9	\$0.7	\$5.6	\$12.2
2028	\$5.2	\$0.0	\$0.1	\$5.3	\$2.8	\$0.3	\$3.1	\$8.4
2029	\$5.2	\$0.0	\$0.0	\$5.2	\$4.1	\$0.7	\$4.7	\$10.0
2030	\$8.2	\$0.0	\$0.1	\$8.3	\$2.8	\$0.3	\$3.1	\$11.4
2031	\$41.1	\$0.0	\$0.3	\$41.4	\$2.8	\$0.3	\$3.1	\$44.5
2032	\$12.2	\$0.0	\$0.1	\$12.2	\$5.1	\$0.7	\$5.8	\$18.0
2033	\$35.3	\$0.0	\$0.1	\$35.4	\$2.8	\$0.3	\$3.1	\$38.6
2034	\$5.3	\$0.0	\$0.0	\$5.4	\$4.6	\$0.7	\$5.2	\$10.6
2035	\$8.2	\$0.0	\$0.1	\$8.3	\$2.8	\$0.3	\$3.1	\$11.4
2036	\$5.2	\$0.0	\$0.3	\$5.4	\$2.8	\$0.3	\$3.1	\$8.6
2037	\$6.5	\$0.0	\$0.1	\$6.6	\$3.9	\$0.7	\$4.6	\$11.2
2038	\$5.2	\$0.0	\$0.1	\$5.3	\$1.8	\$0.3	\$2.1	\$7.4
2039	\$4.8	\$0.0	\$0.0	\$4.8	\$3.0	\$0.6	\$3.6	\$8.4
2040	\$4.7	\$0.0	\$0.0	\$4.7	\$1.7	\$0.3	\$2.0	\$6.7
2041	\$2.2	\$0.0	\$0.0	\$2.2	\$1.7	\$0.2	\$1.9	\$4.1
2042	\$1.3	\$0.0	\$0.0	\$1.3	\$3.6	\$0.5	\$4.1	\$5.4
2043	\$0.4	\$0.0	\$0.0	\$0.4	\$1.6	\$0.2	\$1.8	\$2.2

**Table E1-6: Time Profile of Compliance Costs for the 100 MGD for Certain Waterbodies Option for Existing Facilities and the Proposed Option for New OOG Facilities (in millions; 2003\$)**

Year	Existing Facilities				New OOG Facilities			Total
	Regulated Industry Segments		Administrative Costs	Total	O&G Facilities	Administrative Costs	Total	
	Man.	Generators						
2044					\$2.4	\$0.4	\$2.8	\$2.8
2045					\$1.5	\$0.2	\$1.7	\$1.7
2046					\$1.5	\$0.2	\$1.6	\$1.6
2047					\$2.1	\$0.3	\$2.4	\$2.4
2048					\$0.5	\$0.1	\$0.6	\$0.6
2049					\$1.0	\$0.2	\$1.3	\$1.3
2050					\$0.3	\$0.1	\$0.4	\$0.4
2051					\$0.2	\$0.1	\$0.3	\$0.3
2052					\$1.5	\$0.1	\$1.6	\$1.6
2053					\$0.1	\$0.0	\$0.2	\$0.2
2054					\$0.6	\$0.1	\$0.7	\$0.7
2055					\$0.0	\$0.0	\$0.1	\$0.1
<b>PV 3%</b>	<b>\$352.8</b>	<b>\$0.0</b>	<b>\$3.1</b>	<b>\$355.9</b>	<b>\$65.4</b>	<b>\$8.5</b>	<b>\$74.0</b>	<b>\$429.9</b>
<b>Annualized 3%</b>	<b>\$17.5</b>	<b>\$0.0</b>	<b>\$0.2</b>	<b>\$17.6</b>	<b>\$3.2</b>	<b>\$0.4</b>	<b>\$3.7</b>	<b>\$21.3</b>
<b>PV 7%</b>	<b>\$240.4</b>	<b>\$0.0</b>	<b>\$2.1</b>	<b>\$242.5</b>	<b>\$36.0</b>	<b>\$4.3</b>	<b>\$40.3</b>	<b>\$282.8</b>
<b>Annualized 7%</b>	<b>\$18.1</b>	<b>\$0.0</b>	<b>\$0.2</b>	<b>\$18.3</b>	<b>\$2.7</b>	<b>\$0.3</b>	<b>\$3.0</b>	<b>\$21.3</b>

Source: U.S. EPA Analysis, 2004.

## **E1-4 LIMITATIONS AND UNCERTAINTIES**

EPA did not include in its estimate of social costs the cost associated with unemployment that may result from facility closures. Potential unemployment-related costs would include the cost of administering unemployment programs for workers who are projected to lose employment (but not the cost of unemployment benefits, which are a transfer payment within society); and an estimate of the amount that workers would be willing to pay to avoid involuntary unemployment. However, from its facility impact analysis, EPA estimates that no facilities would close as a result of the proposed rule. EPA also did not recognize any possible savings in unemployment-related costs from jobs created by the rule as a negative cost (benefit) of the regulation. Accordingly, EPA estimates a zero cost of unemployment for the proposed rule.

Another key uncertainty factor in the analysis of costs to society is EPA's estimate of the cost of installation downtime in Manufacturers facilities. As described above, EPA adopted the conservative assumption that the production cost for replacing the goods and services not provided by complying facilities due to installation downtime would be approximately equal to the price received for those goods and services in the market. To the extent that these replacement goods and services are produced at a cost less than selling price, this assumption would lead to an overestimate of the cost to society of installation downtime. The amount of potential overestimation is not known.

## GLOSSARY

**consumer surplus:** The value that consumers derive from goods and services above the price they have to pay to obtain the goods and services.

**opportunity cost:** The lost value of alternative uses of resources (capital, labor, and raw materials) used in regulatory compliance.

**producer surplus:** The difference between what producers' earn on their output and the economic costs of producing that output, including a normal return on capital.

**social cost:** The costs incurred by society as a whole as a result of the proposed rule. Social costs do not include costs that are transfers among parties that do not represent a new cost overall.

## REFERENCES

Office of Management and Budget (OMB). 2003. Circular A-4, Regulatory Analysis. September 17, 2003. Available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

# Appendix to Chapter E1

## INTRODUCTION

This appendix presents the social cost results for five other options evaluated for potential Phase III existing facilities. For all options, facility counts and other results only include those potential Phase III existing facilities that are (1) non-baseline closures and (2) subject to national categorical requirements under the option. See *Chapter B3: Economic Impact Analysis for Manufacturers* and *Chapter B5: Summary of Electric Generator Costs* for more information on baseline closures and counts of facilities subject to national categorical requirements under each option. See the main body of this chapter for a description of data sources and methodologies used in these analyses.

### APPENDIX CONTENTS

E1A-1	Costs of Compliance by Regulated Industry Segment . . . . .	E1A-1
E1A-2	State and Federal Administrative Costs . . . . .	E1A-2
E1A-3	Total Social Cost . . . . .	E1A-2

## E1A-1 COSTS OF COMPLIANCE BY REGULATED INDUSTRY SEGMENT

Table E1A-1 below summarizes total direct facility costs for the five other options evaluated for existing facilities, at a 3% and a 7% discount rate. For a description of this analysis, see section E1-1 above.

<b>Table E1A-1: Summary of Annualized Direct Costs by Regulated Industry Segments Existing Facilities (in millions, 2003\$)</b>					
	<b>Option 3</b>	<b>Option 4</b>	<b>Option 2</b>	<b>Option 1</b>	<b>Option 6</b>
<i>3% Discount Rate</i>					
Manufacturers					
Primary Manufacturing Industries	\$58.2	\$62.1	\$66.2	\$68.3	\$85.9
Other Industries	\$4.4	\$4.3	\$4.4	\$4.4	\$5.2
Electric Generators	\$1.5	\$0.7	\$1.9	\$2.2	\$2.9
<b>Total Direct Facility Costs<sup>a</sup></b>	<b>\$64.1</b>	<b>\$67.1</b>	<b>\$72.6</b>	<b>\$75.0</b>	<b>\$94.0</b>
<i>7% Discount Rate</i>					
Manufacturers					
Primary Manufacturing Industries	\$62.5	\$67.8	\$71.7	\$73.8	\$92.5
Other Industries	\$4.7	\$4.6	\$4.7	\$4.7	\$5.5
Electric Generators	\$1.5	\$0.7	\$1.8	\$2.1	\$2.8
<b>Total Direct Facility Costs<sup>a</sup></b>	<b>\$68.7</b>	<b>\$73.0</b>	<b>\$78.3</b>	<b>\$80.7</b>	<b>\$100.8</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

## E1A-2 STATE AND FEDERAL ADMINISTRATIVE COSTS

Table E1A-2 presents annualized costs to State and Federal governments of administering the permitting and compliance monitoring activities for the five other options evaluated for existing facilities, at a 3% and a 7% discount rate. For a description of this analysis, see section E1-2 above.

<b>Table E1A-2: Summary of Annualized Government Costs for Existing Facilities (in millions, 2003\$)</b>					
	<b>Option 3</b>	<b>Option 4</b>	<b>Option 2</b>	<b>Option 1</b>	<b>Option 6</b>
<i>3% Discount Rate</i>					
State Admin. Costs	\$0.91	\$0.81	\$1.05	\$1.08	\$1.66
Federal Admin. Costs	\$0.02	\$0.01	\$0.02	\$0.02	\$0.03
<b>Total Gov. Admin. Costs<sup>a</sup></b>	<b>\$0.92</b>	<b>\$0.83</b>	<b>\$1.07</b>	<b>\$1.10</b>	<b>\$1.69</b>
<i>7% Discount Rate</i>					
State Admin. Costs	\$0.90	\$0.81	\$1.05	\$1.08	\$1.65
Federal Admin. Costs	\$0.02	\$0.02	\$0.02	\$0.02	\$0.04
<b>Total Gov. Admin. Costs<sup>a</sup></b>	<b>\$0.92</b>	<b>\$0.83</b>	<b>\$1.07</b>	<b>\$1.10</b>	<b>\$1.69</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

## E1A-3 TOTAL SOCIAL COST

Table E1A-3 presents the total social costs of the five other options evaluated for existing facilities, including direct facility costs and government administrative costs, at a 3% and a 7% discount rate. Tables E1A-4 through E1A-8 present the time profiles for the five other options. For a description of these analyses, see section E1-3 above.

<b>Table E1A-3: Summary of Annualized Social Costs for Existing Facilities (in millions, 2003\$)</b>					
	<b>Option 3</b>	<b>Option 4</b>	<b>Option 2</b>	<b>Option 1</b>	<b>Option 6</b>
<i>3% Discount Rate</i>					
Total Direct Facility Costs	\$64.1	\$67.1	\$72.6	\$75.0	\$94.0
Total Government Administrative Costs	\$0.9	\$0.8	\$1.1	\$1.1	\$1.7
<b>Total Social Cost<sup>a</sup></b>	<b>\$65.0</b>	<b>\$67.9</b>	<b>\$73.7</b>	<b>\$76.1</b>	<b>\$95.7</b>
<i>7% Discount Rate</i>					
Total Direct Facility Costs	\$68.7	\$73.0	\$78.3	\$80.7	\$100.8
Total Government Administrative Costs	\$0.9	\$0.8	\$1.1	\$1.1	\$1.7
<b>Total Social Cost<sup>a</sup></b>	<b>\$69.6</b>	<b>\$73.9</b>	<b>\$79.3</b>	<b>\$81.8</b>	<b>\$102.5</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: U.S. EPA Analysis, 2004.

**Table E1A-4: Time Profile of Compliance Costs for Existing Facilities - Option 3 (in millions; 2003\$)**

Year	Costs of Compliance by Regulated Industry Segments		Administrative Costs	Total Cost
	Manufacturers	Generators		
2007	\$3.5	\$0.2	\$0.2	\$3.9
2008	\$14.0	\$0.9	\$0.0	\$14.9
2009	\$23.4	\$1.4	\$0.0	\$24.8
2010	\$184.6	\$1.8	\$1.6	\$188.0
2011	\$190.4	\$3.0	\$2.7	\$196.1
2012	\$277.3	\$2.0	\$2.3	\$281.5
2013	\$116.4	\$1.0	\$1.6	\$119.0
2014	\$28.1	\$2.2	\$0.8	\$31.0
2015	\$28.9	\$1.0	\$0.7	\$30.6
2016	\$26.7	\$1.4	\$1.0	\$29.1
2017	\$24.3	\$0.7	\$0.9	\$25.9
2018	\$18.6	\$1.1	\$0.7	\$20.4
2019	\$23.2	\$1.4	\$0.4	\$25.0
2020	\$52.9	\$1.5	\$0.7	\$55.1
2021	\$91.8	\$2.8	\$1.0	\$95.6
2022	\$36.8	\$1.7	\$0.9	\$39.4
2023	\$64.4	\$1.1	\$0.7	\$66.1
2024	\$28.0	\$2.2	\$0.4	\$30.6
2025	\$28.9	\$1.0	\$0.7	\$30.6
2026	\$26.7	\$1.4	\$1.0	\$29.1
2027	\$24.3	\$0.7	\$0.9	\$25.9
2028	\$18.6	\$1.1	\$0.7	\$20.4
2029	\$23.2	\$1.4	\$0.4	\$25.0
2030	\$52.9	\$1.5	\$0.7	\$55.1
2031	\$91.8	\$2.8	\$1.0	\$95.6
2032	\$36.8	\$1.7	\$0.9	\$39.4
2033	\$64.4	\$1.1	\$0.7	\$66.1
2034	\$28.0	\$2.2	\$0.4	\$30.6
2035	\$28.9	\$1.0	\$0.7	\$30.6
2036	\$26.7	\$1.4	\$1.0	\$29.1
2037	\$24.3	\$0.7	\$0.9	\$25.9
2038	\$18.6	\$1.1	\$0.7	\$20.4
2039	\$17.3	\$0.6	\$0.4	\$18.3
2040	\$14.6	\$0.4	\$0.2	\$15.3
2041	\$8.3	\$0.3	\$0.1	\$8.8
2042	\$5.1	\$0.1	\$0.1	\$5.3
2043	\$0.8	\$0.1	\$0.0	\$1.0
<b>PV 3%</b>	<b>\$1,263.6</b>	<b>\$30.9</b>	<b>\$18.7</b>	<b>\$1,313.2</b>
<b>Annualized 3%</b>	<b>\$62.6</b>	<b>\$1.5</b>	<b>\$0.9</b>	<b>\$65.0</b>
<b>PV 7%</b>	<b>\$892.1</b>	<b>\$19.5</b>	<b>\$12.2</b>	<b>\$923.8</b>
<b>Annualized 7%</b>	<b>\$67.2</b>	<b>\$1.5</b>	<b>\$0.9</b>	<b>\$69.6</b>

Source: U.S. EPA Analysis, 2004.

**Table E1A-5: Time Profile of Compliance Costs for Existing Facilities - Option 4 (in millions; 2003\$)**

Year	Costs of Compliance by Regulated Industry Segments		Administrative Costs	Total Cost
	Manufacturers	Generators		
2007	\$3.2	\$0.0	\$0.2	\$3.3
2008	\$13.6	\$0.3	\$0.0	\$13.9
2009	\$22.4	\$0.6	\$0.0	\$23.0
2010	\$180.9	\$0.6	\$1.1	\$182.6
2011	\$291.4	\$2.0	\$3.0	\$296.5
2012	\$282.0	\$0.5	\$2.1	\$284.6
2013	\$115.6	\$0.5	\$1.5	\$117.7
2014	\$25.1	\$1.3	\$0.6	\$27.0
2015	\$28.8	\$0.6	\$0.5	\$29.9
2016	\$25.0	\$0.7	\$1.1	\$26.8
2017	\$23.7	\$0.3	\$0.8	\$24.8
2018	\$19.5	\$0.6	\$0.5	\$20.7
2019	\$22.0	\$0.3	\$0.3	\$22.6
2020	\$50.6	\$0.6	\$0.5	\$51.8
2021	\$89.8	\$1.0	\$1.1	\$91.9
2022	\$39.7	\$0.3	\$0.8	\$40.8
2023	\$64.0	\$0.6	\$0.5	\$65.2
2024	\$25.1	\$1.2	\$0.3	\$26.6
2025	\$28.8	\$0.6	\$0.5	\$29.9
2026	\$25.0	\$0.7	\$1.1	\$26.8
2027	\$23.7	\$0.3	\$0.8	\$24.8
2028	\$19.5	\$0.6	\$0.5	\$20.7
2029	\$22.0	\$0.3	\$0.3	\$22.6
2030	\$50.6	\$0.6	\$0.5	\$51.8
2031	\$89.8	\$1.0	\$1.1	\$91.9
2032	\$39.7	\$0.3	\$0.8	\$40.8
2033	\$64.0	\$0.6	\$0.5	\$65.2
2034	\$25.1	\$1.2	\$0.3	\$26.6
2035	\$28.8	\$0.6	\$0.5	\$29.9
2036	\$25.0	\$0.7	\$1.1	\$26.8
2037	\$23.7	\$0.3	\$0.8	\$24.8
2038	\$19.5	\$0.6	\$0.5	\$20.7
2039	\$17.4	\$0.3	\$0.3	\$18.0
2040	\$15.2	\$0.3	\$0.2	\$15.7
2041	\$8.4	\$0.2	\$0.1	\$8.7
2042	\$5.1	\$0.1	\$0.1	\$5.2
2043	\$0.8	\$0.1	\$0.0	\$0.9
<b>PV 3%</b>	<b>\$1,340.4</b>	<b>\$14.1</b>	<b>\$16.7</b>	<b>\$1,371.2</b>
<b>Annualized 3%</b>	<b>\$66.4</b>	<b>\$0.7</b>	<b>\$0.8</b>	<b>\$67.9</b>
<b>PV 7%</b>	<b>\$960.9</b>	<b>\$8.9</b>	<b>\$11.0</b>	<b>\$980.8</b>
<b>Annualized 7%</b>	<b>\$72.4</b>	<b>\$0.7</b>	<b>\$0.8</b>	<b>\$73.9</b>

Source: U.S. EPA Analysis, 2004.

**Table E1A-6: Time Profile of Compliance Costs for Existing Facilities - Option 2 (in millions; 2003\$)**

Year	Costs of Compliance by Regulated Industry Segments		Administrative Costs	Total Cost
	Manufacturers	Generators		
2007	\$3.5	\$0.2	\$0.2	\$3.9
2008	\$15.0	\$1.0	\$0.0	\$16.0
2009	\$25.6	\$1.8	\$0.0	\$27.4
2010	\$187.5	\$2.2	\$1.6	\$191.4
2011	\$298.4	\$3.8	\$3.3	\$305.5
2012	\$286.1	\$2.2	\$2.9	\$291.2
2013	\$120.9	\$1.2	\$2.0	\$124.1
2014	\$30.2	\$3.3	\$0.9	\$34.4
2015	\$31.7	\$1.2	\$0.7	\$33.6
2016	\$29.5	\$1.9	\$1.2	\$32.7
2017	\$26.9	\$0.9	\$1.1	\$28.8
2018	\$22.1	\$1.4	\$0.7	\$24.2
2019	\$25.3	\$1.6	\$0.5	\$27.3
2020	\$55.6	\$1.8	\$0.7	\$58.2
2021	\$96.0	\$2.8	\$1.2	\$100.0
2022	\$43.6	\$1.9	\$1.1	\$46.6
2023	\$69.4	\$1.4	\$0.7	\$71.4
2024	\$30.1	\$3.3	\$0.5	\$33.9
2025	\$31.7	\$1.2	\$0.7	\$33.6
2026	\$29.5	\$1.9	\$1.2	\$32.7
2027	\$26.9	\$0.9	\$1.1	\$28.8
2028	\$22.1	\$1.4	\$0.7	\$24.2
2029	\$25.3	\$1.6	\$0.5	\$27.3
2030	\$55.6	\$1.8	\$0.7	\$58.2
2031	\$96.0	\$2.8	\$1.2	\$100.0
2032	\$43.6	\$1.9	\$1.1	\$46.6
2033	\$69.4	\$1.4	\$0.7	\$71.4
2034	\$30.1	\$3.3	\$0.5	\$33.9
2035	\$31.7	\$1.2	\$0.7	\$33.6
2036	\$29.5	\$1.9	\$1.2	\$32.7
2037	\$26.9	\$0.9	\$1.1	\$28.8
2038	\$22.1	\$1.4	\$0.7	\$24.2
2039	\$19.4	\$0.8	\$0.5	\$20.7
2040	\$16.7	\$0.6	\$0.2	\$17.6
2041	\$9.7	\$0.5	\$0.2	\$10.3
2042	\$5.9	\$0.2	\$0.1	\$6.2
2043	\$1.1	\$0.2	\$0.0	\$1.3
<b>PV 3%</b>	<b>\$1,427.1</b>	<b>\$38.6</b>	<b>\$21.6</b>	<b>\$1,487.3</b>
<b>Annualized 3%</b>	<b>\$70.7</b>	<b>\$1.9</b>	<b>\$1.1</b>	<b>\$73.7</b>
<b>PV 7%</b>	<b>\$1,014.8</b>	<b>\$24.3</b>	<b>\$14.2</b>	<b>\$1,053.3</b>
<b>Annualized 7%</b>	<b>\$76.4</b>	<b>\$1.8</b>	<b>\$1.1</b>	<b>\$79.3</b>

Source: U.S. EPA Analysis, 2004.

**Table E1A-7: Time Profile of Compliance Costs for Existing Facilities - Option 1 (in millions; 2003\$)**

Year	Costs of Compliance by Regulated Industry Segments		Administrative Costs	Total Cost
	Manufacturers	Generators		
2007	\$3.5	\$0.2	\$0.2	\$3.9
2008	\$15.1	\$1.0	\$0.0	\$16.1
2009	\$26.1	\$1.8	\$0.0	\$27.9
2010	\$201.3	\$3.1	\$1.7	\$206.0
2011	\$299.7	\$4.0	\$3.3	\$306.9
2012	\$290.1	\$2.6	\$3.1	\$295.9
2013	\$122.0	\$1.4	\$2.0	\$125.3
2014	\$31.3	\$3.8	\$1.0	\$36.1
2015	\$32.7	\$1.4	\$0.8	\$34.9
2016	\$31.1	\$2.2	\$1.2	\$34.5
2017	\$27.9	\$1.1	\$1.1	\$30.2
2018	\$23.1	\$1.6	\$0.7	\$25.4
2019	\$26.4	\$1.8	\$0.5	\$28.6
2020	\$58.6	\$2.4	\$0.7	\$61.7
2021	\$97.6	\$3.0	\$1.2	\$101.8
2022	\$47.7	\$2.3	\$1.1	\$51.2
2023	\$70.4	\$1.6	\$0.7	\$72.7
2024	\$31.2	\$3.3	\$0.5	\$35.0
2025	\$32.7	\$1.4	\$0.7	\$34.9
2026	\$31.1	\$2.2	\$1.2	\$34.5
2027	\$27.9	\$1.1	\$1.1	\$30.2
2028	\$23.1	\$1.6	\$0.7	\$25.4
2029	\$26.4	\$1.8	\$0.5	\$28.6
2030	\$58.6	\$2.4	\$0.7	\$61.7
2031	\$97.6	\$3.0	\$1.2	\$101.8
2032	\$47.7	\$2.3	\$1.1	\$51.2
2033	\$70.4	\$1.6	\$0.7	\$72.7
2034	\$31.2	\$3.3	\$0.5	\$35.0
2035	\$32.7	\$1.4	\$0.7	\$34.9
2036	\$31.1	\$2.2	\$1.2	\$34.5
2037	\$27.9	\$1.1	\$1.1	\$30.2
2038	\$23.1	\$1.6	\$0.7	\$25.4
2039	\$20.4	\$1.0	\$0.5	\$21.9
2040	\$17.6	\$0.8	\$0.2	\$18.6
2041	\$10.6	\$0.6	\$0.2	\$11.4
2042	\$5.9	\$0.3	\$0.1	\$6.2
2043	\$1.1	\$0.3	\$0.0	\$1.4
<b>PV 3%</b>	<b>\$1,469.5</b>	<b>\$43.9</b>	<b>\$22.3</b>	<b>\$1,535.7</b>
<b>Annualized 3%</b>	<b>\$72.8</b>	<b>\$2.2</b>	<b>1.1</b>	<b>\$76.1</b>
<b>PV 7%</b>	<b>\$1,043.3</b>	<b>\$27.6</b>	<b>\$14.6</b>	<b>\$1,085.6</b>
<b>Annualized 7%</b>	<b>\$78.6</b>	<b>\$2.1</b>	<b>\$1.1</b>	<b>\$81.8</b>

Source: U.S. EPA Analysis, 2004.

**Table E1A-8: Time Profile of Compliance Costs for Existing Facilities - Option 6 (in millions; 2003\$)**

Year	Costs of Compliance by Regulated Industry Segments		Administrative Costs	Total Cost
	Manufacturers	Generators		
2007	\$5.5	\$0.2	\$0.2	\$6.0
2008	\$22.8	\$1.0	\$0.0	\$23.8
2009	\$36.7	\$2.0	\$0.0	\$38.7
2010	\$259.6	\$3.5	\$3.0	\$266.2
2011	\$400.0	\$5.2	\$5.0	\$410.1
2012	\$308.6	\$4.0	\$4.1	\$316.7
2013	\$131.9	\$2.6	\$3.1	\$137.6
2014	\$42.8	\$4.9	\$1.9	\$49.6
2015	\$43.7	\$1.8	\$1.3	\$46.8
2016	\$40.1	\$2.5	\$1.9	\$44.5
2017	\$37.6	\$2.0	\$1.5	\$41.1
2018	\$31.6	\$2.8	\$1.1	\$35.5
2019	\$36.5	\$2.2	\$0.8	\$39.6
2020	\$72.5	\$2.7	\$1.3	\$76.5
2021	\$124.3	\$3.4	\$1.8	\$129.5
2022	\$65.0	\$3.2	\$1.5	\$69.7
2023	\$80.3	\$2.9	\$1.1	\$84.3
2024	\$42.6	\$4.2	\$0.8	\$47.7
2025	\$43.7	\$1.8	\$1.3	\$46.7
2026	\$40.1	\$2.5	\$1.8	\$44.5
2027	\$37.6	\$2.0	\$1.5	\$41.1
2028	\$31.6	\$2.8	\$1.1	\$35.5
2029	\$36.5	\$2.2	\$0.8	\$39.6
2030	\$72.5	\$2.7	\$1.3	\$76.5
2031	\$124.3	\$3.4	\$1.8	\$129.5
2032	\$65.0	\$3.2	\$1.5	\$69.7
2033	\$80.3	\$2.9	\$1.1	\$84.3
2034	\$42.6	\$4.2	\$0.8	\$47.7
2035	\$43.7	\$1.8	\$1.3	\$46.7
2036	\$40.1	\$2.5	\$1.8	\$44.5
2037	\$37.6	\$2.0	\$1.5	\$41.1
2038	\$31.6	\$2.8	\$1.1	\$35.5
2039	\$26.5	\$1.3	\$0.8	\$28.7
2040	\$22.2	\$1.1	\$0.3	\$23.6
2041	\$13.0	\$0.9	\$0.2	\$14.2
2042	\$7.5	\$0.5	\$0.1	\$8.1
2043	\$1.7	\$0.5	\$0.0	\$2.2
<b>PV 3%</b>	<b>\$1,839.0</b>	<b>\$58.8</b>	<b>\$34.2</b>	<b>\$1,932.0</b>
<b>Annualized 3%</b>	<b>\$91.1</b>	<b>\$2.9</b>	<b>\$1.7</b>	<b>\$95.7</b>
<b>PV 7%</b>	<b>\$1,301.3</b>	<b>\$36.6</b>	<b>\$22.4</b>	<b>\$1,360.3</b>
<b>Annualized 7%</b>	<b>\$98.0</b>	<b>\$2.8</b>	<b>\$1.7</b>	<b>\$102.5</b>

Source: U.S. EPA Analysis, 2004.

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# Chapter E2: Summary of Benefits

## INTRODUCTION

This chapter summarizes the EPA’s benefits analysis conducted in developing the Proposed Section 316(b) Rule for Phase III Facilities and presents the total monetary value of regional and national baseline losses and of benefits of the three proposed options for Phase III existing facilities:

- ▶ the “50 MGD for All Waterbodies” option (“50 MGD All”),
- ▶ the “200 MGD for All Waterbodies” option (“200 MGD All”), and
- ▶ the “100 MGD for Certain Waterbodies” option (“100 MGD CWB”).

Benefits results for five other options evaluated by EPA, but not proposed, are presented in the appendix to this chapter.

The *Regional Benefits Assessment for the Proposed Section 316(b) Rule for Phase III Facilities* (RBA) provides greater detail on the methods and data used in the regional analyses (U.S. EPA, 2004). See Chapter A1 for a discussion of the methods used to estimate impingement and entrainment (I&E), and see Chapters A2 through A9 for discussion of the methods used to estimate the value of I&E losses and the benefits of the options evaluated for the proposed rule. The results of the regional analyses are presented in Parts B through G of the RBA.

EPA was unable to assess benefits of reducing I&E at new offshore oil and gas extraction facilities due to significant data gaps at the time of proposal. Therefore, the benefits estimates presented in this section are underestimates because they do not reflect benefits associated with reducing I&E at new offshore oil and gas extraction facilities.

## E2-1 CALCULATING LOSSES AND BENEFITS

EPA’s analysis of national baseline losses and benefits under the evaluated options includes 603 sample-weighted facilities in seven case study regions, excluding facilities that are expected to close in the baseline. The Agency calculated baseline losses by summing losses from all 603 facilities. EPA’s estimates of benefits are based on only those facilities that have requirements under each option.

Quantifying and monetizing reductions in I&E due to the evaluated options considered for the proposed rule is challenging. As described in Chapters A3 and A6 of the RBA, EPA has estimated non-use values only qualitatively and, as a result, the estimated total benefits of the evaluated options reflect use values only. The RBA discusses specific limitations and uncertainties associated with estimation of commercial and recreational benefits at the regional level. National benefit estimates, which are based on the regional estimates, are subject to the same uncertainties. The overall effect of these uncertainties is of unknown magnitude and direction (i.e., the estimates may over- or understate the anticipated national-level of use benefits); however, EPA has no data to indicate that the results for any of the benefit categories are atypical or unreasonable.

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## E2-2 SUMMARY OF BASELINE LOSSES AND EXPECTED REDUCTIONS IN I&E

Based on the results of the regional analyses, EPA calculated total baseline I&E losses and the amount by which these losses would be reduced under each of the evaluated options. Losses are presented using two measures of I&E:

1. Age-one equivalent losses – the number of individual fish of different ages impinged and entrained by facility intakes, expressed as age-one equivalents; and
2. Foregone fishery yield – pounds of commercial harvest and numbers of recreational fish and shellfish that are not harvested due to I&E, including indirect losses of harvested species due to losses of forage species.

Table E2-1 presents baseline I&E losses for both measures. As reported in Table E2-1, EPA estimates total national losses of age-one equivalents for all 603 facilities of 120 million fish. Nationwide, EPA estimates that 4.2 million pounds of fishery yield per year is foregone under current rates of I&E. Approximately 37% of all age-one equivalent losses, or 44.2 million fish, occur in the Inland region. The Gulf of Mexico region has the highest foregone fishery yields with approximately 2 million pounds, followed by the Mid-Atlantic region with approximately 0.9 million pounds. More detailed discussions of the I&E losses in each region are provided in Parts B through G of the RBA.

**Table E2-1: Total Annual Baseline I&E Losses for Potential Phase III Existing Facilities by Region (thousands)**

Region	Age-One Equivalents	Foregone Fishery Yield (lbs)
California	1,310	96
North Atlantic	2,340	45
Mid-Atlantic	23,200	920
South Atlantic	1,520	123
Gulf of Mexico	12,700	1,990
Great Lakes	34,400	489
Inland	44,200	495
<b>National Total</b>	<b>120,000</b>	<b>4,160</b>

Source: U.S. EPA Analysis, 2004.

To gauge the expected benefits of the proposed options, EPA estimated the extent to which these options would reduce the estimated baseline losses. These avoided losses are based on the expected reductions in I&E at each facility from implementation of the required compliance technologies. Table E2-2 reports, by region and option, the expected percent reductions in I&E, and the estimated quantities of reduction in (1) losses in age-one equivalents and (2) foregone fishery yield. At the national level, EPA estimates that the 50 MGD All option would reduce age-one equivalent losses by 49.5 million fish and fishery yield loss by 2.2 million pounds. In comparison, the 200 MGD All option and the 100 MGD CWB option apply to smaller numbers of facilities and would result in slightly smaller reductions in I&E. The 200 MGD All option would reduce age-one equivalent losses by 34.0 million fish and fishery yield losses by 1.4 million pounds. The 100 MGD All option would reduce age-one equivalent losses by 29.8 million fish and fishery yield losses by 1.9 million pounds.

The study regions show substantial variation in the estimated reductions in I&E losses and avoided losses in age-one equivalents and foregone fishery yield. As reported in Table E2-2, the largest percentage reductions in I&E occur in the Gulf of Mexico for both the 50 MGD All and 100 MGD CWB options with 76% and 57%, respectively. The 200 MGD All option has the largest reductions in I&E in the Mid-Atlantic region with 65% and 49%, respectively.

Percentage reductions in entrainment are less substantial, overall, than the impingement reductions. However, the Great Lakes region shows larger percentage reductions in entrainment than impingement for each of the three proposed options, where entrainment reductions range from 37% to 43%, and impingement reductions are 21% to 33%.

In terms of avoided age-one equivalent losses, the Inland region accounts for the largest reductions for the 50 MGD All option with approximately 30% of avoided losses. Under the 200 MGD All and the 100 MGD CWB options, the Mid-Atlantic region accounts for the largest reductions in total avoided age-one equivalent losses with 35% and 40%, respectively.

On the basis of avoided losses in fishery yield, the Gulf of Mexico generates the greatest benefits under each of the three options, followed by the Mid-Atlantic region. Together, these two regions account for 83%, 84%, and 92% of the avoided fishery yield losses achieved by the 50 MGD All, the 200 MGD All, and the 100 MGD CWB options, respectively.

More detailed discussions of regional benefits are provided in Parts B through G of the RBA.

**Table E2-2: Expected Reduction in I&E for Phase III Existing Facilities by Option and Region**

Region	Number of Facilities Installing Technology	Impingement	Entrainment	Age-One Equivalents (thousands)	Foregone Fishery Yield (thousands; lbs)
<b>50 MGD All Option</b>					
California	1	39%	29%	383	28
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	3	73%	55%	13,400	600
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	7	76%	57%	8,380	1,250
Great Lakes	19	33%	43%	11,600	169
Inland	69	37%	27%	14,800	157
<b>National Total</b>	<b>103</b>			<b>49,493</b>	<b>2,222</b>
<b>200 MGD All Option</b>					
California <sup>b</sup>	0	0%	0%	0	0
North Atlantic	1	11%	8%	198	4
Mid-Atlantic	2	65%	49%	11,900	534
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	2	41%	31%	4,580	682
Great Lakes	5	21%	37%	7,710	116
Inland	12	22%	21%	9,650	107
<b>National Total</b>	<b>22</b>			<b>34,038</b>	<b>1,443</b>
<b>100 MGD CWB Option</b>					
California <sup>b</sup>	0	0%	0%	0	0
North Atlantic	3	43%	32%	754	15
Mid-Atlantic	2	65%	49%	11,900	534
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	7	76%	57%	8,380	1,250
Great Lakes	6	24%	40%	8,740	130
Inland <sup>c</sup>	0	0%	0%	0	0
<b>National Total</b>	<b>18</b>			<b>29,774</b>	<b>1,929</b>

<sup>a</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

<sup>b</sup> No I&E reductions are expected in the California region because all potentially regulated facilities in this region withdraw less than 100 MGD and therefore would not be required to install technologies to comply with the 200 MGD All and the 100 MGD CWB options.

<sup>c</sup> The 100 MGD CWB option would not apply national categorical requirements to facilities located on freshwater rivers and lakes/reservoirs. Thus, no I&E reductions are expected at the potentially regulated facilities in the Inland region.

Source: U.S. EPA Analysis, 2004.

### E2-3 TIME PROFILE OF BENEFITS

To account for the difference in timing of benefits and costs, EPA developed a time profile of total benefits from all Phase III facilities that reflects when benefits from each facility would be realized. For each study region,

EPA first calculated the undiscounted commercial and recreational fishing benefits from the expected annual I&E reductions under the proposed options, based on the assumptions that all facilities in each region have achieved compliance with the rule and that benefits are realized immediately following compliance. Then, since there are regulatory and biological time lags between promulgation of the rule and the realization of benefits, EPA created a time profile of benefits that takes into account the fact that benefits do not begin immediately. The development of the time profile of benefits is discussed in detail in *Chapter A8: Discounting Benefits*.

Table E2-3 below provides the time profile of the monetary value of baseline I&E losses, by region. EPA developed similar time profiles for monetary benefits for the three proposed options for Phase III existing facilities (see Tables E2-4, E2-5, and E2-6).

**Table E2-3: Time Profile of Mean Monetary Value of Total Baseline I&E Losses (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$111	\$118	\$112	\$341
2008	\$12	\$20	\$111	\$8	\$222	\$236	\$224	\$833
2009	\$23	\$41	\$222	\$16	\$887	\$945	\$897	\$3,031
2010	\$93	\$163	\$889	\$65	\$998	\$1,063	\$1,009	\$4,280
2011	\$105	\$183	\$1,001	\$73	\$1,054	\$1,122	\$1,065	\$4,602
2012	\$110	\$194	\$1,056	\$77	\$1,109	\$1,181	\$1,121	\$4,848
2013	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2014	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2015	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2016	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2017	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2018	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2019	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2020	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2021	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2022	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2023	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2024	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2025	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2026	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2027	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2028	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2029	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2030	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2031	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2032	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2033	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2034	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2035	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2036	\$116	\$204	\$1,112	\$81	\$1,109	\$1,181	\$1,121	\$4,924
2037	\$116	\$204	\$1,112	\$81	\$998	\$1,063	\$1,009	\$4,583
2038	\$105	\$183	\$1,001	\$73	\$887	\$945	\$897	\$4,090
2039	\$93	\$163	\$889	\$65	\$222	\$236	\$224	\$1,892
2040	\$23	\$41	\$222	\$16	\$111	\$118	\$112	\$644
2041	\$12	\$20	\$111	\$8	\$55	\$59	\$56	\$322
2042	\$6	\$10	\$56	\$4	\$0	\$0	\$0	\$76
2043	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2044	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2045	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2046	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2047	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2048	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>PV 3%<sup>b</sup></b>	<b>\$2,143</b>	<b>\$3,761</b>	<b>\$20,519</b>	<b>\$1,498</b>	<b>\$21,088</b>	<b>\$22,452</b>	<b>\$21,306</b>	<b>\$92,769</b>
<b>Annualized 3%<sup>c</sup></b>	<b>\$109</b>	<b>\$192</b>	<b>\$1,047</b>	<b>\$76</b>	<b>\$1,076</b>	<b>\$1,146</b>	<b>\$1,087</b>	<b>\$4,733</b>
<b>PV 7%<sup>b</sup></b>	<b>\$1,258</b>	<b>\$2,207</b>	<b>\$12,042</b>	<b>\$879</b>	<b>\$12,857</b>	<b>\$13,688</b>	<b>\$12,990</b>	<b>\$55,921</b>
<b>Annualized 7%<sup>c</sup></b>	<b>\$101</b>	<b>\$178</b>	<b>\$970</b>	<b>\$71</b>	<b>\$1,036</b>	<b>\$1,103</b>	<b>\$1,047</b>	<b>\$4,506</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the total monetary value of I&E losses includes only losses in use values.

<sup>b</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>c</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

Source: U.S. EPA Analysis, 2004.

**Table E2-4: Time Profile of Mean Total Use Benefits - 50 MGD All Option (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$0 <sup>e</sup>	\$7	\$7
2011	\$3	\$0	\$7	\$0	\$0	\$11	\$33	\$54
2012	\$7	\$5	\$14	\$0	\$76	\$26	\$96	\$223
2013	\$27	\$10	\$99	\$0	\$152	\$106	\$231	\$625
2014	\$31	\$42	\$164	\$0	\$608	\$160	\$275	\$1,280
2015	\$32	\$50	\$439	\$0	\$684	\$291	\$329	\$1,826
2016	\$34	\$72	\$571	\$0	\$722	\$371	\$349	\$2,120
2017	\$34	\$78	\$607	\$0	\$760	\$391	\$354	\$2,225
2018	\$34	\$79	\$636	\$0	\$760	\$406	\$358	\$2,272
2019	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2020	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2021	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2022	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2023	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2024	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2025	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2026	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2027	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2028	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2029	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2030	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2031	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2032	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2033	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2034	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2035	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2036	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2037	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2038	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2039	\$34	\$81	\$643	\$0	\$760	\$410	\$358	\$2,286
2040	\$34	\$81	\$643	\$0	\$760	\$410	\$351	\$2,279
2041	\$31	\$81	\$636	\$0	\$760	\$400	\$324	\$2,232
2042	\$27	\$76	\$629	\$0	\$684	\$384	\$262	\$2,063
2043	\$7	\$71	\$543	\$0	\$608	\$304	\$127	\$1,661
2044	\$3	\$39	\$479	\$0	\$152	\$250	\$83	\$1,006
2045	\$2	\$31	\$203	\$0	\$76	\$120	\$28	\$460
2046	\$0	\$9	\$71	\$0	\$38	\$39	\$8	\$166
2047	\$0	\$3	\$36	\$0	\$0	\$19	\$4	\$61
2048	\$0	\$2	\$7	\$0	\$0	\$5	\$0 <sup>e</sup>	\$14
<b>PV 3%<sup>c</sup></b>	<b>\$577</b>	<b>\$1,298</b>	<b>\$10,239</b>	<b>\$0</b>	<b>\$12,463</b>	<b>\$6,602</b>	<b>\$5,998</b>	<b>\$37,177</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$29</b>	<b>\$66</b>	<b>\$522</b>	<b>\$0</b>	<b>\$636</b>	<b>\$337</b>	<b>\$306</b>	<b>\$1,897</b>
<b>PV 7%<sup>c</sup></b>	<b>\$302</b>	<b>\$635</b>	<b>\$4,973</b>	<b>\$0</b>	<b>\$6,280</b>	<b>\$3,252</b>	<b>\$3,113</b>	<b>\$18,556</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$24</b>	<b>\$51</b>	<b>\$401</b>	<b>\$0</b>	<b>\$506</b>	<b>\$262</b>	<b>\$251</b>	<b>\$1,495</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>e</sup> Positive non-zero value less than \$500.

Source: U.S. EPA Analysis, 2004.

**Table E2-5: Time Profile of Mean Total Use Benefits - 200 MGD All Option (thousands; 2003\$)<sup>a</sup>**

Year	California <sup>b</sup>	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$0	\$3	\$3
2011	\$0	\$0	\$0	\$0	\$0	\$4	\$23	\$27
2012	\$0	\$0	\$0	\$0	\$42	\$8	\$58	\$108
2013	\$0	\$0	\$43	\$0	\$83	\$48	\$168	\$343
2014	\$0	\$2	\$100	\$0	\$332	\$77	\$191	\$702
2015	\$0	\$3	\$372	\$0	\$374	\$185	\$225	\$1,159
2016	\$0	\$14	\$501	\$0	\$394	\$251	\$238	\$1,398
2017	\$0	\$15	\$537	\$0	\$415	\$267	\$240	\$1,474
2018	\$0	\$16	\$565	\$0	\$415	\$279	\$242	\$1,518
2019	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2020	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2021	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2022	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2023	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2024	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2025	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2026	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2027	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2028	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2029	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2030	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2031	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2032	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2033	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2034	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2035	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2036	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2037	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2038	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2039	\$0	\$17	\$572	\$0	\$415	\$283	\$242	\$1,530
2040	\$0	\$17	\$572	\$0	\$415	\$283	\$239	\$1,527
2041	\$0	\$17	\$572	\$0	\$415	\$279	\$219	\$1,503
2042	\$0	\$17	\$572	\$0	\$374	\$275	\$184	\$1,422
2043	\$0	\$17	\$529	\$0	\$332	\$235	\$74	\$1,188
2044	\$0	\$15	\$472	\$0	\$83	\$207	\$51	\$828
2045	\$0	\$14	\$200	\$0	\$42	\$99	\$17	\$371
2046	\$0	\$3	\$71	\$0	\$21	\$32	\$4	\$132
2047	\$0	\$2	\$36	\$0	\$0	\$16	\$2	\$56
2048	\$0	\$1	\$7	\$0	\$0	\$4	\$0	\$12
<b>PV 3%<sup>c</sup></b>	<b>\$0</b>	<b>\$266</b>	<b>\$9,047</b>	<b>\$0</b>	<b>\$6,810</b>	<b>\$4,513</b>	<b>\$4,063</b>	<b>\$24,698</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$0</b>	<b>\$14</b>	<b>\$462</b>	<b>\$0</b>	<b>\$347</b>	<b>\$230</b>	<b>\$207</b>	<b>\$1,260</b>
<b>PV 7%<sup>c</sup></b>	<b>\$0</b>	<b>\$124</b>	<b>\$4,349</b>	<b>\$0</b>	<b>\$3,431</b>	<b>\$2,192</b>	<b>\$2,113</b>	<b>\$12,209</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$0</b>	<b>\$10</b>	<b>\$350</b>	<b>\$0</b>	<b>\$277</b>	<b>\$177</b>	<b>\$170</b>	<b>\$984</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 200 MGD and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

Source: U.S. EPA Analysis, 2004.

**Table E2-6: Time Profile of Mean Total Use Benefits - 100 MGD CWB Option (thousands; 2003\$)<sup>a</sup>**

Year	California <sup>b</sup>	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland <sup>c</sup>	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2011	\$0	\$0	\$0	\$0	\$0	\$6	\$0	\$6
2012	\$0	\$5	\$0	\$0	\$76	\$12	\$0	\$93
2013	\$0	\$10	\$43	\$0	\$152	\$66	\$0	\$270
2014	\$0	\$40	\$100	\$0	\$608	\$98	\$0	\$846
2015	\$0	\$47	\$372	\$0	\$684	\$212	\$0	\$1,316
2016	\$0	\$60	\$501	\$0	\$722	\$284	\$0	\$1,566
2017	\$0	\$64	\$537	\$0	\$760	\$301	\$0	\$1,661
2018	\$0	\$65	\$565	\$0	\$760	\$314	\$0	\$1,703
2019	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2020	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2021	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2022	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2023	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2024	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2025	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2026	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2027	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2028	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2029	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2030	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2031	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2032	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2033	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2034	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2035	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2036	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2037	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2038	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2039	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2040	\$0	\$66	\$572	\$0	\$760	\$318	\$0	\$1,716
2041	\$0	\$66	\$572	\$0	\$760	\$312	\$0	\$1,710
2042	\$0	\$61	\$572	\$0	\$684	\$306	\$0	\$1,623
2043	\$0	\$56	\$529	\$0	\$608	\$252	\$0	\$1,445
2044	\$0	\$25	\$472	\$0	\$152	\$220	\$0	\$870
2045	\$0	\$19	\$200	\$0	\$76	\$105	\$0	\$400
2046	\$0	\$6	\$71	\$0	\$38	\$34	\$0	\$150
2047	\$0	\$2	\$36	\$0	\$0	\$17	\$0	\$55
2048	\$0	\$1	\$7	\$0	\$0	\$4	\$0	\$12
<b>PV 3%<sup>d</sup></b>	<b>\$0</b>	<b>\$1,059</b>	<b>\$9,047</b>	<b>\$0</b>	<b>\$12,463</b>	<b>\$5,079</b>	<b>\$0</b>	<b>\$27,647</b>
<b>Annualized 3%<sup>e</sup></b>	<b>\$0</b>	<b>\$54</b>	<b>\$462</b>	<b>\$0</b>	<b>\$636</b>	<b>\$259</b>	<b>\$0</b>	<b>\$1,411</b>
<b>PV 7%<sup>d</sup></b>	<b>\$0</b>	<b>\$524</b>	<b>\$4,349</b>	<b>\$0</b>	<b>\$6,280</b>	<b>\$2,479</b>	<b>\$0</b>	<b>\$13,632</b>
<b>Annualized 7%<sup>e</sup></b>	<b>\$0</b>	<b>\$42</b>	<b>\$350</b>	<b>\$0</b>	<b>\$506</b>	<b>\$200</b>	<b>\$0</b>	<b>\$1,099</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 100 MGD and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The 100 MGD CWB option would not apply national categorical requirements to facilities located on freshwater rivers and lakes/reservoirs. Thus, no I&E reductions are expected at the potentially regulated facilities in the Inland region.

<sup>d</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>e</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

Source: U.S. EPA Analysis, 2004.

## E2-4 TOTAL ANNUALIZED MONETARY VALUE OF LOSSES AND BENEFITS

EPA used the profiles of benefits, by region, to calculate a total present value of benefits and then to calculate a constant annual equivalent value (annualized value) of the present value. EPA performed the calculations of present value and annualized value using two discount rate values: a real rate of 3% and a real rate of 7%. Although the total period for analysis of benefits extends from 2007 through 2048, a 42-year period, EPA annualized the value of benefits over 30 years, which is the assumed length of each facility's compliance period for the social cost analysis, as described in *Chapter E1: Summary of Social Costs*. Using the same annualization period as in the cost analysis is necessary to provide a conceptually and mathematically consistent comparison of annualized benefit and cost values.

EPA estimated mean values, as well as lower and upper bound values reflecting uncertainty in the recreational benefits estimates. Table E2-7 presents the value of baseline I&E losses for each region and for the nation as a whole. Tables E2-8 and E2-9 present I&E losses for each region and the nation under the 50 MGD All, 200 MGD All, and 100 MGD CWB options discounted at 3% and 7%, respectively. Because EPA did not estimate non-use benefits quantitatively, the monetary value of national losses and benefits presented in these tables reflects only use values.<sup>1</sup> As described in Chapter A3 of the RBA, the Agency was not able to monetize benefits for 96.7% of the age-one equivalent losses of all commercial, recreational, and forage species analyzed for the evaluated options for existing facilities. This means that the estimates of losses and benefits presented in this section represent the losses and benefits associated with less than 3.3% of the total age-one equivalents lost due to I&E by cooling water intake structures, and should be interpreted with caution.

Table E2-7 reports the monetized value of baseline losses as outlined above. EPA estimates the national value of these losses at \$0.3 million in commercial fishing losses and \$4.4 million in recreational fishing losses (2003\$, discounted to 2007 at 3%). The total use value of fishery resources lost is \$4.7 million per year, with lower and upper bounds of \$2.4 million and \$9.5 million, respectively (2003\$, discounted at 3%). At a 7% discount rate, EPA estimates total annual national value of losses at \$0.3 million in commercial fishing losses and \$4.2 million in recreational fishing losses (2003\$). The total use value of fishery resources lost, discounted at 7%, is \$4.5 million per year, with lower and upper bounds of \$2.3 million and \$9.0 million, respectively (2003\$). Total monetized losses are greatest in the Great Lakes region. More detailed discussions of the valuation of recreational and commercial fishing losses under the baseline conditions in each region are provided in Parts B through G of the RBA.

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<sup>1</sup> See Chapter A6 of the RBA for a detailed description of the ecological benefits from reduced I&E.

**Table E2-7: Summary of Monetary Values of Baseline I&E Losses (thousands; 2003\$)<sup>a</sup>**

Region	Annualized Use Value of Baseline I&E Losses						
	Commercial Fishing	Recreational Fishing			Total Use Value <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<i>3% discount rate</i>							
California	\$0 - \$20	\$38	\$90	\$211	\$58	\$109	\$231
North Atlantic	\$0 - \$9	\$84	\$183	\$401	\$93	\$192	\$409
Mid-Atlantic	\$0 - \$47	\$473	\$1,000	\$2,124	\$520	\$1,047	\$2,171
South Atlantic	\$0	\$34	\$76	\$171	\$34	\$76	\$171
Gulf of Mexico	\$0 - \$139	\$419	\$937	\$2,105	\$558	\$1,076	\$2,244
Great Lakes	\$0 - \$70	\$534	\$1,076	\$2,109	\$604	\$1,146	\$2,179
Inland <sup>c</sup>	n/a	\$576	\$1,087	\$2,047	\$576	\$1,087	\$2,047
<b>National Total</b>	<b>\$0 - \$284</b>	<b>\$2,159</b>	<b>\$4,449</b>	<b>\$9,168</b>	<b>\$2,443</b>	<b>\$4,733</b>	<b>\$9,452</b>
<i>7% discount rate</i>							
California	\$0 - \$18	\$35	\$83	\$196	\$54	\$101	\$214
North Atlantic	\$0 - \$8	\$78	\$170	\$371	\$86	\$178	\$379
Mid-Atlantic	\$0 - \$44	\$438	\$927	\$1,969	\$482	\$970	\$2,012
South Atlantic	\$0	\$32	\$71	\$158	\$32	\$71	\$158
Gulf of Mexico	\$0 - \$133	\$404	\$903	\$2,028	\$537	\$1,036	\$2,161
Great Lakes	\$0 - \$67	\$515	\$1,036	\$2,031	\$582	\$1,103	\$2,099
Inland <sup>c</sup>	n/a	\$555	\$1,047	\$1,971	\$555	\$1,047	\$1,971
<b>National Total</b>	<b>\$0 - \$271</b>	<b>\$2,057</b>	<b>\$4,236</b>	<b>\$8,724</b>	<b>\$2,328</b>	<b>\$4,506</b>	<b>\$8,995</b>

<sup>a</sup> All losses presented in this table are annualized. These estimated annualized losses represent the value of all losses generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>b</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. A range of recreational fishing benefits is provided, based on the Krinsky and Robb technique to estimate the 95<sup>th</sup> and 5<sup>th</sup> percentile limits on the marginal value per fish predicted by EPA's meta-analysis (see chapter A5 of the RBA). Commercial fishing benefits are computed based on a range from 0% to 40% of the change in gross revenue (see Chapter A4 of the RBA). To calculate the total use value columns (low, mean, and high), the high end value for commercial fishing benefits is added to the low, mean, and high values for recreational fishing benefits, respectively.

<sup>c</sup> No significant commercial fishing takes place in the Inland region. Thus, this region is excluded from the commercial fishing analysis.

Source: U.S. EPA Analysis, 2004.

Tables E2-8 and E2-9 present EPA's estimates of the national and regional values of avoided I&E losses (all values are in 2003\$, discounted at 3% and 7% to beginning of year 2007, and annualized over a 30-year period). National values of avoided I&E losses at a 3% discount rate are as follows:

- ▶ For the 50 MGD All option, a mean value of \$1.9 million per year, with lower and upper bounds of \$1.0 million and \$3.8 million (see Table E2-8);
- ▶ For the 200 MGD All option, a mean value of \$1.3 million per year, with lower and upper bounds of \$0.6 million and \$2.5 million (see Table E2-8); and
- ▶ For the 100 MGD CWB option, a mean value of \$1.4 million per year, with lower and upper bounds of \$0.7 million and \$2.9 million (see Table E2-8).

The 7% discount rate calculations yield smaller values as follows:

- ▶ For the 50 MGD All option, a mean value of \$1.5 million per year, with lower and upper bounds of \$0.8 million and \$3.0 million (see Table E2-9);
- ▶ For the 200 MGD All option, a mean value of \$1.0 million per year, with lower and upper bounds of \$0.5 million and \$2.0 million (see Table E2-9); and
- ▶ For the 100 MGD CWB option, a mean value of \$1.1 million per year, with lower and upper bounds of \$0.6 million and \$2.3 million (see Table E2-9).

EPA also considered how benefits might increase if facilities that meet technology requirements in the baseline optimize their operation and maintenance (O&M) procedures (e.g., by rotating screens more often to reduce impingement mortality due to the proposed regulation). For this analysis, EPA evaluated facilities that are expected to (1) install no new technology and (2) meet impingement standards with a 0.5 fps screen. If there was a 5% increase in the efficacy of O&M at these facilities, the total annualized national benefits from the proposed regulation would increase by approximately \$19,000 for the 50 MGD All option, from \$1.897 million to \$1.916 million (using the 3% discount rate). If there was a 15% increase in efficacy, the estimated annualized benefits would increase by over \$58,000, to \$1.955 million (using the 3% discount rate). Using the 7% discount rate, total annualized national benefits from the proposed regulation would increase by approximately \$18,000 and \$55,000, for the 5% and 15% increases in efficacy, respectively. Therefore, optimization of O&M procedures would result in 1.0% to 3.5% increase in the estimated total use benefits of the proposed regulation, depending on the assumed increase in efficacy and the discount rate being used. Optimization of O&M procedures would result in similar increases in the estimated use benefits under “200 MGD for All Waterbodies” and “100 MGD for Certain Waterbodies” options.

The majority of the use benefit value is attributable to benefits to recreational anglers from improved catch rates. As shown in Tables E2-8 and E2-9, use benefits are largest in the Gulf of Mexico for the 50 MGD All and 100 MGD CWB options and the Mid-Atlantic region under the 200 MGD All option. More detailed discussions of regional benefits under each option are provided in Parts B through G of the RBA.

**Table E2-8: Summary of Monetized Benefits by Option (thousands; 2003\$; discounted at 3%)<sup>a</sup>**

Region	Annualized Commercial Fishing Benefits	Annualized Recreational Fishing Benefits			Total Annualized Value of Monetized Impingement and Entrainment Reductions <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>50 MGD All Option</b>							
California	\$0 - \$5	\$10	\$24	\$57	\$16	\$29	\$62
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$25	\$235	\$497	\$1,057	\$260	\$522	\$1,082
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$78	\$249	\$558	\$1,254	\$327	\$636	\$1,332
Great Lakes	\$0 - \$20	\$157	\$316	\$621	\$178	\$337	\$641
Inland <sup>d</sup>	n/a	\$162	\$306	\$577	\$162	\$306	\$577
<b>National Total</b>	<b>\$0 - \$132</b>	<b>\$843</b>	<b>\$1,765</b>	<b>\$3,704</b>	<b>\$975</b>	<b>\$1,897</b>	<b>\$3,836</b>
<b>200 MGD All Option</b>							
California <sup>e</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
North Atlantic	\$0 - \$1	\$6	\$13	\$28	\$7	\$14	\$29
Mid-Atlantic	\$0 - \$22	\$208	\$440	\$934	\$230	\$462	\$956
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$43	\$136	\$305	\$685	\$179	\$347	\$728
Great Lakes	\$0 - \$14	\$108	\$216	\$425	\$122	\$230	\$439
Inland <sup>d</sup>	n/a	\$110	\$207	\$390	\$110	\$207	\$390
<b>National Total</b>	<b>\$0 - \$79</b>	<b>\$567</b>	<b>\$1,181</b>	<b>\$2,463</b>	<b>\$647</b>	<b>\$1,260</b>	<b>\$2,542</b>
<b>100 MGD CWB Option</b>							
California <sup>e</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
North Atlantic	\$0 - \$2	\$24	\$52	\$113	\$26	\$54	\$115
Mid-Atlantic	\$0 - \$22	\$208	\$440	\$934	\$230	\$462	\$956
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$78	\$249	\$558	\$1,254	\$327	\$636	\$1,332
Great Lakes	\$0 - \$16	\$121	\$243	\$478	\$137	\$259	\$494
Inland <sup>d,f</sup>	n/a	\$0	\$0	\$0	\$0	\$0	\$0
<b>National Total</b>	<b>\$0 - \$118</b>	<b>\$602</b>	<b>\$1,292</b>	<b>\$2,779</b>	<b>\$720</b>	<b>\$1,411</b>	<b>\$2,897</b>

<sup>a</sup> All benefits presented in this table are annualized. These annualized benefits represent the value of all losses generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>b</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. A range of recreational fishing benefits is provided, based on the Krinsky and Robb technique to estimated the 95th and 5th percentile limits on the marginal value per fish predicted by EPA's meta-analysis (see chapter A5 of the RBA). Commercial fishing benefits are computed based on a range from 0% to 40% of the change in gross revenue (see Chapter A4 of the RBA). To calculate the total use value columns (low, mean, and high), the high end value for commercial fishing benefits is added to the low, mean, and high values for recreational fishing benefits, respectively.

<sup>c</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

<sup>d</sup> No significant commercial fishing takes place in the Inland region. Thus, this region is excluded from the commercial fishing analysis.

<sup>e</sup> No I&E reductions are expected in the California region because all potentially regulated facilities in this region withdraw less than 100 MGD and therefore would not be required to install technologies to comply with the 200 MGD All and the 100 MGD CWB options.

<sup>f</sup> The 100 MGD CWB option would not apply national categorical requirements to facilities located on freshwater rivers and lakes/reservoirs. Thus, no I&E reductions are expected at the potentially regulated facilities in the Inland region.

Source: U.S. EPA Analysis, 2004.

**Table E2-9: Summary of Monetized Benefits by Option (thousands; 2003\$; discounted at 7%)<sup>a</sup>**

Region	Annualized Commercial Fishing Benefits	Annualized Recreational Fishing Benefits			Total Annualized Value of Monetized Impingement and Entrainment Reductions <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>50 MGD All Option</b>							
California	\$0 - \$4	\$9	\$20	\$47	\$13	\$24	\$51
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$19	\$181	\$382	\$811	\$200	\$401	\$830
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$62	\$198	\$444	\$998	\$260	\$506	\$1,061
Great Lakes	\$0 - \$16	\$122	\$246	\$483	\$138	\$262	\$499
Inland <sup>d</sup>	n/a	\$133	\$251	\$473	\$133	\$251	\$473
National Total	\$0 - \$104	\$665	\$1,391	\$2,919	\$769	\$1,495	\$3,023
<b>200 MGD All Option</b>							
California <sup>e</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
North Atlantic	\$0	\$4	\$10	\$21	\$5	\$10	\$21
Mid-Atlantic	\$0 - \$17	\$158	\$334	\$709	\$175	\$350	\$726
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$34	\$108	\$243	\$545	\$142	\$277	\$579
Great Lakes	\$0 - \$11	\$83	\$166	\$326	\$93	\$177	\$337
Inland <sup>d</sup>	n/a	\$90	\$170	\$321	\$90	\$170	\$321
National Total	\$0 - \$62	\$443	\$922	\$1,922	\$505	\$984	\$1,984
<b>100 MGD CWB Option</b>							
California <sup>e</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
North Atlantic	\$0 - \$2	\$19	\$40	\$88	\$20	\$42	\$90
Mid-Atlantic	\$0 - \$17	\$158	\$334	\$709	\$175	\$350	\$726
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$62	\$198	\$444	\$998	\$260	\$506	\$1,061
Great Lakes	\$0 - \$12	\$93	\$188	\$368	\$105	\$200	\$381
Inland <sup>d,f</sup>	n/a	\$0	\$0	\$0	\$0	\$0	\$0
National Total	\$0 - \$93	\$468	\$1,006	\$2,164	\$561	\$1,099	\$2,257

<sup>a</sup> All benefits presented in this table are annualized. These annualized benefits represent the value of all losses generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>b</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. A range of recreational fishing benefits is provided, based on the Krinsky and Robb technique to estimate the 95th and 5th percentile limits on the marginal value per fish predicted by EPA's meta-analysis (see chapter A5 of the RBA). Commercial fishing benefits are computed based on a range from 0% to 40% of the change in gross revenue (see Chapter A4 of the RBA). To calculate the total use value columns (low, mean, and high), the high end value for commercial fishing benefits is added to the low, mean, and high values for recreational fishing benefits, respectively.

<sup>c</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

<sup>d</sup> No significant commercial fishing takes place in the Inland region, and thus this region is excluded from the commercial fishing benefits analysis.

<sup>e</sup> No I&E reductions are expected in the California region because all potentially regulated facilities in this region withdraw less than 100 MGD and therefore would not be required to install technologies to comply with the 200 MGD All and the 100 MGD CWB options.

<sup>f</sup> The 100 MGD CWB option would not apply national categorical requirements to facilities located on freshwater rivers and lakes/reservoirs. Thus, no I&E reductions are expected at the potentially regulated facilities in the Inland region.

Source: U.S. EPA Analysis, 2004.

## **REFERENCES**

U.S. Environmental Protection Agency (U.S. EPA). 2004. *The Regional Benefits Assessment for the Proposed Section 316(b) Rule for Phase III Facilities*. EPA-821-R-04-017. November 2004.

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# Appendix to Chapter E2

## INTRODUCTION

This appendix supplements Chapter E2 by presenting the results of the benefits analysis for five other options evaluated for potential Phase III existing facilities. For all options, facility counts and other results only include those potential Phase III existing facilities that are (1) non-baseline closures and (2) subject to national categorical requirements under the option. The options are presented in increasing order based on design intake flow (DIF) applicability threshold and the stringency of compliance requirements. See the main body of this chapter for a description of methodologies used in this analysis.

### APPENDIX CONTENTS

E2A-1	Summary of Expected Reductions in I&E . . . . .	E2A-1
E2A-2	Time Profile of Benefits . . . . .	E2A-3
E2A-3	Total Annualized Monetary Value of Benefits . . . . .	E2A-9

## E2A-1 SUMMARY OF EXPECTED REDUCTIONS IN I&E

Table E2A-1 presents the number of facilities with technology requirements under the other options, by region, and EPA’s estimates of the percentage by which I&E would be reduced. The table also presents estimates of regional and national reductions in I&E losses under each option, expressed as age-one equivalents lost and foregone fishery yield.

**Table E2A-1: Expected Reductions in I&E for Existing Phase III Facilities by Option**

Region	Number of Facilities Installing Technology	Impingement	Entrainment	Age-One Equivalents (thousands)	Foregone Fishery Yield (thousands; lbs)
<b>Option 3</b>					
California	4	78%	29%	391	28
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	4	74%	55%	13,400	606
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	11	80%	57%	8,650	1,270
Great Lakes	38	38%	43%	13,200	190
Inland	130	43%	27%	16,600	171
<b>National Total</b>	<b>190</b>			<b>53,171</b>	<b>2,283</b>
<b>Option 4</b>					
California	4	78%	59%	771	56
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	4	74%	55%	13,600	610
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	11	80%	60%	8,860	1,320
Great Lakes	38	38%	46%	13,300	192
Inland	69	37%	27%	14,800	157
<b>National Total</b>	<b>130</b>			<b>52,261</b>	<b>2,353</b>

### Option 2

**Table E2A-1: Expected Reductions in I&E for Existing Phase III Facilities by Option**

Region	Number of Facilities Installing Technology	Impingement	Entrainment	Age-One Equivalents (thousands)	Foregone Fishery Yield (thousands; lbs)
California	4	78%	59%	771	56
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	4	74%	55%	13,600	610
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	11	80%	60%	8,860	1,320
Great Lakes	38	38%	46%	13,300	192
Inland	69	37%	27%	14,800	157
<b>National Total</b>	<b>130</b>			<b>52,261</b>	<b>2,353</b>
<b>Option 1</b>					
California	4	78%	59%	771	56
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	4	74%	55%	13,600	610
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	11	80%	60%	8,860	1,320
Great Lakes	38	38%	46%	13,300	192
Inland	134	43%	29%	16,900	177
<b>National Total</b>	<b>194</b>			<b>54,361</b>	<b>2,373</b>
<b>Option 6</b>					
California	4	78%	59%	771	56
North Atlantic	4	43%	40%	930	18
Mid-Atlantic	5	75%	56%	13,700	615
South Atlantic <sup>a</sup>	0	0%	0%	0	0
Gulf of Mexico	11	80%	60%	8,860	1,320
Great Lakes	61	41%	48%	14,300	206
Inland	203	45%	30%	17,600	183
<b>National Total</b>	<b>288</b>			<b>56,161</b>	<b>2,398</b>

<sup>a</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with these options.

Source: U.S. EPA Analysis, 2004.

## **E2A-2 TIME PROFILE OF BENEFITS**

Tables E2A-2 through E2A-6 below provide the time profiles of regional benefits for Option 3, Option 4, Option 2, Option 1, and Option 6.

**Table E2A-2: Time Profile of Mean Total Use Benefits - Option 3 (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$0 <sup>c</sup>	\$7	\$8
2011	\$2	\$0	\$7	\$0	\$0	\$12	\$34	\$55
2012	\$4	\$5	\$15	\$0	\$79	\$31	\$101	\$234
2013	\$14	\$10	\$100	\$0	\$158	\$121	\$238	\$641
2014	\$18	\$42	\$170	\$0	\$631	\$193	\$292	\$1,346
2015	\$20	\$50	\$443	\$0	\$710	\$331	\$354	\$1,909
2016	\$32	\$72	\$574	\$0	\$750	\$418	\$380	\$2,226
2017	\$34	\$78	\$610	\$0	\$789	\$440	\$387	\$2,338
2018	\$35	\$79	\$638	\$0	\$789	\$455	\$391	\$2,387
2019	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2020	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2021	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2022	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2023	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2024	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2025	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2026	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2027	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2028	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2029	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2030	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2031	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2032	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2033	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2034	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2035	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2036	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2037	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2038	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2039	\$36	\$81	\$645	\$0	\$789	\$460	\$391	\$2,403
2040	\$36	\$81	\$645	\$0	\$789	\$460	\$384	\$2,395
2041	\$34	\$81	\$638	\$0	\$789	\$448	\$357	\$2,348
2042	\$32	\$76	\$630	\$0	\$710	\$429	\$291	\$2,169
2043	\$21	\$71	\$545	\$0	\$631	\$339	\$153	\$1,762
2044	\$18	\$39	\$475	\$0	\$158	\$267	\$99	\$1,057
2045	\$15	\$31	\$202	\$0	\$79	\$129	\$37	\$493
2046	\$4	\$9	\$71	\$0	\$39	\$42	\$11	\$176
2047	\$2	\$3	\$35	\$0	\$0	\$20	\$5	\$65
2048	\$1	\$2	\$7	\$0	\$0	\$5	\$1	\$15
<b>PV 3%<sup>c</sup></b>	<b>\$574</b>	<b>\$1,298</b>	<b>\$10,281</b>	<b>\$0</b>	<b>\$12,945</b>	<b>\$7,416</b>	<b>\$6,542</b>	<b>\$39,056</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$29</b>	<b>\$66</b>	<b>\$525</b>	<b>\$0</b>	<b>\$660</b>	<b>\$378</b>	<b>\$334</b>	<b>\$1,993</b>
<b>PV 7%<sup>c</sup></b>	<b>\$285</b>	<b>\$635</b>	<b>\$4,996</b>	<b>\$0</b>	<b>\$6,523</b>	<b>\$3,661</b>	<b>\$3,384</b>	<b>\$19,484</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$23</b>	<b>\$51</b>	<b>\$403</b>	<b>\$0</b>	<b>\$526</b>	<b>\$295</b>	<b>\$273</b>	<b>\$1,570</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>e</sup> Positive non-zero value less than \$500.

Source: U.S. EPA Analysis, 2004.

**Table E2A-3: Time Profile of Mean Total Use Benefits - Option 4 (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$1	\$7	\$7
2011	\$3	\$0	\$7	\$0	\$0	\$12	\$33	\$56
2012	\$7	\$5	\$15	\$0	\$80	\$31	\$96	\$234
2013	\$27	\$10	\$101	\$0	\$161	\$122	\$231	\$652
2014	\$34	\$42	\$172	\$0	\$642	\$195	\$275	\$1,360
2015	\$39	\$50	\$449	\$0	\$723	\$334	\$329	\$1,924
2016	\$62	\$72	\$581	\$0	\$763	\$422	\$349	\$2,250
2017	\$65	\$78	\$617	\$0	\$803	\$445	\$354	\$2,362
2018	\$67	\$79	\$646	\$0	\$803	\$460	\$358	\$2,413
2019	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2020	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2021	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2022	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2023	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2024	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2025	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2026	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2027	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2028	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2029	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2030	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2031	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2032	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2033	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2034	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2035	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2036	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2037	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2038	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2039	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2040	\$69	\$81	\$653	\$0	\$803	\$464	\$351	\$2,421
2041	\$65	\$81	\$646	\$0	\$803	\$453	\$324	\$2,373
2042	\$62	\$76	\$638	\$0	\$723	\$434	\$262	\$2,195
2043	\$41	\$71	\$552	\$0	\$642	\$343	\$127	\$1,776
2044	\$35	\$39	\$481	\$0	\$161	\$270	\$83	\$1,068
2045	\$29	\$31	\$205	\$0	\$80	\$131	\$28	\$504
2046	\$7	\$9	\$72	\$0	\$40	\$42	\$8	\$179
2047	\$3	\$3	\$36	\$0	\$0	\$20	\$4	\$66
2048	\$2	\$2	\$7	\$0	\$0	\$5	\$0 <sup>e</sup>	\$16
<b>PV 3%<sup>c</sup></b>	<b>\$1,112</b>	<b>\$1,298</b>	<b>\$10,407</b>	<b>\$0</b>	<b>\$13,167</b>	<b>\$7,494</b>	<b>\$5,998</b>	<b>\$39,475</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$57</b>	<b>\$66</b>	<b>\$531</b>	<b>\$0</b>	<b>\$672</b>	<b>\$382</b>	<b>\$306</b>	<b>\$2,014</b>
<b>PV 7%<sup>c</sup></b>	<b>\$552</b>	<b>\$635</b>	<b>\$5,057</b>	<b>\$0</b>	<b>\$6,635</b>	<b>\$3,699</b>	<b>\$3,113</b>	<b>\$19,692</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$44</b>	<b>\$51</b>	<b>\$408</b>	<b>\$0</b>	<b>\$535</b>	<b>\$298</b>	<b>\$251</b>	<b>\$1,587</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>e</sup> Positive non-zero value less than \$500.

Source: U.S. EPA Analysis, 2004.

**Table E2A-4: Time Profile of Mean Total Use Benefits - Option 2 (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$1	\$7	\$7
2011	\$3	\$0	\$7	\$0	\$0	\$12	\$33	\$56
2012	\$7	\$5	\$15	\$0	\$80	\$31	\$96	\$234
2013	\$27	\$10	\$101	\$0	\$161	\$122	\$231	\$652
2014	\$34	\$42	\$172	\$0	\$642	\$195	\$275	\$1,360
2015	\$39	\$50	\$449	\$0	\$723	\$334	\$329	\$1,924
2016	\$62	\$72	\$581	\$0	\$763	\$422	\$349	\$2,250
2017	\$65	\$78	\$617	\$0	\$803	\$445	\$354	\$2,362
2018	\$67	\$79	\$646	\$0	\$803	\$460	\$358	\$2,413
2019	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2020	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2021	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2022	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2023	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2024	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2025	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2026	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2027	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2028	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2029	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2030	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2031	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2032	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2033	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2034	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2035	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2036	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2037	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2038	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2039	\$69	\$81	\$653	\$0	\$803	\$465	\$358	\$2,428
2040	\$69	\$81	\$653	\$0	\$803	\$464	\$351	\$2,421
2041	\$65	\$81	\$646	\$0	\$803	\$453	\$324	\$2,373
2042	\$62	\$76	\$638	\$0	\$723	\$434	\$262	\$2,195
2043	\$41	\$71	\$552	\$0	\$642	\$343	\$127	\$1,776
2044	\$35	\$39	\$481	\$0	\$161	\$270	\$83	\$1,068
2045	\$29	\$31	\$205	\$0	\$80	\$131	\$28	\$504
2046	\$7	\$9	\$72	\$0	\$40	\$42	\$8	\$179
2047	\$3	\$3	\$36	\$0	\$0	\$20	\$4	\$66
2048	\$2	\$2	\$7	\$0	\$0	\$5	\$0 <sup>e</sup>	\$16
<b>PV 3%<sup>c</sup></b>	<b>\$1,112</b>	<b>\$1,298</b>	<b>\$10,407</b>	<b>\$0</b>	<b>\$13,167</b>	<b>\$7,494</b>	<b>\$5,998</b>	<b>\$39,475</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$57</b>	<b>\$66</b>	<b>\$531</b>	<b>\$0</b>	<b>\$672</b>	<b>\$382</b>	<b>\$306</b>	<b>\$2,014</b>
<b>PV 7%<sup>c</sup></b>	<b>\$552</b>	<b>\$635</b>	<b>\$5,057</b>	<b>\$0</b>	<b>\$6,635</b>	<b>\$3,699</b>	<b>\$3,113</b>	<b>\$19,692</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$44</b>	<b>\$51</b>	<b>\$408</b>	<b>\$0</b>	<b>\$535</b>	<b>\$298</b>	<b>\$251</b>	<b>\$1,587</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>e</sup> Positive non-zero value less than \$500.

Source: U.S. EPA Analysis, 2004.

**Table E2A-5: Time Profile of Mean Total Use Benefits - Option 1 (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$1	\$7	\$8
2011	\$3	\$0	\$7	\$0	\$0	\$12	\$35	\$57
2012	\$7	\$5	\$15	\$0	\$80	\$31	\$104	\$242
2013	\$27	\$10	\$101	\$0	\$161	\$122	\$245	\$666
2014	\$34	\$42	\$172	\$0	\$642	\$195	\$302	\$1,387
2015	\$39	\$50	\$449	\$0	\$723	\$334	\$366	\$1,961
2016	\$62	\$72	\$581	\$0	\$763	\$422	\$392	\$2,292
2017	\$65	\$78	\$617	\$0	\$803	\$445	\$399	\$2,407
2018	\$67	\$79	\$646	\$0	\$803	\$460	\$403	\$2,458
2019	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2020	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2021	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2022	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2023	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2024	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2025	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2026	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2027	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2028	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2029	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2030	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2031	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2032	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2033	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2034	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2035	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2036	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2037	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2038	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2039	\$69	\$81	\$653	\$0	\$803	\$465	\$404	\$2,474
2040	\$69	\$81	\$653	\$0	\$803	\$464	\$396	\$2,467
2041	\$65	\$81	\$646	\$0	\$803	\$453	\$369	\$2,417
2042	\$62	\$76	\$638	\$0	\$723	\$434	\$300	\$2,232
2043	\$41	\$71	\$552	\$0	\$642	\$343	\$159	\$1,809
2044	\$35	\$39	\$481	\$0	\$161	\$270	\$102	\$1,087
2045	\$29	\$31	\$205	\$0	\$80	\$131	\$38	\$514
2046	\$7	\$9	\$72	\$0	\$40	\$42	\$12	\$182
2047	\$3	\$3	\$36	\$0	\$0	\$20	\$5	\$67
2048	\$2	\$2	\$7	\$0	\$0	\$5	\$1	\$16
<b>PV 3%<sup>c</sup></b>	<b>\$1,112</b>	<b>\$1,298</b>	<b>\$10,407</b>	<b>\$0</b>	<b>\$13,167</b>	<b>\$7,494</b>	<b>\$6,748</b>	<b>\$40,225</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$57</b>	<b>\$66</b>	<b>\$531</b>	<b>\$0</b>	<b>\$672</b>	<b>\$382</b>	<b>\$344</b>	<b>\$2,052</b>
<b>PV 7%<sup>c</sup></b>	<b>\$552</b>	<b>\$635</b>	<b>\$5,057</b>	<b>\$0</b>	<b>\$6,635</b>	<b>\$3,699</b>	<b>\$3,490</b>	<b>\$20,068</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$44</b>	<b>\$51</b>	<b>\$408</b>	<b>\$0</b>	<b>\$535</b>	<b>\$298</b>	<b>\$281</b>	<b>\$1,617</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

Source: U.S. EPA Analysis, 2004.

**Table E2A-6: Time Profile of Mean Total Use Benefits - Option 6 (thousands; 2003\$)<sup>a</sup>**

Year	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
2007	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2008	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2009	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2010	\$0	\$0	\$0	\$0	\$0	\$1	\$8	\$9
2011	\$3	\$0	\$7	\$0	\$0	\$15	\$36	\$61
2012	\$7	\$5	\$15	\$0	\$80	\$41	\$106	\$254
2013	\$27	\$10	\$101	\$0	\$161	\$140	\$251	\$690
2014	\$34	\$42	\$172	\$0	\$642	\$216	\$311	\$1,418
2015	\$39	\$50	\$449	\$0	\$723	\$361	\$377	\$1,999
2016	\$62	\$72	\$582	\$0	\$763	\$455	\$406	\$2,340
2017	\$65	\$78	\$622	\$0	\$803	\$478	\$413	\$2,460
2018	\$67	\$79	\$651	\$0	\$803	\$494	\$418	\$2,512
2019	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2020	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2021	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2022	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2023	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2024	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2025	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2026	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2027	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2028	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2029	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2030	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2031	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2032	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2033	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2034	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2035	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2036	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2037	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2038	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2039	\$69	\$81	\$659	\$0	\$803	\$499	\$419	\$2,529
2040	\$69	\$81	\$659	\$0	\$803	\$498	\$411	\$2,520
2041	\$65	\$81	\$652	\$0	\$803	\$484	\$383	\$2,468
2042	\$62	\$76	\$644	\$0	\$723	\$458	\$312	\$2,275
2043	\$41	\$71	\$557	\$0	\$642	\$359	\$168	\$1,839
2044	\$35	\$39	\$487	\$0	\$161	\$283	\$107	\$1,112
2045	\$29	\$31	\$210	\$0	\$80	\$138	\$41	\$530
2046	\$7	\$9	\$77	\$0	\$40	\$45	\$13	\$190
2047	\$3	\$3	\$37	\$0	\$0	\$21	\$5	\$70
2048	\$2	\$2	\$8	\$0	\$0	\$5	\$1	\$17
<b>PV 3%<sup>c</sup></b>	<b>\$1,112</b>	<b>\$1,298</b>	<b>\$10,492</b>	<b>\$0</b>	<b>\$13,167</b>	<b>\$8,063</b>	<b>\$6,993</b>	<b>\$41,124</b>
<b>Annualized 3%<sup>d</sup></b>	<b>\$57</b>	<b>\$66</b>	<b>\$535</b>	<b>\$0</b>	<b>\$672</b>	<b>\$411</b>	<b>\$357</b>	<b>\$2,098</b>
<b>PV 7%<sup>c</sup></b>	<b>\$552</b>	<b>\$635</b>	<b>\$5,095</b>	<b>\$0</b>	<b>\$6,635</b>	<b>\$3,990</b>	<b>\$3,614</b>	<b>\$20,521</b>
<b>Annualized 7%<sup>d</sup></b>	<b>\$44</b>	<b>\$51</b>	<b>\$411</b>	<b>\$0</b>	<b>\$535</b>	<b>\$322</b>	<b>\$291</b>	<b>\$1,654</b>

<sup>a</sup> Because EPA estimated non-use benefits only qualitatively, the monetary value of benefits includes use values only.

<sup>b</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>c</sup> The present value (PV) is estimated by discounting individual annual values to 2007, using the stated discount rate.

<sup>d</sup> Annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

Source: U.S. EPA Analysis, 2004.

**E2A-3 TOTAL ANNUALIZED MONETARY VALUE OF BENEFITS**

Tables E2A-7 and E2A-8 present EPA’s estimates of the value of national and regional reductions in I&E under the other options analyzed for the proposed rule, using 3% and 7% discount rates. The tables show for all other options, that benefits to recreational anglers account for the majority of use benefits. National use benefits are largest in the Gulf of Mexico region under all five options. More detailed discussions of regional benefits under each option are provided in Sections B through G of the RBA.

**Table E2A-7: Summary of Monetized Benefits for Existing Phase III Facilities<sup>a</sup>**  
(thousands; 2003\$; discounted at 3%)

Region	Annualized Use Benefits of I&E Reductions						
	Annualized Commercial Fishing	Recreational Fishing			Total Use Value <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>Option 3</b>							
California	\$0 - \$5	\$10	\$24	\$57	\$15	\$29	\$62
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$25	\$236	\$499	\$1,061	\$261	\$525	\$1,086
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$80	\$259	\$580	\$1,305	\$339	\$660	\$1,385
Great Lakes	\$0 - \$23	\$177	\$355	\$697	\$200	\$378	\$720
Inland <sup>d</sup>	n/a	\$176	\$334	\$630	\$176	\$334	\$630
<b>National Total</b>	<b>\$0 - \$137</b>	<b>\$888</b>	<b>\$1,856</b>	<b>\$3,888</b>	<b>\$1,024</b>	<b>\$1,993</b>	<b>\$4,025</b>
<b>Option 4</b>							
California	\$0 - \$10	\$20	\$47	\$110	\$30	\$57	\$120
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$25	\$239	\$506	\$1,074	\$265	\$531	\$1,100
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$83	\$263	\$589	\$1,325	\$346	\$672	\$1,408
Great Lakes	\$0 - \$23	\$178	\$359	\$704	\$202	\$382	\$728
Inland <sup>d</sup>	n/a	\$162	\$306	\$577	\$162	\$306	\$577
<b>National Total</b>	<b>\$0 - \$144</b>	<b>\$892</b>	<b>\$1,870</b>	<b>\$3,929</b>	<b>\$1,036</b>	<b>\$2,014</b>	<b>\$4,073</b>
<b>Option 2</b>							
California	\$0 - \$10	\$20	\$47	\$110	\$30	\$57	\$120
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$25	\$239	\$506	\$1,074	\$265	\$531	\$1,100
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$83	\$263	\$589	\$1,325	\$346	\$672	\$1,408
Great Lakes	\$0 - \$23	\$178	\$359	\$704	\$202	\$382	\$728
Inland <sup>d</sup>	n/a	\$162	\$306	\$577	\$162	\$306	\$577
<b>National Total</b>	<b>\$0 - \$144</b>	<b>\$892</b>	<b>\$1,870</b>	<b>\$3,929</b>	<b>\$1,036</b>	<b>\$2,014</b>	<b>\$4,073</b>

**Table E2A-7: Summary of Monetized Benefits for Existing Phase III Facilities<sup>a</sup>**  
**(thousands; 2003\$; discounted at 3%)**

Region	Annualized Use Benefits of I&E Reductions						
	Annualized Commercial Fishing	Recreational Fishing			Total Use Value <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>Option 1</b>							
California	\$0 - \$10	\$20	\$47	\$110	\$30	\$57	\$120
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$25	\$239	\$506	\$1,074	\$265	\$531	\$1,100
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$83	\$263	\$589	\$1,325	\$346	\$672	\$1,408
Great Lakes	\$0 - \$23	\$178	\$359	\$704	\$202	\$382	\$728
Inland <sup>d</sup>	n/a	\$182	\$344	\$649	\$182	\$344	\$649
<b>National Total</b>	<b>\$0 - \$144</b>	<b>\$912</b>	<b>\$1,908</b>	<b>\$4,001</b>	<b>\$1,056</b>	<b>\$2,052</b>	<b>\$4,146</b>
<b>Option 6</b>							
California	\$0 - \$10	\$20	\$47	\$110	\$30	\$57	\$120
North Atlantic	\$0 - \$3	\$29	\$63	\$138	\$32	\$66	\$141
Mid-Atlantic	\$0 - \$26	\$241	\$510	\$1,083	\$267	\$535	\$1,109
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$83	\$263	\$589	\$1,325	\$346	\$672	\$1,408
Great Lakes	\$0 - \$25	\$192	\$386	\$758	\$217	\$411	\$783
Inland <sup>d</sup>	n/a	\$189	\$357	\$673	\$189	\$357	\$673
<b>National Total</b>	<b>\$0 - \$146</b>	<b>\$934</b>	<b>\$1,952</b>	<b>\$4,087</b>	<b>\$1,080</b>	<b>\$2,098</b>	<b>\$4,233</b>

<sup>a</sup> All benefits presented in this table are annualized. These annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>b</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. A range of recreational fishing benefits is provided, based on the Krinsky and Robb technique to estimate the 95th and 5th percentile limits on the marginal value per fish predicted by EPA's meta-analysis (see chapter A5 of the RBA). Commercial fishing benefits are computed based on a range from 0% to 40% of the change in gross revenue (see Chapter A4 of the RBA). To calculate the total use value columns (low, mean, and high), the high end value for commercial fishing benefits is added to the low, mean, and high values for recreational fishing benefits, respectively.

<sup>c</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with these options.

<sup>d</sup> No significant commercial fishing takes place in the Inland region, and thus this region is excluded from the commercial fishing benefits analysis.

Source: U.S. EPA Analysis, 2004.

**Table E2A-8: Summary of Monetized Benefits for Existing Phase III Facilities<sup>a</sup>**  
**(thousands; 2003\$, discounted at 7%)**

Region	Annualized Use Benefits of I&E Reductions						
	Annualized Commercial Fishing	Recreational Fishing			Total Use Value <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>Option 3</b>							
California	\$0 - \$4	\$8	\$19	\$45	\$12	\$23	\$49
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$19	\$181	\$383	\$814	\$201	\$403	\$834
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$64	\$206	\$462	\$1,038	\$270	\$526	\$1,102
Great Lakes	\$0 - \$18	\$138	\$277	\$543	\$156	\$295	\$561
Inland <sup>d</sup>	n/a	\$144	\$273	\$515	\$144	\$273	\$515
<b>National Total</b>	<b>\$0 - \$107</b>	<b>\$700</b>	<b>\$1,463</b>	<b>\$3,063</b>	<b>\$807</b>	<b>\$1,570</b>	<b>\$3,170</b>
<b>Option 4</b>							
California	\$0 - \$8	\$16	\$37	\$86	\$24	\$44	\$94
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$19	\$184	\$388	\$825	\$203	\$408	\$844
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$66	\$209	\$469	\$1,055	\$275	\$535	\$1,120
Great Lakes	\$0 - \$18	\$139	\$280	\$549	\$157	\$298	\$567
Inland <sup>d</sup>	n/a	\$133	\$251	\$473	\$133	\$251	\$473
<b>National Total</b>	<b>\$0 - \$114</b>	<b>\$703</b>	<b>\$1,473</b>	<b>\$3,095</b>	<b>\$816</b>	<b>\$1,587</b>	<b>\$3,208</b>
<b>Option 2</b>							
California	\$0 - \$8	\$16	\$37	\$86	\$24	\$44	\$94
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$19	\$184	\$388	\$825	\$203	\$408	\$844
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$66	\$209	\$469	\$1,055	\$275	\$535	\$1,120
Great Lakes	\$0 - \$18	\$139	\$280	\$549	\$157	\$298	\$567
Inland <sup>d</sup>	n/a	\$133	\$251	\$473	\$133	\$251	\$473
<b>National Total</b>	<b>\$0 - \$114</b>	<b>\$703</b>	<b>\$1,473</b>	<b>\$3,095</b>	<b>\$816</b>	<b>\$1,587</b>	<b>\$3,208</b>
<b>Option 1</b>							
California	\$0 - \$8	\$16	\$37	\$86	\$24	\$44	\$94
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$19	\$184	\$388	\$825	\$203	\$408	\$844
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$66	\$209	\$469	\$1,055	\$275	\$535	\$1,120
Great Lakes	\$0 - \$18	\$139	\$280	\$549	\$157	\$298	\$567
Inland <sup>d</sup>	n/a	\$149	\$281	\$531	\$149	\$281	\$531

**Table E2A-8: Summary of Monetized Benefits for Existing Phase III Facilities<sup>a</sup>**  
**(thousands; 2003\$, discounted at 7%)**

Region	Annualized Use Benefits of I&E Reductions						
	Annualized Commercial Fishing	Recreational Fishing			Total Use Value <sup>b</sup>		
		Low	Mean	High	Low	Mean	High
<b>National Total</b>	<b>\$0 - \$114</b>	<b>\$719</b>	<b>\$1,504</b>	<b>\$3,152</b>	<b>\$832</b>	<b>\$1,617</b>	<b>\$3,266</b>
<b>Option 6</b>							
California	\$0 - \$8	\$16	\$37	\$86	\$24	\$44	\$94
North Atlantic	\$0 - \$2	\$22	\$49	\$107	\$25	\$51	\$109
Mid-Atlantic	\$0 - \$20	\$185	\$391	\$831	\$205	\$411	\$850
South Atlantic <sup>c</sup>	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Gulf of Mexico	\$0 - \$66	\$209	\$469	\$1,055	\$275	\$535	\$1,120
Great Lakes	\$0 - \$20	\$150	\$302	\$592	\$170	\$322	\$612
Inland <sup>d</sup>	n/a	\$154	\$291	\$549	\$154	\$291	\$549
<b>National Total</b>	<b>\$0 - \$115</b>	<b>\$736</b>	<b>\$1,539</b>	<b>\$3,220</b>	<b>\$852</b>	<b>\$1,654</b>	<b>\$3,335</b>

<sup>a</sup> All benefits presented in this table are annualized. These annualized benefits represent the value of all benefits generated over the time frame of the analysis, discounted to 2007, and then annualized over a 30-year period.

<sup>b</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. A range of recreational fishing benefits is provided, based on the Krinsky and Robb technique to estimate the 95th and 5th percentile limits on the marginal value per fish predicted by EPA's meta-analysis (see chapter A5 of the RBA). Commercial fishing benefits are computed based on a range from 0% to 40% of the change in gross revenue (see Chapter A4 of the RBA). To calculate the total use value columns (low, mean, and high), the high end value for commercial fishing benefits is added to the low, mean, and high values for recreational fishing benefits, respectively.

<sup>c</sup> No I&E reductions are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with these options.

<sup>d</sup> No significant commercial fishing takes place in the Inland region, and thus this region is excluded from the commercial fishing benefits analysis.

Source: U.S. EPA Analysis, 2004.

# Chapter E3: Comparison of Benefits and Social Costs

## INTRODUCTION

This chapter compares total monetized benefits to total social costs for the options analyzed for the Proposed Section 316(b) Rule for Phase III Facilities. Benefits and costs are compared on two bases: (1) for each of the options analyzed and (2) incrementally across options. For more information on the analysis of social costs and benefits, see *Chapter E1: Summary of Social Costs* and *Chapter E2: Summary of Benefits*.

### CHAPTER CONTENTS

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EPA considered and analyzed three proposed options and five other options for Phase III existing facilities (Manufacturers and Generators) in developing the proposed rule. New offshore oil and gas extraction facilities were excluded from the comparison of benefits and costs because EPA was unable to estimate benefits for this industry segment. This chapter presents results for the three proposed options for existing facilities: the “50 MGD for All Waterbodies” option (“50 MGD All”), the “200 MGD for All Waterbodies” option (“200 MGD All”), and the “100 MGD for Certain Waterbodies” option (“100 MGD CWB”). Summary results for five other options evaluated in regulation development are presented in the appendix to this chapter.

Table E3-1 shows compliance action assumptions for the three proposed options based on the performance standard each facility would need to meet (depending on each facility’s waterbody type, design intake flow, capacity utilization, and annual intake flow as a percent of source waterbody mean annual flow) and its baseline technologies in-place.

**Table E3-1: Number of Existing Phase III Facilities by Compliance Action<sup>a</sup>**

Facility Compliance Action	50 MGD All	200 MGD All	100 MGD CWB
<b>Total Facilities Potentially Subject to Regulation (excluding baseline closures)</b>	<b>603</b>	<b>603</b>	<b>603</b>
Facilities Subject to Best Professional Judgment	468	579	584
Facilities Subject to National Categorical Requirements	136	25	19
<i>No compliance action<sup>b</sup></i>	32	2	1
<i>Impingement controls only</i>	37	3	0
<i>Impingement and entrainment controls</i>	66	19	18

<sup>a</sup> Alternative less stringent requirements based on site-specific assessments of costs, or costs and benefits are allowed. Estimation of compliance responses is uncertain because the number of facilities requesting alternative less stringent requirements based on these site-specific assessments is unknown.

<sup>b</sup> These facilities meet compliance requirements in the baseline and thus would require no action to comply with the regulation.

Source: U.S. EPA Analysis, 2004.

### E3-1 COMPARISON OF BENEFITS AND SOCIAL COSTS BY OPTION

The preceding chapters, *Chapter E1: Summary of Social Costs* and *Chapter E2: Summary of Benefits*, present estimates of total social cost and benefit for the three proposed and five other options evaluated in developing the 316(b) Phase III regulation. Based on these values of estimated benefits and social costs, EPA calculated the net monetized benefit to society of each option.

As documented in *Chapter E2: Summary of Benefits*, the monetized benefit values developed by EPA for the 316(b) Phase III regulation, and included in the net benefits calculation presented in this chapter, include only *use benefit* values for commercial and recreational fishing. EPA was unable to estimate, at this time, a monetized value of non-use benefits from reduced impingement and entrainment (I&E). As a result, the monetized benefit value that is compared with the estimated value of total social cost in this benefit-cost comparison, is narrow in conceptual scope and omits a benefit category with potentially large monetary value. Specifically, the Agency was unable to monetize benefits for 96.7% of the age-one equivalent losses of all commercial, recreational, and forage species considered for the options for Phase III existing facilities. As a result, the benefits estimates used in this analysis represent the benefits associated with only about 3.3% of the total avoided loss in age-one equivalents. Accordingly, the net benefit values presented in this chapter are based on comparison of a substantially complete estimate of costs to society with a substantially incomplete estimate of benefits.

Table E3-2, below, presents EPA's estimates of use benefits and social costs for the three proposed options for existing facilities, at 3% and 7% discount rates. At a 3% discount rate, EPA estimates that social costs exceed use benefits by \$45.4 million under the 50 MGD All option, \$21.5 million under the 200 MGD All option, and \$16.2 million under the 100 MGD CWB option. At a 7% discount rate, social costs exceed use benefits by \$48.6 million under the 50 MGD All option, \$23.1 million under the 200 MGD All option, and \$17.2 million under the 100 MGD CWB option. These values are all in dollars as of mid-year 2003 and are based on the discounting of costs and benefits to beginning of year 2007, the assumed date when the proposed rule would take effect.

**Table E3-2: Total Benefits, Social Costs, and Net Benefits for Existing Phase III Facilities by Option (millions; 2003\$)**

Option	Total Monetized Use Benefits <sup>a</sup>			Total Social Costs	Net Benefits Based on Use Benefits Only <sup>b</sup>		
	Low	Mean	High		Low	Mean	High
<i>3% discount rate</i>							
50 MGD All	\$1.0	\$1.9	\$3.8	\$47.3	(\$46.4)	(\$45.4)	(\$43.5)
200 MGD All	\$0.6	\$1.3	\$2.5	\$22.8	(\$22.1)	(\$21.5)	(\$20.2)
100 MGD CWB	\$0.7	\$1.4	\$2.9	\$17.6	(\$16.9)	(\$16.2)	(\$14.7)
<i>7% discount rate</i>							
50 MGD All	\$0.8	\$1.5	\$3.0	\$50.1	(\$49.3)	(\$48.6)	(\$47.1)
200 MGD All	\$0.5	\$1.0	\$2.0	\$24.1	(\$23.6)	(\$23.1)	(\$22.1)
100 MGD CWB	\$0.6	\$1.1	\$2.3	\$18.3	(\$17.7)	(\$17.2)	(\$16.0)

<sup>a</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. The range (low, mean, and high) of annualized use values is computed by adding the high end value for commercial fishing benefits (based on assumed producer surplus of 40% of gross revenue) to the low, mean, and high values from recreational fishing benefits, respectively (see Chapter A4 of the RBA).

<sup>b</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

Source: U.S. EPA Analysis, 2004.

This comparison of fairly complete costs and incomplete benefits provides an incomplete assessment of net benefits to society. The proposed options are expected to provide benefits that were not accounted for in the benefits analysis. These benefits include reduced I&E losses of fish, shellfish, and other aquatic organisms, which, in turn, increase the numbers of individuals present, increase local and regional fishery populations (a subset of which was accounted for in the benefits analysis), and ultimately contribute to the enhanced environmental functioning of affected waterbodies (rivers, lakes, estuaries, and oceans) and associated ecosystems. See Chapter A6 of the *Regional Benefits Assessment for the Proposed Section 316(b) Rule for Phase III Facilities* (RBA) for a detailed description of the ecological benefits from reduced I&E (U.S. EPA, 2004). Taking into account these additional unquantified benefits of improved fisheries and aquatic ecosystem functioning, the Agency believes that the total benefits to society of the proposed rule for Phase III existing facilities could potentially exceed total social costs.

Tables E3-3 and E3-4 present total net benefits for existing Phase III facilities by option and region, discounted at 3% and 7%, respectively. As reported in Tables E3-3 and E3-4, EPA estimates that costs are largest relative to benefits in the Inland region for the 50 MGD All and 200 MGD All options, and in the Gulf of Mexico region for the 100 MGD CWB option. Conversely, costs outweigh benefits by the least amount in the California region for the 50 MGD All option, in the North Atlantic region for the 200 MGD All option, and in the Mid-Atlantic region for the 100 MGD CWB option.

**Table E3-3: Total Net Benefits for Existing Phase III Facilities  
by Option and Region (millions; 2003\$, discounted at 3%)**

Option	Net Benefits Based on Use Benefits Only <sup>a</sup>							
	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
<i>Low</i>								
50 MGD All	(\$0.8)	(\$4.5)	(\$2.3)	\$0.0	(\$8.7)	(\$9.9)	(\$19.5)	(\$46.4)
200 MGD All	\$0.0	(\$0.5)	(\$1.7)	\$0.0	(\$3.6)	(\$3.9)	(\$12.2)	(\$22.1)
100 MGD CWB	\$0.0	(\$2.0)	(\$1.7)	\$0.0	(\$8.7)	(\$4.3)	\$0.0	(\$16.9)
<i>Mean</i>								
50 MGD All	(\$0.8)	(\$4.5)	(\$2.0)	\$0.0	(\$8.4)	(\$9.7)	(\$19.4)	(\$45.4)
200 MGD All	\$0.0	(\$0.5)	(\$1.5)	\$0.0	(\$3.5)	(\$3.8)	(\$12.1)	(\$21.5)
100 MGD CWB	\$0.0	(\$1.9)	(\$1.5)	\$0.0	(\$8.4)	(\$4.2)	\$0.0	(\$16.2)
<i>High</i>								
50 MGD All	(\$0.8)	(\$4.4)	(\$1.5)	\$0.0	(\$7.7)	(\$9.4)	(\$19.1)	(\$43.5)
200 MGD All	\$0.0	(\$0.5)	(\$1.0)	\$0.0	(\$3.1)	(\$3.6)	(\$11.9)	(\$20.2)
100 MGD CWB	\$0.0	(\$1.9)	(\$1.0)	\$0.0	(\$7.7)	(\$4.0)	\$0.0	(\$14.7)

<sup>a</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>b</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

Source: U.S. EPA Analysis, 2004.

**Table E3-4: Total Net Benefits for Existing Phase III Facilities  
by Option and Region (millions; 2003\$, discounted at 7%)**

Option	Net Benefits Based on Use Benefits Only <sup>a</sup>							
	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	National Total
<i>Low</i>								
50 MGD All	(\$1.0)	(\$5.0)	(\$2.2)	\$0.0	(\$9.9)	(\$10.1)	(\$20.5)	(\$49.3)
200 MGD All	\$0.0	(\$0.5)	(\$1.6)	\$0.0	(\$4.2)	(\$3.6)	(\$13.6)	(\$23.6)
100 MGD CWB	\$0.0	(\$2.0)	(\$1.6)	\$0.0	(\$9.9)	(\$4.0)	\$0.0	(\$17.7)
<i>Mean</i>								
50 MGD All	(\$0.9)	(\$5.0)	(\$2.0)	\$0.0	(\$9.7)	(\$9.9)	(\$20.4)	(\$48.6)
200 MGD All	\$0.0	(\$0.5)	(\$1.4)	\$0.0	(\$4.1)	(\$3.5)	(\$13.5)	(\$23.1)
100 MGD CWB	\$0.0	(\$2.0)	(\$1.4)	\$0.0	(\$9.7)	(\$3.9)	\$0.0	(\$17.2)
<i>High</i>								
50 MGD All	(\$0.9)	(\$4.9)	(\$1.6)	\$0.0	(\$9.1)	(\$9.7)	(\$20.2)	(\$47.1)
200 MGD All	\$0.0	(\$0.4)	(\$1.1)	\$0.0	(\$3.8)	(\$3.3)	(\$13.4)	(\$22.1)
100 MGD CWB	\$0.0	(\$1.9)	(\$1.1)	\$0.0	(\$9.1)	(\$3.7)	\$0.0	(\$16.0)

<sup>a</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>b</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

Source: U.S. EPA Analysis, 2004.

Table E3-5, on the following page, provides additional detail on the net benefits calculation. Table E3-5 compiles, for the three proposed options, the time profiles of benefits and costs as presented in the preceding chapters. The table also reports the calculated present and annualized values of benefits and costs at 3% and 7% discount rates.

**Table E3-5: Time Profile of Benefits and Social Costs for Existing Phase III Facilities**  
(millions; 2003\$)

Year	50 MGD All		200 MGD All		100 MGD CWB	
	Monetized Benefits	Total Cost (excl. O&G)	Monetized Benefits	Total Cost (excl. O&G)	Monetized Benefits	Total Cost (excl. O&G)
2007	\$0.00	\$3.3	\$0.00	\$0.2	\$0.00	\$0.6
2008	\$0.00	\$10.2	\$0.00	\$1.4	\$0.00	\$3.8
2009	\$0.00	\$15.4	\$0.00	\$2.1	\$0.00	\$3.9
2010	\$0.01	\$172.6	\$0.00	\$129.1	\$0.00	\$9.0
2011	\$0.05	\$180.5	\$0.03	\$83.8	\$0.01	\$139.7
2012	\$0.22	\$74.4	\$0.11	\$12.3	\$0.09	\$11.5
2013	\$0.63	\$110.8	\$0.34	\$45.8	\$0.27	\$35.3
2014	\$1.28	\$22.2	\$0.70	\$7.5	\$0.85	\$5.4
2015	\$1.83	\$22.7	\$1.16	\$8.5	\$1.32	\$8.3
2016	\$2.12	\$18.6	\$1.40	\$7.5	\$1.57	\$5.4
2017	\$2.22	\$18.6	\$1.47	\$9.0	\$1.66	\$6.6
2018	\$2.27	\$15.3	\$1.52	\$7.5	\$1.70	\$5.3
2019	\$2.29	\$19.0	\$1.53	\$7.3	\$1.72	\$5.2
2020	\$2.29	\$44.5	\$1.53	\$12.7	\$1.72	\$8.3
2021	\$2.29	\$81.7	\$1.53	\$40.0	\$1.72	\$41.4
2022	\$2.29	\$29.2	\$1.53	\$14.6	\$1.72	\$12.2
2023	\$2.29	\$58.2	\$1.53	\$45.8	\$1.72	\$35.4
2024	\$2.29	\$22.1	\$1.53	\$7.4	\$1.72	\$5.4
2025	\$2.29	\$22.7	\$1.53	\$8.5	\$1.72	\$8.3
2026	\$2.29	\$18.6	\$1.53	\$7.5	\$1.72	\$5.4
2027	\$2.29	\$18.6	\$1.53	\$9.0	\$1.72	\$6.6
2028	\$2.29	\$15.3	\$1.53	\$7.5	\$1.72	\$5.3
2029	\$2.29	\$19.0	\$1.53	\$7.3	\$1.72	\$5.2
2030	\$2.29	\$44.5	\$1.53	\$12.7	\$1.72	\$8.3
2031	\$2.29	\$81.7	\$1.53	\$40.0	\$1.72	\$41.4
2032	\$2.29	\$29.2	\$1.53	\$14.6	\$1.72	\$12.2
2033	\$2.29	\$58.2	\$1.53	\$45.8	\$1.72	\$35.4
2034	\$2.29	\$22.1	\$1.53	\$7.4	\$1.72	\$5.4
2035	\$2.29	\$22.7	\$1.53	\$8.5	\$1.72	\$8.3
2036	\$2.29	\$18.6	\$1.53	\$7.5	\$1.72	\$5.4
2037	\$2.29	\$18.6	\$1.53	\$9.0	\$1.72	\$6.6
2038	\$2.29	\$15.3	\$1.53	\$7.5	\$1.72	\$5.3
2039	\$2.29	\$14.4	\$1.53	\$7.1	\$1.72	\$4.8
2040	\$2.28	\$12.1	\$1.53	\$6.8	\$1.72	\$4.7
2041	\$2.23	\$6.3	\$1.50	\$3.9	\$1.71	\$2.2
2042	\$2.06	\$4.1	\$1.42	\$3.1	\$1.62	\$1.3
2043	\$1.66	\$0.5	\$1.19	\$0.4	\$1.45	\$0.4
2044	\$1.01	\$0.0	\$0.83	\$0.0	\$0.87	\$0.0
2045	\$0.46	\$0.0	\$0.37	\$0.0	\$0.40	\$0.0
2046	\$0.17	\$0.0	\$0.13	\$0.0	\$0.15	\$0.0
2047	\$0.06	\$0.0	\$0.06	\$0.0	\$0.05	\$0.0
2048	\$0.01	\$0.0	\$0.01	\$0.0	\$0.01	\$0.0
<b>PV 3%</b>	<b>\$37.18</b>	<b>\$955.8</b>	<b>\$24.70</b>	<b>\$459.7</b>	<b>\$27.65</b>	<b>\$355.9</b>
<b>Annualized 3%</b>	<b>\$1.90</b>	<b>\$47.3</b>	<b>\$1.26</b>	<b>\$22.8</b>	<b>\$1.41</b>	<b>\$17.6</b>
<b>PV 7%</b>	<b>\$18.56</b>	<b>\$665.0</b>	<b>\$12.21</b>	<b>\$320.3</b>	<b>\$13.63</b>	<b>\$242.5</b>
<b>Annualized 7%</b>	<b>\$1.50</b>	<b>\$50.1</b>	<b>\$0.98</b>	<b>\$24.1</b>	<b>\$1.10</b>	<b>\$18.3</b>

Source: U.S. EPA Analysis, 2004.

### E3-2 INCREMENTAL ANALYSIS OF BENEFITS AND SOCIAL COSTS

In addition to comparing benefits and costs for each proposed option, as presented in the preceding section, EPA also analyzed the benefits and costs of the three options on an incremental basis. The comparison in the preceding section addresses the simple quantitative relationship between estimated benefits and costs for each option by itself: for a given option, which is greater – benefits or costs – and what is the amount of difference? In contrast, incremental analysis looks at the differential relationship of benefits and costs across options and poses a different question: as increasingly more costly options are considered, by what amount do benefits, costs, and net benefits change from option to option? Incremental benefit-cost analysis provides insight into the net gain to society from imposing increasingly more costly requirements and may aid regulatory decision-makers in choosing among a set of regulatory proposals that otherwise have a similar quantitative relationship between benefits and costs based on a one-option-at-a-time comparison.

The Agency conducted the incremental benefit-cost analysis by calculating, for each option, the change in net benefits, from option to option, in moving from the least costly option to successively more costly options. As described previously, the three proposed options – the 50 MGD All, 200 MGD All, and 100 MGD CWB options – differ in terms of design intake flow (DIF) applicability threshold and affected waterbodies. Thus the difference in benefits and costs across the options derives from the number of facilities each option is expected to cover and what types of waterbodies are affected. As reported in Table E3-6, at a 3% discount rate, the incremental change in net benefits in moving from the 100 MGD CWB option to the 200 MGD All option is -\$5.3 million, and from the 200 MGD All option to the 50 MGD All option, is -\$23.9 million. Thus, for both incremental steps, calculated net benefits become increasingly more negative but the step from the 200 MGD All option to the 50 MGD All option is more costly to society, on a net benefit basis, than the step from the 100 MGD CWB option to the 200 MGD All option. The same pattern of change occurs for the calculations under a 7% discount rate: the incremental change in net benefits in moving from the 100 MGD CWB option to the 200 MGD All option is -\$6.0 million, and from the 200 MGD All option to the 50 MGD All option, is -\$25.4 million.

**Table E3-6: Incremental Benefit-Cost Analysis for Existing Phase III Facilities (millions; 2003\$)**

Option <sup>a</sup>	Net Benefits Based on Use Benefits Only <sup>b</sup>			Incremental Net Benefits <sup>c</sup>		
	Low	Mean	High	Low	Mean	High
<i>3% discount rate</i>						
100 MGD CWB	(\$16.9)	(\$16.2)	(\$14.7)	n/a	n/a	n/a
200 MGD All	(\$22.1)	(\$21.5)	(\$20.2)	(\$5.2)	(\$5.3)	(\$5.5)
50 MGD All	(\$46.4)	(\$45.4)	(\$43.5)	(\$24.2)	(\$23.9)	(\$23.3)
<i>7% discount rate</i>						
100 MGD CWB	(\$17.7)	(\$17.2)	(\$16.0)	n/a	n/a	n/a
200 MGD All	(\$23.6)	(\$23.1)	(\$22.1)	(\$5.9)	(\$6.0)	(\$6.1)
50 MGD All	(\$49.3)	(\$48.6)	(\$47.1)	(\$25.7)	(\$25.4)	(\$24.9)

<sup>a</sup> Options are presented in order of increasing applicability, based on the number of facilities regulated.

<sup>b</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>c</sup> Incremental net benefits are equal to the difference between net benefits of a given option and the net benefits of the previous less stringent option.

Source: U.S. EPA Analysis, 2004.

### E3-3 BREAK-EVEN ANALYSIS OF POTENTIAL NON-USE BENEFITS

As described in Section E3-1, above, EPA’s monetized estimates of benefits for the 316(b) Phase III regulation consider only the *use benefit* values for commercial and recreational fishing, and exclude *non-use benefits*. Estimating non-use benefit values is a very challenging and uncertain exercise, particularly when primary research using stated preference methods is not a feasible option (as is the case for the proposed rulemaking). In Chapter A3 of the RBA, EPA described alternative approaches for developing non-use benefit estimates based on benefits transfer and associated methods. Because of the uncertainty in estimating the non-use benefits of the options evaluated for the proposed rule, the Agency assessed non-use benefits only qualitatively (see Chapter A6 of RBA for a qualitative assessment of non-use benefits). As a result, the comparison of costs and benefits presented in Sections E3-1 and E3-2 involves a substantially more complete accounting of costs than of benefits. On the basis of this limited, incomplete accounting of benefits and costs, EPA found that costs exceed use benefits for each of the three proposed options.

Although EPA did not specifically estimate the non-use benefits of the 316(b) Phase III regulation, it is possible to calculate the amount of non-use benefits that would be needed for the regulation’s benefits to equal the estimated total costs (the “break-even” non-use benefits value). Regulatory decision-makers may then judge the reasonableness of these required values in assessing whether the regulation is likely, overall, to achieve total benefits to society that exceed costs.

To perform this break-even analysis, EPA subtracted the estimated commercial and recreational use benefits from the estimated annual costs. EPA then used this required residual to calculate the non-use benefit value, in terms of annual willingness-to-pay (WTP), needed for total benefits to equal total costs. This calculation was done in two different ways: (1) on a per household basis and (2) on a per age-1 equivalent basis. EPA performed this analysis using the regional studies framework as described in the RBA. This approach assumes that all of the facilities in the sample weight of a given sample facility are in the same benefits analysis region as the sample facility.

For the WTP per household analysis, this approach also assumes that the size and other characteristics of potential use and non-use benefit populations, which are assessed for the sample facility, may be extended to the weight of the sample facility. Although this assumption embeds considerable uncertainty, it permits the estimation of a non-use benefit population for each facility, which may then be used to calculate the WTP value by household that equates total benefits and total costs, on a sample-weighted basis, for each option. For this analysis, EPA assumed that only anglers fishing in the region and households within a 25-mile radius of the facility hold non-use values for the affected resources (BLS, 2000).<sup>1</sup>

At the national level, EPA estimated the following (see Table E3-7 below):

- ▶ **WTP per household.** Under the 50 MGD All option, non-use benefit values per household would have to be \$1.99 (3% discount rate) and \$2.13 (7% discount rate) for total annual benefits to equal total annualized costs. Under the 200 MGD All option, which applies to the next smaller set of facilities, these values decrease to \$1.87 (3% discount rate) and \$2.01 (7% discount rate). Under the 100 MGD CWB option, which applies to the smallest set of facilities of the three proposed options, these values decrease, to \$1.43 (3% discount rate) and \$1.52 (7% discount rate).
- ▶ **WTP per age-1 equivalent.** Under the 50 MGD All option, non-use benefit values per age-1 equivalent would have to be \$0.92 (3% discount rate) and \$0.98 (7% discount rate) for total annual benefits to equal total annualized costs. Under the 200 MGD All option, which applies to the next smaller set of facilities, these values decrease to \$0.63 (3% discount rate) and \$0.68 (7% discount rate). Under the 100 MGD CWB option, which applies to the smallest set of facilities of the three proposed options, these values decrease, to \$0.54 (3% discount rate) and \$0.58 (7% discount rate).

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<sup>1</sup> See chapter E2 for details on the estimation of age-1 equivalents.

**Table E3-7: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis (2003\$)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>3% Discount Rate</i>							
50 MGD All	\$47.3	\$1.9	\$45.4	22,784,450	\$1.99	49,493,000	\$0.92
200 MGD All	\$22.8	\$1.3	\$21.5	11,524,368	\$1.87	34,038,000	\$0.63
100 MGD CWB	\$17.6	\$1.4	\$16.2	11,328,241	\$1.43	29,774,000	\$0.54
<i>7% Discount Rate</i>							
50 MGD All	\$50.1	\$1.5	\$48.6	22,784,450	\$2.13	49,493,000	\$0.98
200 MGD All	\$24.1	\$1.0	\$23.1	11,524,368	\$2.01	34,038,000	\$0.68
100 MGD CWB	\$18.3	\$1.1	\$17.2	11,328,241	\$1.52	29,774,000	\$0.58

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish’s contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

Source: U.S. EPA Analysis, 2004.

EPA also calculated the annual WTP needed on a per household basis and a per age-1 equivalent basis at the regional level (see Tables E3-8 and E3-9 below). EPA estimated the following:

- ▶ **WTP per household.** The Gulf of Mexico region has the highest estimated annual break-even WTP values per household with \$6.38, \$13.83, and \$6.38 (3% discount rate) and \$7.34, \$16.31, and \$7.34 (7% discount rate) under the 50 MGD All, the 200 MGD All, and the 100 MGD CWB options, respectively. The Mid-Atlantic region has the lowest estimated annual break-even WTP values per household with \$0.35, \$0.27, and \$0.27 (3% discount rate) and \$0.35, \$0.25, and \$0.25 (7% discount rate) under the 50 MGD All, the 200 MGD All, and the 100 MGD CWB options, respectively.
- ▶ **WTP per age-1 equivalent.** The North Atlantic region has the highest estimated annual break-even WTP value per age-1 equivalent with \$4.84, \$2.51, and \$2.56 (3% discount rate) and \$5.37, \$2.28, and \$2.62 (7% discount rate) under the 50 MGD All, the 200 MGD All, and the 100 MGD CWB options, respectively. The Mid-Atlantic region has the lowest estimated annual break-even WTP values per age-1 equivalent with \$0.15, \$0.13, and \$0.13 (3% discount rate) and \$0.15, \$0.12, and \$0.12 (7% discount rate) under the 50 MGD All, the 200 MGD All, and the 100 MGD CWB options, respectively.

**Table E3-8: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 3%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>50 MGD All</i>							
California	\$0.8	\$0.0 <sup>d</sup>	\$0.8	1,166,416	\$0.70	383,000	\$2.14
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$2.6	\$0.5	\$2.0	5,887,031	\$0.35	13,400,000	\$0.15
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$9.1	\$0.6	\$8.4	1,322,480	\$6.38	8,380,000	\$1.01
Great Lakes	\$10.1	\$0.3	\$9.7	4,064,660	\$2.40	11,600,000	\$0.84
Inland	\$19.7	\$0.3	\$19.4	8,214,682	\$2.36	14,800,000	\$1.31
<b>National Total</b>	<b>\$47.3</b>	<b>\$1.9</b>	<b>\$45.4</b>	<b>22,784,450</b>	<b>\$1.99</b>	<b>49,493,000</b>	<b>\$0.92</b>
<i>200 MGD All</i>							
California	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
North Atlantic	\$0.5	\$0.0 <sup>d</sup>	\$0.5	1,699,855	\$0.29	198,000	\$2.51
Mid-Atlantic	\$2.0	\$0.5	\$1.5	5,603,551	\$0.27	11,900,000	\$0.13
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$3.8	\$0.3	\$3.5	251,666	\$13.83	4,580,000	\$0.76
Great Lakes	\$4.1	\$0.2	\$3.8	2,388,297	\$1.60	7,710,000	\$0.50
Inland	\$12.3	\$0.2	\$12.1	1,580,998	\$7.65	9,650,000	\$1.25
<b>National Total</b>	<b>\$22.8</b>	<b>\$1.3</b>	<b>\$21.5</b>	<b>11,524,368</b>	<b>\$1.87</b>	<b>34,038,000</b>	<b>\$0.63</b>
<i>100 MGD CWB</i>							
California	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
North Atlantic	\$2.0	\$0.1	\$1.9	1,989,096	\$0.97	754,000	\$2.56
Mid-Atlantic	\$2.0	\$0.5	\$1.5	5,603,551	\$0.27	11,900,000	\$0.13
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$9.1	\$0.6	\$8.4	1,322,480	\$6.38	8,380,000	\$1.01
Great Lakes	\$4.5	\$0.3	\$4.2	2,413,114	\$1.74	8,740,000	\$0.48
Inland	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
<b>National Total</b>	<b>\$17.6</b>	<b>\$1.4</b>	<b>\$16.2</b>	<b>11,328,241</b>	<b>\$1.43</b>	<b>29,774,000</b>	<b>\$0.54</b>

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish’s contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

<sup>c</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

<sup>d</sup> Positive non-zero value less than \$50,000.

Source: U.S. EPA Analysis, 2004.

**Table E3-9: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 7%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>50 MGD All</i>							
California	\$1.0	\$0.0 <sup>d</sup>	\$0.9	1,166,416	\$0.81	383,000	\$2.48
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$2.4	\$0.4	\$2.0	5,887,031	\$0.35	13,400,000	\$0.15
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$10.2	\$0.5	\$9.7	1,322,480	\$7.34	8,380,000	\$1.16
Great Lakes	\$10.2	\$0.3	\$9.9	4,064,660	\$2.45	11,600,000	\$0.86
Inland	\$20.6	\$0.3	\$20.4	8,214,682	\$2.48	14,800,000	\$1.38
<b>National Total</b>	<b>\$50.1</b>	<b>\$1.5</b>	<b>\$48.6</b>	<b>22,784,450</b>	<b>\$2.13</b>	<b>49,493,000</b>	<b>\$0.98</b>
<i>200 MGD All</i>							
California	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
North Atlantic	\$0.5	\$0.0 <sup>d</sup>	\$0.5	1,699,855	\$0.27	198,000	\$2.28
Mid-Atlantic	\$1.8	\$0.4	\$1.4	5,603,551	\$0.25	11,900,000	\$0.12
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$4.4	\$0.3	\$4.1	251,666	\$16.31	4,580,000	\$0.90
Great Lakes	\$3.7	\$0.2	\$3.5	2,388,297	\$1.47	7,710,000	\$0.45
Inland	\$13.7	\$0.2	\$13.5	1,580,998	\$8.56	9,650,000	\$1.40
<b>National Total</b>	<b>\$24.1</b>	<b>\$1.0</b>	<b>\$23.1</b>	<b>11,524,368</b>	<b>\$2.01</b>	<b>34,038,000</b>	<b>\$0.68</b>
<i>100 MGD CWB</i>							
California	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
North Atlantic	\$2.0	\$0.0 <sup>d</sup>	\$2.0	1,989,096	\$0.99	754,000	\$2.62
Mid-Atlantic	\$1.8	\$0.4	\$1.4	5,603,551	\$0.25	11,900,000	\$0.12
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$10.2	\$0.5	\$9.7	1,322,480	\$7.34	8,380,000	\$1.16
Great Lakes	\$4.1	\$0.2	\$3.9	2,413,114	\$1.62	8,740,000	\$0.45
Inland	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
<b>National Total</b>	<b>\$18.3</b>	<b>\$1.1</b>	<b>\$17.2</b>	<b>11,328,241</b>	<b>\$1.52</b>	<b>29,774,000</b>	<b>\$0.58</b>

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish's contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

<sup>c</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region withdraw less than 50 MGD and therefore would not be required to install technologies to comply with the proposed options.

<sup>d</sup> Positive non-zero value less than \$50,000.

Source: U.S. EPA Analysis, 2004.

## GLOSSARY

**opportunity cost:** The lost value of alternative uses of resources (capital, labor, and raw materials) used in regulatory compliance.

**social cost:** The costs incurred by society as a whole as a result of the proposed rule. Social costs do not include costs that are transfers among parties that do not represent a new cost overall.

## REFERENCES

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# Appendix to Chapter E3

## INTRODUCTION

This appendix presents results from EPA’s analysis of the benefits and costs of the 316(b) Phase III regulation for five additional options evaluated for Phase III existing facilities. Results are presented for the comparison of benefits and costs and the breakeven assessment of non-use benefits. As discussed previously in Chapter E3, the benefit and cost values presented in this appendix pertain only to the Manufacturers and Electric Generators segments of the industries subject to Phase III regulation.

### APPENDIX CONTENTS

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EPA estimated the compliance response for each facility under each of the other options (see Table E3A-1, below). In this table and the following tables, the options are listed in order of increasing cost, which reflects the breadth of regulatory coverage based on design intake flow applicability threshold and the stringency of compliance requirements. For a description of this analysis, see section E3-1 above.

**Table E3A-1: Number of Existing Phase III Facilities by Compliance Action<sup>a</sup>**

Facility Compliance Action	Option 3	Option 4	Option 2	Option 1	Option 6
<b>Total Facilities Potentially Subject to Regulation (excluding baseline closures)</b>	<b>603</b>	<b>603</b>	<b>603</b>	<b>603</b>	<b>603</b>
Facilities Subject to Best Professional Judgment	235	415	235	251	0
Facilities Subject to National Categorical Requirements	368	189	368	353	603
<i>No compliance action<sup>b</sup></i>	202	59	184	160	317
<i>Impingement controls only</i>	100	39	93	73	114
<i>Impingement and entrainment controls</i>	66	91	91	120	172

<sup>a</sup> Alternative less stringent requirements based on a site-specific assessment of costs, or costs and benefits, are allowed. The estimate of number of facilities meeting specific requirements is uncertain because the number of facilities requesting alternative less stringent requirements based on site-specific assessments is unknown.

<sup>b</sup> These facilities already meet compliance requirements.

Source: U.S. EPA Analysis, 2004.

## E3A-1 COMPARISON OF BENEFITS AND SOCIAL COSTS BY OPTION

Table E3A-2 on the following page reports benefits, costs, and net benefits for all five other options. For further information on this analysis, see section E3-1, above.

**Table E3A-2: Total Benefits, Social Costs, and Net Benefits for Existing Phase III Facilities by Option (millions; 2003\$)**

Option	Total Monetized Use Benefits <sup>a</sup>			Total Social Costs	Net Benefits Based on Use Benefits Only <sup>b</sup>		
	Low	Mean	High		Low	Mean	High
<i>3% Discount Rate</i>							
Option 3	\$1.0	\$2.0	\$4.0	\$65.0	(\$64.0)	(\$63.1)	(\$61.0)
Option 4	\$1.0	\$2.0	\$4.1	\$67.9	(\$66.9)	(\$65.9)	(\$63.8)
Option 2	\$1.0	\$2.0	\$4.1	\$73.7	(\$72.6)	(\$71.7)	(\$69.6)
Option 1	\$1.1	\$2.1	\$4.1	\$76.1	(\$75.0)	(\$74.0)	(\$71.9)
Option 6	\$1.1	\$2.1	\$4.2	\$95.7	(\$94.6)	(\$93.6)	(\$91.5)
<i>7% Discount Rate</i>							
Option 3	\$0.8	\$1.6	\$3.2	\$69.6	(\$68.8)	(\$68.0)	(\$66.4)
Option 4	\$0.8	\$1.6	\$3.2	\$73.9	(\$73.1)	(\$72.3)	(\$70.7)
Option 2	\$0.8	\$1.6	\$3.2	\$79.3	(\$78.5)	(\$77.7)	(\$76.1)
Option 1	\$0.8	\$1.6	\$3.3	\$81.8	(\$80.9)	(\$80.1)	(\$78.5)
Option 6	\$0.9	\$1.7	\$3.3	\$102.5	(\$101.6)	(\$100.8)	(\$99.1)

<sup>a</sup> The total monetizable value of I&E reductions includes use benefits only. EPA evaluated non-use benefits only qualitatively. The range (low, mean, and high) of annualized use values is computed by adding the high end value for commercial fishing benefits (based on assumed producer surplus of 40% of gross revenue) to the low, mean, and high values from recreational fishing benefits, respectively (see Chapter A4 of the RBA).

<sup>b</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

Source: U.S. EPA Analysis, 2004.

Tables E3A-3 and E3A-4, below and following page, report net benefits, by option and benefit study region for, respectively, the 3% and 7% discount rate calculations. For further information on this analysis, see section E3-1, above.

**Table E3A-3: Total Net Benefits for Existing Phase III Facilities by Option and Region  
(millions; 2003\$, discounted at 3%)**

Option	Net Benefits Based on Use Benefits Only <sup>a</sup>							National Total
	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	
<i>Low</i>								
Option 3	(\$1.1)	(\$4.5)	(\$2.5)	\$0.0	(\$9.2)	(\$20.4)	(\$25.0)	(\$64.0)
Option 4	(\$1.5)	(\$4.5)	(\$3.0)	\$0.0	(\$14.2)	(\$22.6)	(\$19.5)	(\$66.9)
Option 2	(\$1.5)	(\$4.5)	(\$3.0)	\$0.0	(\$14.2)	(\$22.6)	(\$25.0)	(\$72.6)
Option 1	(\$1.5)	(\$4.5)	(\$3.0)	\$0.0	(\$14.2)	(\$22.6)	(\$27.4)	(\$75.0)
Option 6	(\$2.2)	(\$4.5)	(\$3.2)	\$0.0	(\$14.2)	(\$28.4)	(\$39.8)	(\$94.6)
<i>Mean</i>								
Option 3	(\$1.1)	(\$4.5)	(\$2.2)	\$0.0	(\$8.9)	(\$20.2)	(\$24.8)	(\$63.1)
Option 4	(\$1.5)	(\$4.5)	(\$2.8)	\$0.0	(\$13.8)	(\$22.5)	(\$19.4)	(\$65.9)
Option 2	(\$1.5)	(\$4.5)	(\$2.8)	\$0.0	(\$13.8)	(\$22.5)	(\$24.9)	(\$71.7)
Option 1	(\$1.5)	(\$4.5)	(\$2.8)	\$0.0	(\$13.8)	(\$22.5)	(\$27.2)	(\$74.0)
Option 6	(\$2.2)	(\$4.5)	(\$3.0)	\$0.0	(\$13.8)	(\$28.2)	(\$39.6)	(\$93.6)
<i>High</i>								
Option 3	(\$1.1)	(\$4.4)	(\$1.6)	\$0.0	(\$8.1)	(\$19.9)	(\$24.5)	(\$61.0)
Option 4	(\$1.4)	(\$4.4)	(\$2.2)	\$0.0	(\$13.1)	(\$22.1)	(\$19.1)	(\$63.8)
Option 2	(\$1.4)	(\$4.4)	(\$2.2)	\$0.0	(\$13.1)	(\$22.1)	(\$24.6)	(\$69.6)
Option 1	(\$1.4)	(\$4.4)	(\$2.2)	\$0.0	(\$13.1)	(\$22.1)	(\$26.9)	(\$71.9)
Option 6	(\$2.1)	(\$4.4)	(\$2.4)	\$0.0	(\$13.1)	(\$27.8)	(\$39.3)	(\$91.5)

<sup>a</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>b</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

Source: U.S. EPA Analysis, 2004.

**Table E3A-4: Total Net Benefits for Existing Phase III Facilities by Option and Region**  
(millions; 2003\$, discounted at 7%)

Option	Net Benefits Based on Use Benefits Only <sup>a</sup>							National Total
	California	North Atlantic	Mid-Atlantic	South Atlantic <sup>b</sup>	Gulf of Mexico	Great Lakes	Inland	
<i>Low</i>								
Option 3	(\$1.2)	(\$5.0)	(\$2.4)	\$0.0	(\$10.4)	(\$22.7)	(\$25.7)	(\$68.8)
Option 4	(\$1.6)	(\$5.0)	(\$2.9)	\$0.0	(\$16.7)	(\$24.8)	(\$20.5)	(\$73.1)
Option 2	(\$1.6)	(\$5.0)	(\$2.9)	\$0.0	(\$16.7)	(\$24.8)	(\$25.7)	(\$78.5)
Option 1	(\$1.6)	(\$5.0)	(\$2.9)	\$0.0	(\$16.7)	(\$24.8)	(\$28.1)	(\$80.9)
Option 6	(\$2.2)	(\$5.0)	(\$3.1)	\$0.0	(\$16.7)	(\$30.7)	(\$41.6)	(\$101.6)
<i>Mean</i>								
Option 3	(\$1.2)	(\$5.0)	(\$2.2)	\$0.0	(\$10.1)	(\$22.6)	(\$25.6)	(\$68.0)
Option 4	(\$1.6)	(\$5.0)	(\$2.7)	\$0.0	(\$16.5)	(\$24.7)	(\$20.4)	(\$72.3)
Option 2	(\$1.6)	(\$5.0)	(\$2.7)	\$0.0	(\$16.5)	(\$24.7)	(\$25.6)	(\$77.7)
Option 1	(\$1.6)	(\$5.0)	(\$2.7)	\$0.0	(\$16.5)	(\$24.7)	(\$28.0)	(\$80.1)
Option 6	(\$2.2)	(\$5.0)	(\$2.9)	\$0.0	(\$16.5)	(\$30.5)	(\$41.4)	(\$100.8)
<i>High</i>								
Option 3	(\$1.2)	(\$4.9)	(\$1.8)	\$0.0	(\$9.6)	(\$22.3)	(\$25.4)	(\$66.4)
Option 4	(\$1.5)	(\$4.9)	(\$2.3)	\$0.0	(\$15.9)	(\$24.4)	(\$20.2)	(\$70.7)
Option 2	(\$1.5)	(\$4.9)	(\$2.3)	\$0.0	(\$15.9)	(\$24.4)	(\$25.4)	(\$76.1)
Option 1	(\$1.5)	(\$4.9)	(\$2.3)	\$0.0	(\$15.9)	(\$24.4)	(\$27.7)	(\$78.5)
Option 6	(\$2.1)	(\$4.9)	(\$2.4)	\$0.0	(\$15.9)	(\$30.2)	(\$41.2)	(\$99.1)

<sup>a</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>b</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

Source: U.S. EPA Analysis, 2004.

Tables E3A-5 and E3A-6 compile the time profiles of benefits and costs for the five other options. The tables also report the calculated present and annualized values of benefits and costs at 3% and 7% discount rates.

**Table E3A-5: Time Profile of Benefits and Costs for Existing Phase III Facilities  
for Options 3, 4, and 2 (millions; 2003\$)**

Year	Option 3		Option 4		Option 2	
	Monetized Benefits	Total Cost (excl. O&G)	Monetized Benefits	Total Cost (excl. O&G)	Monetized Benefits	Total Cost (excl. O&G)
2007	\$0.00	\$3.9	\$0.00	\$3.3	\$0.00	\$3.9
2008	\$0.00	\$14.9	\$0.00	\$13.9	\$0.00	\$16.0
2009	\$0.00	\$24.8	\$0.00	\$23.0	\$0.00	\$27.4
2010	\$0.01	\$188.0	\$0.01	\$182.6	\$0.01	\$191.4
2011	\$0.05	\$196.1	\$0.06	\$296.5	\$0.06	\$305.5
2012	\$0.23	\$281.5	\$0.23	\$284.6	\$0.23	\$291.2
2013	\$0.64	\$119.0	\$0.65	\$117.7	\$0.65	\$124.1
2014	\$1.35	\$31.0	\$1.36	\$27.0	\$1.36	\$34.4
2015	\$1.91	\$30.6	\$1.92	\$29.9	\$1.92	\$33.6
2016	\$2.23	\$29.1	\$2.25	\$26.8	\$2.25	\$32.7
2017	\$2.34	\$25.9	\$2.36	\$24.8	\$2.36	\$28.8
2018	\$2.39	\$20.4	\$2.41	\$20.7	\$2.41	\$24.2
2019	\$2.40	\$25.0	\$2.43	\$22.6	\$2.43	\$27.3
2020	\$2.40	\$55.1	\$2.43	\$51.8	\$2.43	\$58.2
2021	\$2.40	\$95.6	\$2.43	\$91.9	\$2.43	\$100.0
2022	\$2.40	\$39.4	\$2.43	\$40.8	\$2.43	\$46.6
2023	\$2.40	\$66.1	\$2.43	\$65.2	\$2.43	\$71.4
2024	\$2.40	\$30.6	\$2.43	\$26.6	\$2.43	\$33.9
2025	\$2.40	\$30.6	\$2.43	\$29.9	\$2.43	\$33.6
2026	\$2.40	\$29.1	\$2.43	\$26.8	\$2.43	\$32.7
2027	\$2.40	\$25.9	\$2.43	\$24.8	\$2.43	\$28.8
2028	\$2.40	\$20.4	\$2.43	\$20.7	\$2.43	\$24.2
2029	\$2.40	\$25.0	\$2.43	\$22.6	\$2.43	\$27.3
2030	\$2.40	\$55.1	\$2.43	\$51.8	\$2.43	\$58.2
2031	\$2.40	\$95.6	\$2.43	\$91.9	\$2.43	\$100.0
2032	\$2.40	\$39.4	\$2.43	\$40.8	\$2.43	\$46.6
2033	\$2.40	\$66.1	\$2.43	\$65.2	\$2.43	\$71.4
2034	\$2.40	\$30.6	\$2.43	\$26.6	\$2.43	\$33.9
2035	\$2.40	\$30.6	\$2.43	\$29.9	\$2.43	\$33.6
2036	\$2.40	\$29.1	\$2.43	\$26.8	\$2.43	\$32.7
2037	\$2.40	\$25.9	\$2.43	\$24.8	\$2.43	\$28.8
2038	\$2.40	\$20.4	\$2.43	\$20.7	\$2.43	\$24.2
2039	\$2.40	\$18.3	\$2.43	\$18.0	\$2.43	\$20.7
2040	\$2.39	\$15.3	\$2.42	\$15.7	\$2.42	\$17.6
2041	\$2.35	\$8.8	\$2.37	\$8.7	\$2.37	\$10.3
2042	\$2.17	\$5.3	\$2.19	\$5.2	\$2.19	\$6.2
2043	\$1.76	\$1.0	\$1.78	\$0.9	\$1.78	\$1.3
2044	\$1.06	\$0.0	\$1.07	\$0.0	\$1.07	\$0.0
2045	\$0.49	\$0.0	\$0.50	\$0.0	\$0.50	\$0.0
2046	\$0.18	\$0.0	\$0.18	\$0.0	\$0.18	\$0.0
2047	\$0.06	\$0.0	\$0.07	\$0.0	\$0.07	\$0.0
2048	\$0.02	\$0.0	\$0.02	\$0.0	\$0.02	\$0.0
<b>PV 3%</b>	<b>\$39.06</b>	<b>\$1,313.2</b>	<b>\$39.48</b>	<b>\$1,371.2</b>	<b>\$39.48</b>	<b>\$1,487.3</b>
<b>Annualized 3%</b>	<b>\$1.99</b>	<b>\$65.0</b>	<b>\$2.01</b>	<b>\$67.9</b>	<b>\$2.01</b>	<b>\$73.7</b>
<b>PV 7%</b>	<b>\$19.48</b>	<b>\$923.8</b>	<b>\$19.69</b>	<b>\$980.8</b>	<b>\$19.69</b>	<b>\$1,053.3</b>
<b>Annualized 7%</b>	<b>\$1.57</b>	<b>\$69.6</b>	<b>\$1.59</b>	<b>\$73.9</b>	<b>\$1.59</b>	<b>\$79.3</b>

Source: U.S. EPA Analysis, 2004.

**Table E3A-6: Time Profile of Benefits and Costs for Existing Phase III Facilities  
for Options 1 and 6 (millions; 2003\$)**

Year	Option 1		Option 6	
	Monetized Benefits	Total Cost (excl. O&G)	Monetized Benefits	Total Cost (excl. O&G)
2007	\$0.00	\$3.9	\$0.00	\$6.0
2008	\$0.00	\$16.1	\$0.00	\$23.8
2009	\$0.00	\$27.9	\$0.00	\$38.7
2010	\$0.01	\$206.0	\$0.01	\$266.2
2011	\$0.06	\$306.9	\$0.06	\$410.1
2012	\$0.24	\$295.9	\$0.25	\$316.7
2013	\$0.67	\$125.3	\$0.69	\$137.6
2014	\$1.39	\$36.1	\$1.42	\$49.6
2015	\$1.96	\$34.9	\$2.00	\$46.8
2016	\$2.29	\$34.5	\$2.34	\$44.5
2017	\$2.41	\$30.2	\$2.46	\$41.1
2018	\$2.46	\$25.4	\$2.51	\$35.5
2019	\$2.47	\$28.6	\$2.53	\$39.6
2020	\$2.47	\$61.7	\$2.53	\$76.5
2021	\$2.47	\$101.8	\$2.53	\$129.5
2022	\$2.47	\$51.2	\$2.53	\$69.7
2023	\$2.47	\$72.7	\$2.53	\$84.3
2024	\$2.47	\$35.0	\$2.53	\$47.7
2025	\$2.47	\$34.9	\$2.53	\$46.7
2026	\$2.47	\$34.5	\$2.53	\$44.5
2027	\$2.47	\$30.2	\$2.53	\$41.1
2028	\$2.47	\$25.4	\$2.53	\$35.5
2029	\$2.47	\$28.6	\$2.53	\$39.6
2030	\$2.47	\$61.7	\$2.53	\$76.5
2031	\$2.47	\$101.8	\$2.53	\$129.5
2032	\$2.47	\$51.2	\$2.53	\$69.7
2033	\$2.47	\$72.7	\$2.53	\$84.3
2034	\$2.47	\$35.0	\$2.53	\$47.7
2035	\$2.47	\$34.9	\$2.53	\$46.7
2036	\$2.47	\$34.5	\$2.53	\$44.5
2037	\$2.47	\$30.2	\$2.53	\$41.1
2038	\$2.47	\$25.4	\$2.53	\$35.5
2039	\$2.47	\$21.9	\$2.53	\$28.7
2040	\$2.47	\$18.6	\$2.52	\$23.6
2041	\$2.42	\$11.4	\$2.47	\$14.2
2042	\$2.23	\$6.2	\$2.27	\$8.1
2043	\$1.81	\$1.4	\$1.84	\$2.2
2044	\$1.09	\$0.0	\$1.11	\$0.0
2045	\$0.51	\$0.0	\$0.53	\$0.0
2046	\$0.18	\$0.0	\$0.19	\$0.0
2047	\$0.07	\$0.0	\$0.07	\$0.0
2048	\$0.02	\$0.0	\$0.02	\$0.0
<b>PV 3%</b>	<b>\$40.23</b>	<b>\$1,535.7</b>	<b>\$41.12</b>	<b>\$1,932.0</b>
<b>Annualized 3%</b>	<b>\$2.05</b>	<b>\$76.1</b>	<b>\$2.10</b>	<b>\$95.7</b>
<b>PV 7%</b>	<b>\$20.07</b>	<b>\$1,085.6</b>	<b>\$20.52</b>	<b>\$1,360.3</b>
<b>Annualized 7%</b>	<b>\$1.62</b>	<b>\$81.8</b>	<b>\$1.65</b>	<b>\$102.5</b>

Source: U.S. EPA Analysis, 2004.

### E3A-2 INCREMENTAL ANALYSIS OF BENEFITS AND SOCIAL COSTS

EPA conducted an incremental analysis of benefits and social costs to determine as increasingly more costly options are considered, by what amount do benefits, costs, and net benefits change from option to option. Table E3A-7, below, reports this analysis for the five other options evaluated. For a description of this analysis, see section E3-2 above.

**Table E3A-7: Incremental Benefit-Cost Analysis for Existing Phase III Facilities (millions; 2003\$)**

Option <sup>a</sup>	Net Benefits Based on Use Benefits Only <sup>b</sup>			Incremental Net Benefits <sup>c</sup>		
	Low	Mean	High	Low	Mean	High
<i>3% discount rate</i>						
Option 3	(\$64.0)	(\$63.1)	(\$61.0)	n/a	n/a	n/a
Option 4	(\$66.9)	(\$65.9)	(\$63.8)	(\$2.9)	(\$2.9)	(\$2.8)
Option 2	(\$72.6)	(\$71.7)	(\$69.6)	(\$5.8)	(\$5.8)	(\$5.8)
Option 1	(\$75.0)	(\$74.0)	(\$71.9)	(\$2.4)	(\$2.4)	(\$2.6)
Option 6	(\$94.6)	(\$93.6)	(\$91.5)	(\$19.6)	(\$19.6)	(\$19.5)
<i>7% discount rate</i>						
Option 3	(\$68.8)	(\$68.0)	(\$66.4)	n/a	n/a	n/a
Option 4	(\$73.1)	(\$72.3)	(\$70.7)	(\$4.3)	(\$4.3)	(\$4.3)
Option 2	(\$78.5)	(\$77.7)	(\$76.1)	(\$5.5)	(\$5.5)	(\$5.5)
Option 1	(\$80.9)	(\$80.1)	(\$78.5)	(\$2.4)	(\$2.4)	(\$2.4)
Option 6	(\$101.6)	(\$100.8)	(\$99.1)	(\$20.7)	(\$20.7)	(\$20.6)

<sup>a</sup> Options are presented in order of increasing applicability, based on the number of facilities regulated.

<sup>b</sup> Net benefits are computed by subtracting total annualized costs from total annual use benefits. The net benefits presented here are based on the comparison of a substantially complete measure of social costs with an incomplete measure of benefits and should be interpreted with caution.

<sup>c</sup> Incremental net benefits are equal to the difference between net benefits of a given option and the net benefits of the previous less stringent option.

Source: U.S. EPA Analysis, 2004.

### E3A-3 BREAK-EVEN ANALYSIS OF POTENTIAL NON-USE BENEFITS

EPA conducted a break-even analysis for each option to determine the per household value and per age-1 equivalent value of non-use benefits needed for total annual benefits to equal total annual costs. Table E3A-8 presents the results at the national level; Tables E3A-9 and E3A-10 present results at the regional level. For a description of this analysis, see section E3-3 above.

**Table E3A-8: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Cost for Existing Phase III Facilities - Break-Even Analysis (2003\$)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction in I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>3% Discount Rate</i>							
Option 3	\$65.0	\$2.0	\$63.1	31,890,286	\$1.98	53,171,000	\$1.19
Option 4	\$67.9	\$2.0	\$65.9	26,772,975	\$2.46	52,261,000	\$1.26
Option 2	\$73.7	\$2.0	\$71.7	26,772,975	\$2.68	52,261,000	\$1.37
Option 1	\$76.1	\$2.1	\$74.0	32,298,995	\$2.29	54,361,000	\$1.36
Option 6	\$95.7	\$2.1	\$93.6	38,143,532	\$2.45	56,161,000	\$1.67
<i>7% Discount Rate</i>							
Option 3	\$69.6	\$1.6	\$68.0	31,890,286	\$2.13	53,171,000	\$1.28
Option 4	\$73.9	\$1.6	\$72.3	26,772,975	\$2.70	52,261,000	\$1.38
Option 2	\$79.3	\$1.6	\$77.7	26,772,975	\$2.90	52,261,000	\$1.49
Option 1	\$81.8	\$1.6	\$80.1	32,298,995	\$2.48	54,361,000	\$1.47
Option 6	\$102.5	\$1.7	\$100.8	38,143,532	\$2.64	56,161,000	\$1.79

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish’s contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

Source: U.S. EPA Analysis, 2004.

**Table E3A-9: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 3%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>Option 3</i>							
California	\$1.1	\$0.0 <sup>d</sup>	\$1.1	1,518,773	\$0.71	391,000	\$2.76
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$2.7	\$0.5	\$2.2	6,491,544	\$0.34	13,400,000	\$0.16
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$9.5	\$0.7	\$8.9	1,344,996	\$6.59	8,650,000	\$1.02
Great Lakes	\$20.6	\$0.4	\$20.2	7,076,410	\$2.86	13,200,000	\$1.53
Inland	\$25.2	\$0.3	\$24.8	13,329,383	\$1.86	16,600,000	\$1.50
<b>National Total</b>	<b>\$65.0</b>	<b>\$2.0</b>	<b>\$63.1</b>	<b>31,890,286</b>	<b>\$1.98</b>	<b>53,171,000</b>	<b>\$1.19</b>
<i>Option 4</i>							
California	\$1.5	\$0.1	\$1.5	1,518,773	\$0.98	771,000	\$1.93
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$3.3	\$0.5	\$2.8	6,491,544	\$0.43	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$14.5	\$0.7	\$13.8	1,344,996	\$10.28	8,860,000	\$1.56
Great Lakes	\$22.8	\$0.4	\$22.5	7,076,410	\$3.17	13,300,000	\$1.69
Inland	\$19.7	\$0.3	\$19.4	8,212,072	\$2.36	14,800,000	\$1.31
<b>National Total</b>	<b>\$67.9</b>	<b>\$2.0</b>	<b>\$65.9</b>	<b>26,772,975</b>	<b>\$2.46</b>	<b>52,261,000</b>	<b>\$1.26</b>
<i>Option 2</i>							
California	\$1.5	\$0.1	\$1.5	1,518,773	\$0.98	771,000	\$1.93
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$3.3	\$0.5	\$2.8	6,491,544	\$0.43	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$14.5	\$0.7	\$13.8	1,344,996	\$10.28	8,860,000	\$1.56
Great Lakes	\$22.8	\$0.4	\$22.5	7,076,410	\$3.17	13,300,000	\$1.69
Inland	\$25.2	\$0.3	\$24.9	8,212,072	\$3.03	14,800,000	\$1.68
<b>National Total</b>	<b>\$73.7</b>	<b>\$2.0</b>	<b>\$71.7</b>	<b>26,772,975</b>	<b>\$2.68</b>	<b>52,261,000</b>	<b>\$1.37</b>
<i>Option 1</i>							
California	\$1.5	\$0.1	\$1.5	1,518,773	\$0.98	771,000	\$1.93

**Table E3A-9: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 3%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$3.3	\$0.5	\$2.8	6,491,544	\$0.43	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$14.5	\$0.7	\$13.8	1,344,996	\$10.28	8,860,000	\$1.56
Great Lakes	\$22.8	\$0.4	\$22.5	7,076,410	\$3.17	13,300,000	\$1.69
Inland	\$27.5	\$0.3	\$27.2	13,738,093	\$1.98	16,900,000	\$1.61
<b>National Total</b>	<b>\$76.1</b>	<b>\$2.1</b>	<b>\$74.0</b>	<b>32,298,995</b>	<b>\$2.29</b>	<b>54,361,000</b>	<b>\$1.36</b>

*Option 6*

California	\$2.2	\$0.1	\$2.2	1,518,773	\$1.43	771,000	\$2.82
North Atlantic	\$4.6	\$0.1	\$4.5	2,129,180	\$2.11	930,000	\$4.84
Mid-Atlantic	\$3.5	\$0.5	\$3.0	7,214,556	\$0.41	13,700,000	\$0.22
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$14.5	\$0.7	\$13.8	1,344,996	\$10.28	8,860,000	\$1.56
Great Lakes	\$28.6	\$0.4	\$28.2	9,055,971	\$3.11	14,300,000	\$1.97
Inland	\$40.0	\$0.4	\$39.6	16,880,055	\$2.35	17,600,000	\$2.25
<b>National Total</b>	<b>\$95.7</b>	<b>\$2.1</b>	<b>\$93.6</b>	<b>38,143,532</b>	<b>\$2.45</b>	<b>56,161,000</b>	<b>\$1.67</b>

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish's contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

<sup>c</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>d</sup> Positive non-zero value less than \$50,000.

Source: U.S. EPA Analysis, 2004.

**Table E3A-10: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 7%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
<i>Option 3</i>							
California	\$1.2	\$0.0 <sup>d</sup>	\$1.2	1,518,773	\$0.79	391,000	\$3.07
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$2.6	\$0.4	\$2.2	6,491,544	\$0.34	13,400,000	\$0.16
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$10.7	\$0.5	\$10.1	1,344,996	\$7.54	8,650,000	\$1.17
Great Lakes	\$22.9	\$0.3	\$22.6	7,076,410	\$3.19	13,200,000	\$1.71
Inland	\$25.9	\$0.3	\$25.6	13,329,383	\$1.92	16,600,000	\$1.54
<b>National Total</b>	<b>\$69.6</b>	<b>\$1.6</b>	<b>\$68.0</b>	<b>31,890,286</b>	<b>\$2.13</b>	<b>53,171,000</b>	<b>\$1.28</b>
<i>Option 4</i>							
California	\$1.6	\$0.0 <sup>d</sup>	\$1.6	1,518,773	\$1.03	771,000	\$2.03
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$3.1	\$0.4	\$2.7	6,491,544	\$0.42	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$17.0	\$0.5	\$16.5	1,344,996	\$12.25	8,860,000	\$1.86
Great Lakes	\$25.0	\$0.3	\$24.7	7,076,410	\$3.49	13,300,000	\$1.86
Inland	\$20.6	\$0.3	\$20.4	8,212,072	\$2.48	14,800,000	\$1.38
<b>National Total</b>	<b>\$73.9</b>	<b>\$1.6</b>	<b>\$72.3</b>	<b>26,772,975</b>	<b>\$2.70</b>	<b>52,261,000</b>	<b>\$1.38</b>
<i>Option 2</i>							
California	\$1.6	\$0.0 <sup>d</sup>	\$1.6	1,518,773	\$1.03	771,000	\$2.03
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$3.1	\$0.4	\$2.7	6,491,544	\$0.42	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$17.0	\$0.5	\$16.5	1,344,996	\$12.25	8,860,000	\$1.86
Great Lakes	\$25.0	\$0.3	\$24.7	7,076,410	\$3.49	13,300,000	\$1.86
Inland	\$25.9	\$0.3	\$25.6	8,212,072	\$3.12	14,800,000	\$1.73
<b>National Total</b>	<b>\$79.3</b>	<b>\$1.6</b>	<b>\$77.7</b>	<b>26,772,975</b>	<b>\$2.90</b>	<b>52,261,000</b>	<b>\$1.49</b>
<i>Option 1</i>							
California	\$1.6	\$0.0 <sup>d</sup>	\$1.6	1,518,773	\$1.03	771,000	\$2.03

**Table E3A-10: Estimated Value of Non-Use Benefits Required for Total Benefits to Equal Total Social Costs for Existing Phase III Facilities - Break-Even Analysis by Regions (2003\$, discounted at 7%)**

Option	Total Social Costs (millions)	Mean Value of Use Benefits (millions)	Non-Use Benefits Necessary to Break Even <sup>a</sup> (millions)	Number of Households	Break-Even WTP per Household (\$)	Reduction of I&E Losses (Age-1 Equivalents)	Break-Even Value per Age-1 Equivalent <sup>b</sup> (\$)
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$3.1	\$0.4	\$2.7	6,491,544	\$0.42	13,600,000	\$0.20
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$17.0	\$0.5	\$16.5	1,344,996	\$12.25	8,860,000	\$1.86
Great Lakes	\$25.0	\$0.3	\$24.7	7,076,410	\$3.49	13,300,000	\$1.86
Inland	\$28.3	\$0.3	\$28.0	13,738,093	\$2.04	16,900,000	\$1.66
<b>National Total</b>	<b>\$81.8</b>	<b>\$1.6</b>	<b>\$80.1</b>	<b>32,298,995</b>	<b>\$2.48</b>	<b>54,361,000</b>	<b>\$1.47</b>

*Option 6*

California	\$2.2	\$0.0 <sup>d</sup>	\$2.2	1,518,773	\$1.45	771,000	\$2.85
North Atlantic	\$5.0	\$0.1	\$5.0	2,129,180	\$2.35	930,000	\$5.37
Mid-Atlantic	\$3.3	\$0.4	\$2.9	7,214,556	\$0.40	13,700,000	\$0.21
South Atlantic <sup>c</sup>	\$0.0	\$0.0	\$0.0	0	\$0.00	0	\$0.00
Gulf of Mexico	\$17.0	\$0.5	\$16.5	1,344,996	\$12.25	8,860,000	\$1.86
Great Lakes	\$30.8	\$0.3	\$30.5	9,055,971	\$3.37	14,300,000	\$2.13
Inland	\$41.7	\$0.3	\$41.4	16,880,055	\$2.45	17,600,000	\$2.35
<b>National Total</b>	<b>\$102.5</b>	<b>\$1.7</b>	<b>\$100.8</b>	<b>38,143,532</b>	<b>\$2.64</b>	<b>56,161,000</b>	<b>\$1.79</b>

<sup>a</sup> The non-use benefits category in this table may include some categories of use values that were not taken into account by the recreation and commercial fishing analyses.

<sup>b</sup> The non-use value per age-1 equivalent reported in the table includes the value placed on the fish's contribution to non-use ecological services (e.g., population, health, sustainability, and overall ecosystem health).

<sup>c</sup> No benefits or costs are expected in the South Atlantic region because all potentially regulated facilities in this region already meet the national categorical requirements in the baseline and therefore would not be required to install technologies to comply with this option.

<sup>d</sup> Positive non-zero value less than \$50,000.

Source: U.S. EPA Analysis, 2004.