

**ENVIRONMENTAL PROTECTION  
AGENCY**

**40 CFR Parts 9, 122, 123, 124, and 125**

[FRL-7154-7]

RIN 2040-AD62

**National Pollutant Discharge  
Elimination System—Proposed  
Regulations to Establish Requirements  
for Cooling Water Intake Structures at  
Phase II Existing Facilities**

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Proposed rule.

**SUMMARY:** Today's proposed rule would implement section 316(b) of the Clean Water Act (CWA) for certain existing power producing facilities that employ a cooling water intake structure and that withdraw 50 million gallons per day (MGD) or more of water from rivers, streams, lakes, reservoirs, estuaries, oceans, or other waters of the U.S. for cooling purposes. The proposed rule constitutes Phase II in EPA's development of section 316(b) regulations and would establish national requirements applicable to the location, design, construction, and capacity of cooling water intake structures at these facilities. The proposed national requirements, which would be implemented through National Pollutant Discharge Elimination System (NPDES) permits, would minimize the adverse environmental impact associated with the use of these structures.

Today's proposed rule would establish location, design, construction, and capacity requirements that reflect the best technology available for minimizing adverse environmental impact from the cooling water intake structure based on water body type, and the amount of water withdrawn by a facility. The Environmental Protection Agency (EPA) proposes to group surface water into five categories—freshwater rivers and streams, lakes and reservoirs, Great Lakes, estuaries and tidal rivers, and oceans—and establish requirements for cooling water intake structures located in distinct water body types. In general, the more sensitive or biologically productive the waterbody, the more stringent the requirements proposed as reflecting the best technology available for minimizing adverse environmental impact. Proposed requirements also vary according to the percentage of the source waterbody withdrawn, and facility utilization rate.

A facility may choose one of three options for meeting best technology

available requirements under this proposed rule. These options include demonstrating that the facility subject to the proposed rule currently meet specified performance standards; selecting and implementing design and construction technologies, operational measures, or restoration measures that meet specified performance standards; or demonstrating that the facility qualifies for a site-specific determination of best technology available because its costs of compliance are either significantly greater than those considered by the Agency during the development of this proposed rule, or the facility's costs of compliance would be significantly greater than the environmental benefits of compliance with the proposed performance standards. The proposed rule also provides that facilities may use restoration measures in addition to or in lieu of technology measures to meet performance standards or in establishing best technology available on a site-specific basis.

EPA expects that this proposed regulation would minimize adverse environmental impact, including substantially reducing the harmful effects of impingement and entrainment, at existing facilities over the next 20 years. As a result, the Agency anticipates that this proposed rule would help protect ecosystems in proximity to cooling water intake structures. Today's proposal would help preserve aquatic organisms, including threatened and endangered species, and the ecosystems they inhabit in waters used by cooling water intake structures at existing facilities. EPA has considered the potential benefits of the proposed rule and in the preamble discusses these benefits in both quantitative and non-quantitative terms. Benefits, among other factors, are based on a decrease in expected mortality or injury to aquatic organisms that would otherwise be subject to entrainment into cooling water systems or impingement against screens or other devices at the entrance of cooling water intake structures. Benefits may also accrue at population, community, or ecosystem levels of ecological structures.

**DATES:** Comments on this proposed rule and Information Collection Request (ICR) must be received or postmarked on or before midnight July 8, 2002.

**ADDRESSES:** Public comments regarding this proposed rule should be submitted by mail to: Cooling Water Intake Structure (Existing Facilities: Phase II) Proposed Rule Comment Clerk—W-00-32, Water Docket, Mail Code 4101, EPA, Ariel Rios Building, 1200 Pennsylvania

Avenue, NW., Washington, DC 20460. Comments delivered in person (including overnight mail) should be submitted to the Cooling Water Intake Structure (Existing Facilities: Phase II) Proposed Rule Comment Clerk—W-00-32, Water Docket, Room EB 57, 401 M Street, SW., Washington, DC 20460. You also may submit comments electronically to [ow-docket@epa.gov](mailto:ow-docket@epa.gov). Please submit any references cited in your comments. Please submit an original and three copies of your written comments and enclosures. For additional information on how to submit comments, see "**SUPPLEMENTARY INFORMATION, How May I Submit Comments?**"

EPA has prepared an Information Collection Request (ICR) under the Paperwork Reduction Act for this proposed rule (EPA ICR number 2060.01). For further information or a copy of the ICR contact Susan Auby by phone at (202) 260-4901, e-mail at [auby.susan@epamail.epa.gov](mailto:auby.susan@epamail.epa.gov) or download off the internet at <http://www.epa.gov/icr>. Send comments on the Agency's need for this information, the accuracy of the burden estimates, and any suggested methods for minimizing respondent burden (including the use of automated collection techniques) to the following addresses. Please refer to EPA ICR Number 2060.01 in any correspondence. Ms. Susan Auby, U.S. Environmental Protection Agency, OP Regulatory Information Division (2137), 401 M Street, SW., Washington, DC 20460. and Office of Information and Regulatory Affairs, Office of Management and Budget, Attention: Desk Officer for EPA 725 17th Street, NW, Washington, DC 20503.

**FOR FURTHER INFORMATION CONTACT:** For additional technical information contact Deborah G. Nagle at (202) 566-1063. For additional economic information contact Lynne Tudor, Ph.D. at (202) 566-1043. For additional biological information contact Dana A. Thomas, Ph.D. at (202) 566-1046. The e-mail address for the above contacts is "[rule.316b@epa.gov](mailto:rule.316b@epa.gov)."

**SUPPLEMENTARY INFORMATION:**

*What Entities Are Potentially Regulated by This Action?*

This proposed rule would apply to "Phase II existing facilities," i.e., existing facilities that both generate and transmit electric power or that generate electric power for sale to another entity for transmission; use one or more cooling water intake structures to withdraw water from waters of the U.S.;

have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the CWA; and meet proposed flow thresholds.<sup>1</sup> Existing electric power generating facilities subject to this proposal would include those that use cooling water intake structures to withdraw fifty (50) million gallons per day (MGD) or more and that use at least twenty-five (25) percent of water withdrawn solely for cooling purposes. If a facility that otherwise would be subject to the proposed rule does not meet the fifty (50) MGD design intake flow or twenty-five (25) percent cooling water threshold, the permit authority would implement section 316(b) on a case-by-case basis, using best

professional judgment. EPA intends to address such facilities in a future rulemaking effort. This proposal defines the term "cooling water intake structure" to mean the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps. The category of facilities that would meet the proposed cooling water intake structure criteria for existing facilities are electric power generation utilities and nonutility power producers.

The following exhibit lists the types of entities that EPA is now aware potentially could be subject to this proposed rule. This exhibit is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. Types of entities not listed in the exhibit could also be regulated. To determine whether your facility would be regulated by this action, you should carefully examine the applicability criteria proposed at § 125.91 of the proposed rule. If you have questions regarding the applicability of this action to a particular entity, consult one of the persons listed for technical information in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Category	Examples of regulated entities	Standard Industrial Classification (SIC) codes	North American Industry Classification System (NAICS) codes
Federal, State, and Local Government.	Operators of steam electric generating point source dischargers that employ cooling water intake structures.	4911 and 493 .....	221112, 221113, 221119, 221121, 221122.
Industry .....	Steam electric generating (this includes utilities and nonutilities).	4911 and 493 .....	221112, 221113, 221119, 221121, 221122.

*Supporting Documentation*

The proposed Phase II regulation is supported by three major documents:

1. *Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule* (EPA-821-R-02-001), hereafter referred to as the *EBA*. This document presents the analysis of compliance costs, closures, energy supply effects and benefits associated with the proposed rule.

2. *Case Study Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule* (EPA-821-R-02-002), hereafter referred to as the *Case Study Document*. This document presents the information gathered from the watershed and facility level case studies and methodology used to determine baseline impingement and entrainment losses.

3. *Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule* (EPA-821-R-02-003), hereafter referred to as the *Technical Development Document*. This document presents detailed information on the methods used to develop unit costs and describes the set of technologies that may be used to meet the proposed rule's requirements.

*How May I Review the Public Record?*

The record (including supporting documentation) for this proposed rule is

filed under docket number W-00-32 (Phase II Existing Facility proposed rule). The record is available for inspection from 9 a.m. to 4 p.m. on Monday through Friday, excluding legal holidays, at the Water Docket, Room EB 57, USEPA Headquarters, 401 M Street, SW, Washington, DC 20460. For access to docket materials, please call (202) 260-3027 to schedule an appointment during the hours of operation stated above.

*How May I Submit Comments?*

To ensure that EPA can read, understand, and therefore properly respond to comments, the Agency requests that you cite, where possible, the paragraph(s) or sections in the preamble, rule, or supporting documents to which each comment refers. You should use a separate paragraph for each issue you discuss.

If you want EPA to acknowledge receipt of your comments, enclose a self-addressed, stamped envelope. No faxes will be accepted. Electronic comments must be submitted as a WordPerfect 5.1, 6.1, 8, or 9 format, or an ASCII file or file avoiding the use of special characters and forms of encryption. Electronic comments must be identified by the docket number W-00-32. EPA will accept comments and data on disks in WordPerfect 5.1, 6.1, 8

or 9 format or in ASCII file format. Electronic comments on this notice may be filed on-line at many Federal depository libraries.

**Organization of This Document**

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<sup>1</sup> Proposed § 125.93 defines "existing facility" as any facility that commenced construction before

January 17, 2002 and certain modifications and additions to such facilities.

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## I. Legal Authority, Purpose of Today's Proposal, and Background

### A. Legal Authority

Today's proposed rule is issued under the authority of sections 101, 301, 304, 306, 308, 316, 401, 402, 501, and 510 of the Clean Water Act (CWA), 33 U.S.C. 1251, 1311, 1314, 1316, 1318, 1326, 1341, 1342, 1361, and 1370. This proposal partially fulfills the obligations of the U.S. Environmental Protection Agency (EPA) under a consent decree in *Riverkeeper Inc., et al. v. Whitman*, United States District Court, Southern District of New York, No. 93 Civ. 0314 (AGS).

### B. Purpose of Today's Proposal

Section 316(b) of the CWA provides that any standard established pursuant to section 301 or 306 of the CWA and applicable to a point source must require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact. Today's proposed rule would establish requirements, reflecting the best technology available for minimizing adverse environmental impact, applicable to the location, design, construction, and capacity of cooling water intake structures at Phase II existing power generating facilities that withdraw at least fifty (50) MGD of cooling water from waters of the U.S. Today's proposal would define a cooling water intake structure as the total physical structure, including the pumps, and any associated constructed waterways used to withdraw water from waters of the U.S. Cooling water absorbs waste heat rejected from processes employed or from auxiliary operations on a facility's premises. Single cooling water intake structures might have multiple intake bays. In 1977 EPA issued draft guidance for determining the best technology available to minimize adverse environmental impact from cooling water intake structures. In the absence of section 316(b) regulations or final guidance, the 1977 draft guidance has served as applicable guidance for section 316(b) determinations. See *Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) Pub. L. 92-500* (U.S. EPA, 1977). Administrative determinations in several permit proceedings also have served as de facto guidance.

Today, EPA proposes a national framework that would establish certain minimum requirements for the location, design, capacity, and construction of

cooling water intake structures for large cooling water intake structures at Phase II existing facilities. In doing so, the Agency is proposing to revise the approach adopted in the 1977 draft guidance which was based on the judgment that "[t]he decision as to best technology available for intake design location, construction, and capacity must be made on a case-by-case basis." Other important differences from the 1977 draft guidance include today's proposed definition of a "cooling water intake structure." Today's proposal also would establish a cost-benefit test that is different from the "wholly disproportionate" cost-benefit test that has been in use since the 1970s.

Although EPA's judgment is that the requirements proposed today would best implement section 316(b) at Phase II existing facilities, the Agency is also inviting comment on a broad array of other alternatives, including, for example, more stringent technology-based requirements and a framework under which Directors would continue to evaluate adverse environmental impact and determine the best technology available for minimizing such impact on a wholly site-specific basis. Because the Agency is inviting comment on a broad range of alternatives for potential promulgation, today's proposal is not intended as guidance for determining the best technology available to minimize the adverse environmental impact of cooling water intake structures at potentially regulated Phase II existing facilities. Until the Agency promulgates final regulations based on today's proposal, Directors should continue to make section 316(b) determinations with respect to existing facilities, which may be more or less stringent than today's proposal, on a case-by-case basis applying best professional judgment.

Today's proposal would not apply to existing manufacturing facilities or to power generating facilities that withdraw less than fifty (50) MGD of cooling water. These facilities will be addressed in a separate rulemaking, referred to as the Phase III rule (see section I.C.2., below). In the interim, these facilities are subject to section 316(b) requirements established by permitting authorities on a case-by-case basis, using best professional judgment. Upon promulgation of final regulations based on today's proposal, the Agency will address the extent to which the final regulations and preamble should serve as guidance for developing section 316(b) requirements for Phase III facilities prior to the promulgation of the Phase III regulations.

EPA and State permitting authorities should use existing guidance and information to form their best professional judgment in issuing permits to existing facilities. EPA's draft *Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b)* (May 1, 1977), continues to be applicable for existing facilities pending EPA's issuance of final regulations under section 316(b). Two background papers that EPA prepared in 1994 and 1996 to describe cooling water intake technologies being used or tested for minimizing adverse environmental impact also contain information that could be useful to permit writers. (*Preliminary Regulatory Development, Section 316(b) of the Clean Water Act, Background Paper Number 3: Cooling Water Intake Technologies* (1994) and *Draft Supplement to Background Paper Number 3: Cooling Water Intake Technologies*.) Fact sheets from recent 316(b) State and Regional permits are another source of potentially relevant information. The evaluations of the costs and efficacies of technologies presented in the *Technical Development Document for the Final Regulations Addressing Cooling Water Intake Structures for New Facilities*, EPA-821-R-01-036, November 2001 may also be relevant on some cases, although costs for some technologies will differ between new and existing facilities. EPA and State decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from applicable guidance where appropriate. Any decisions on a particular facility should be based on the requirements of section 316(b).

### C. Background

#### 1. The Clean Water Act

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), 33 U.S.C. 1251 *et seq.*, seeks to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." 33 U.S.C. 1251(a). The CWA establishes a comprehensive regulatory program, key elements of which are (1) a prohibition on the discharge of pollutants from point sources to waters of the U.S., except as authorized by the statute; (2) authority for EPA or authorized States or Tribes to issue National Pollutant Discharge Elimination System (NPDES) permits that regulate the discharge of pollutants; and (3) requirements for EPA to develop effluent limitations guidelines and standards and for States to develop water quality standards that are the

basis for the limitations required in NPDES permits.

Today's proposed rule would implement section 316(b) of the CWA as it applies to "Phase II existing facilities" as defined in this proposal. Section 316(b) addresses the adverse environmental impact caused by the intake of cooling water, not discharges into water. Despite this special focus, the requirements of section 316(b) are closely linked to several of the core elements of the NPDES permit program established under section 402 of the CWA to control discharges of pollutants into navigable waters. For example, section 316(b) applies to facilities that withdraw water from the waters of the United States for cooling through a cooling water intake structure and are point sources subject to an NPDES permit. Conditions implementing section 316(b) are included in NPDES permits and would continue to be included in such permits under this proposed rule.

Section 301 of the CWA prohibits the discharge of any pollutant by any person, except in compliance with specified statutory requirements. These requirements include compliance with technology-based effluent limitations guidelines and new source performance standards, water quality standards, NPDES permit requirements, and certain other requirements.

Section 402 of the CWA provides authority for EPA or an authorized State or Tribe to issue an NPDES permit to any person discharging any pollutant or combination of pollutants from a point source into waters of the U.S. Forty-four States and one U.S. territory are authorized under section 402(b) to administer the NPDES permitting program. NPDES permits restrict the types and amounts of pollutants, including heat, that may be discharged from various industrial, commercial, and other sources of wastewater. These permits control the discharge of pollutants primarily by requiring dischargers to meet effluent limitations and other permit conditions. Effluent limitations may be based on promulgated federal effluent limitations guidelines, new source performance standards, or the best professional judgment of the permit writer. Limitations based on these guidelines, standards, or best professional judgment are known as technology-based effluent limits. Where technology-based effluent limits are inadequate to ensure compliance with water quality standards applicable to the receiving water, more stringent effluent limits based on applicable water quality standards are required. NPDES permits

also routinely include monitoring and reporting requirements, standard conditions, and special conditions.

Sections 301, 304, and 306 of the CWA require that EPA develop technology-based effluent limitations guidelines and new source performance standards that are used as the basis for technology-based minimum discharge requirements in wastewater discharge permits. EPA issues these effluent limitations guidelines and standards for categories of industrial dischargers based on the pollutants of concern discharged by the industry, the degree of control that can be attained using various levels of pollution control technology, consideration of various economic tests appropriate to each level of control, and other factors identified in sections 304 and 306 of the CWA (such as non-water quality environmental impacts including energy impacts). EPA has promulgated regulations setting effluent limitations guidelines and standards under sections 301, 304, and 306 of the CWA for more than 50 industries. See 40 CFR parts 405 through 471. Among these, EPA has established effluent limitations guidelines that apply to most of the industry categories that use cooling water intake structures (e.g., steam electric power generation, iron and steel manufacturing, pulp and paper manufacturing, petroleum refining, chemical manufacturing).

Section 306 of the CWA requires that EPA establish discharge standards for new sources. For purposes of section 306, new sources include any source that commenced construction after the promulgation of applicable new source performance standards, or after proposal of applicable standards of performance if the standards are promulgated in accordance with section 306 within 120 days of proposal. CWA section 306; 40 CFR 122.2. New source performance standards are similar to the technology-based limitations established for Phase II existing sources, except that new source performance standards are based on the best available demonstrated technology instead of the best available technology economically achievable. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. Therefore, Congress directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-process control and treatment technologies that reduce pollution to the maximum extent feasible. In addition, in establishing new source performance standards, EPA is required to take into consideration the cost of achieving the effluent reduction

and any non-water quality environmental impacts and energy requirements.

## 2. Consent Decree

Today's proposed rule partially fulfills EPA's obligation to comply with an Amended Consent Decree. The Amended Consent Decree was filed on November 22, 2000, in the United States District Court, Southern District of New York, in *Riverkeeper Inc., et al. v. Whitman*, No. 93 Civ 0314 (AGS), a case brought against EPA by a coalition of individuals and environmental groups. The original Consent Decree, filed on October 10, 1995, provided that EPA was to propose regulations implementing section 316(b) by July 2, 1999, and take final action with respect to those regulations by August 13, 2001. Under subsequent interim orders and the Amended Consent Decree, EPA has divided the rulemaking into three phases and is working under new deadlines. As required by the Amended Consent Decree, on November 9, 2001, EPA took final action on a rule governing cooling water intake structures used by new facilities (Phase I). 66 FR 65255 (December 18, 2001). The Amended Consent Decree also requires that EPA issue this proposal by February 28, 2002, and take final action by August 28, 2003 (Phase II).<sup>2</sup> The decree requires further that EPA propose regulations governing cooling water intake structures used, at a minimum, by smaller-flow power plants and factories in four industrial sectors (pulp and paper making, petroleum and coal products manufacturing, chemical and allied manufacturing, and primary metal manufacturing) by June 15, 2003, and take final action by December 15, 2004 (Phase III).

## 3. What Other EPA Rulemakings and Guidance Have Addressed Cooling Water Intake Structures?

In April 1976 EPA published a rule under section 316(b) that addressed cooling water intake structures. 41 FR 17387 (April 26, 1976), proposed at 38 FR 34410 (December 13, 1973). The rule added a new § 401.14 to 40 CFR Chapter I that reiterated the requirements of

<sup>2</sup> Under the Amended Consent Decree, EPA is to propose regulations in Phase II that are "applicable to, at a minimum: (i) Existing utilities (i.e., facilities that both generate and transmit electric power) that employ a cooling water intake structure, and whose intake flow levels exceed a minimum threshold to be determined by EPA during the Phase II rulemaking process; and (ii) existing non-utility power producers (i.e., facilities that generate electric power but sell it to another entity for transmission) that employ a cooling water intake structure, and whose intake flow levels exceed a minimum threshold to be determined by EPA during the Phase II rulemaking process."

CWA section 316(b). It also added a new part 402, which included three sections: (1) § 402.10 (Applicability), (2) § 402.11 (Specialized definitions), and (3) § 402.12 (Best technology available for cooling water intake structures). Section 402.10 stated that the provisions of part 402 applied to "cooling water intake structures for point sources for which effluent limitations are established pursuant to section 301 or standards of performance are established pursuant to section 306 of the Act." Section 402.11 defined the terms "cooling water intake structure," "location," "design," "construction," "capacity," and "Development Document." Section 402.12 included the following language:

The information contained in the Development Document shall be considered in determining whether the location, design, construction, and capacity of a cooling water intake structure of a point source subject to standards established under section 301 or 306 reflect the best technology available for minimizing adverse environmental impact.

In 1977, fifty-eight electric utility companies challenged these regulations, arguing that EPA had failed to comply with the requirements of the Administrative Procedure Act (APA) in promulgating the rule. Specifically, the utilities argued that EPA had neither published the Development Document in the *Federal Register* nor properly incorporated the document into the rule by reference. The United States Court of Appeals for the Fourth Circuit agreed and, without reaching the merits of the regulations themselves, remanded the rule. *Appalachian Power Co. v. Train*, 566 F.2d 451 (4th Cir. 1977). EPA later withdrew part 402. 44 FR 32956 (June 7, 1979). 40 CFR 401.14 remains in effect.

Since the Fourth Circuit remanded EPA's section 316(b) regulations in 1977, NPDES permit authorities have made decisions implementing section 316(b) on a case-by-case, site-specific basis. EPA published draft guidance addressing section 316(b) implementation in 1977. See *Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92-500* (U.S. EPA, 1977). This draft guidance describes the studies recommended for evaluating the impact of cooling water intake structures on the aquatic environment and recommends a basis for determining the best technology available for minimizing adverse environmental impact. The 1977 section 316(b) draft guidance states, "The environmental-intake interactions in question are highly site-specific and the decision as to best technology available for intake

design, location, construction, and capacity must be made on a case-by-case basis." (Section 316(b) Draft Guidance, U.S. EPA, 1977, p. 4). This case-by-case approach also is consistent with the approach described in the 1976 Development Document referenced in the remanded regulation.

The 1977 section 316(b) draft guidance suggests a general process for developing information needed to support section 316(b) decisions and presenting that information to the permitting authority. The process involves the development of a site-specific study of the environmental effects associated with each facility that uses one or more cooling water intake structures, as well as consideration of that study by the permitting authority in determining whether the facility must make any changes for minimizing adverse environmental impact. Where adverse environmental impact is present, the 1977 draft guidance suggests a stepwise approach that considers screening systems, size, location, capacity, and other factors.

Although the draft guidance describes the information that should be developed, key factors that should be considered, and a process for supporting section 316(b) determinations, it does not establish uniform technology-based national standards for best technology available for minimizing adverse environmental impact. Rather, the guidance leaves the decisions on the appropriate location, design, capacity, and construction of cooling water intake structures to the permitting authority. Under this framework, the Director determines whether appropriate studies have been performed and whether a given facility has minimized adverse environmental impact.

## 4. New Facility Rule

On November 9, 2001, EPA took final action on regulations governing cooling water intake structures at new facilities. 66 FR 65255 (December 18, 2001). The final new facility rule (Phase I) established requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities that withdraw at least two (2) million gallons per day (MGD) and use at least twenty-five (25) percent of the water they withdraw solely for cooling purposes. EPA adopted a two-track approach. Under Track I, for facilities with a design intake flow more than 10 MGD, the capacity of the cooling water intake structure is restricted, at a minimum, to a level commensurate with that which could be attained by use of a closed-cycle recirculating system. For facilities

with a design intake flow more than 2 MGD, the design through-screen intake velocity is restricted to 0.5 ft/s and the total quantity of intake is restricted to a proportion of the mean annual flow of a freshwater river or stream, or to maintain the natural thermal stratification or turnover patterns (where present) of a lake or reservoir except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies), or to a percentage of the tidal excursions of a tidal river or estuary. In addition, an applicant with intake capacity greater than 10 MGD must select and implement an appropriate design and construction technology for minimizing impingement mortality and entrainment if certain environmental conditions exist. (Applicants with 2–10 MGD flows are not required to reduce capacity but must install technologies for reducing entrainment at all locations.) Under Track II, the applicant has the opportunity to demonstrate that impacts to fish and shellfish, including important forage and predator species, within the watershed will be comparable to these which it would achieve were it to implement the Track I requirements for capacity and design velocity. This demonstration can include the use of restoration measures such as habitat enhancement or fish restocking programs. Proportional flow requirements also apply under Track II.

With the new facility rule, EPA promulgated a national framework that establishes minimum requirements for the design, capacity, and construction of cooling water intake structures for new facilities. EPA believes that the final new facility rule establishes a reasonable framework that creates certainty for permitting of new facilities, while providing some flexibility to take site-specific factors into account.

## 5. Public Participation

EPA has worked extensively with stakeholders from the industry, public interest groups, state agencies, and other federal agencies in the development of this proposed rule. These public participation activities have focused on various section 316(b) issues, including general issues, as well as issues relevant to development of the Phase I rule and issues relevant to the proposed Phase II rule.

In addition to outreach to industry groups, environmental groups, and other government entities in the development, testing, refinement, and

completion of the 316(b) survey,<sup>3</sup> which has been used as a source of data for the Phase II proposal, EPA conducted two public meetings on 316(b) issues. In June 1998, in Arlington, Virginia (63 FR 27958) EPA conducted a public meeting focused on a draft regulatory framework for assessing potential adverse environmental impacts from impingement and entrainment. In September, 1998, in Alexandria, Virginia (63 FR 40683) EPA conducted a public meeting focused on technology, cost, and mitigation issues. In addition, 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 participated in other industry conferences, met upon request on numerous occasions with industry representatives, and met on a number of occasions with representatives of environmental groups.

In the months leading up to publication of the proposed Phase I rule, EPA conducted a series of stakeholder meetings to review the draft regulatory framework for the proposed rule and invited stakeholders to provide their recommendations for the Agency's consideration. EPA managers have met with the Utility Water Act Group, Edison Electric Institute, representatives from an individual utility, and with representatives from the petroleum refining, pulp and paper, and iron and steel industries. EPA conducted several meetings with environmental groups attended by representatives from 15 organizations. EPA also 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. After publication of the proposed Phase I rule, EPA continued to meet with stakeholders at their request. These meetings are summarized in the record.

EPA received many comments from industry stakeholders, government agencies and private citizens on the Phase I proposed rule 65 FR 49059 (August 10, 2000). EPA received additional comments on the Notice of Data Availability (NODA) 66 FR 28853 (May 25, 2001). These comments have informed the development of the Phase II proposal.

<sup>3</sup> U.S. EPA, *Information Collection Request, Detailed Industry Questionnaires: Phase II Cooling Water Intake Structures & Watershed Case Study Short Questionnaires*, Section 3, 1999.

In January, 2001, EPA also attended technical workshops organized by the Electric Power Research Institute and the Utilities Water Act Group. These workshops focused on the presentation of key issues associated with different regulatory approaches considered under the Phase I proposed rule and alternatives for addressing 316(b) requirements.

On May 23, 2001, EPA held a day-long forum to discuss specific issues associated with the development of regulations under section 316(b) of the Clean Water Act. 66 FR 20658. 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 August 21, 2001, EPA staff participated in a technical symposium sponsored by the Electric Power Research Institute in association with the American Fisheries Society on issues relating to the definition and assessment of adverse environmental impact under section 316(b) of the CWA.

Finally, EPA has coordinated with the staff from the Nuclear Regulatory Commission (NRC) in the development of this proposed rule to ensure that the proposal does not conflict with NRC safety requirements. NRC staff have reviewed the proposed 316(b) rule and did not identify any apparent conflict with nuclear plant safety. NRC licensees would continue to be obligated to meet NRC requirements for design and reliable operation of cooling systems. NRC staff recommended that EPA consider adding language which states that in cases of conflict between an EPA requirement under this proposed rule and an NRC safety requirement, the NRC safety requirement take precedence. EPA has added language to address this concern to the proposed rule. These coordination efforts and all of the meetings described above are documented or summarized in the record.

## II. Scope and Applicability of the Proposed Rule

This proposed rule would apply to existing facilities as defined below, that use a cooling water intake structure to withdraw water for cooling purposes from waters of the U.S. and that have or are required to have a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the

CWA. Specifically, the rule applies to you if you are the owner or operator of an existing facility that meets all of the following criteria:

- Your facility both generates and transmits electric power or generates electric power but sells it to another entity for transmission;
- Your facility is a point source and uses or proposes to use a cooling water intake structure or structures, or your facility obtains cooling water by any sort of contract or arrangement with an independent supplier who has a cooling water intake structure;
- Your facility's cooling water intake structure(s) withdraw(s) cooling water from waters of the U.S. and at least twenty-five (25) percent of the water withdrawn is used solely for contact or non-contact cooling purposes;
- Your facility has an NPDES permit or is required to obtain one; and
- Your facility has a design intake flow of 50 million gallons per day (MGD) or greater;
- In the case of a cogeneration facility that shares a cooling water intake structure with another facility, only that portion of the cooling water flow that is used in the cogeneration process shall be considered when determining whether the 50 MGD and 25 percent criteria are met.

Facilities subject to the proposed rule are referred to as "Phase II existing facilities." Existing facilities with design flows below the 50 MGD threshold, as well as certain existing manufacturing facilities, and offshore and coastal oil and gas extraction facilities, would not be subject to this proposed rule, but will be addressed in Phase III. If an existing facility that would otherwise be a Phase II existing facility has or requires an NPDES permit but does not meet the twenty-five percent cooling water use threshold, it would not be subject to permit conditions based on today's proposed rule; rather, it would be subject to permit conditions implementing section 316(b) of the CWA set by the permit director on a case-by-case basis, using best professional judgment.

#### *A. What Is an "Existing Facility" for Purposes of the Section 316(b) Proposed Phase II Rule?*

EPA is proposing to define the term "existing facility" as any facility that commenced construction before January 17, 2002 and (1) any modification of such a facility; (2) any addition of a unit at such a facility for purposes of the same industrial operation; (3) any addition of a unit at such a facility for purposes of a different industrial operation, if the additional unit uses an

existing cooling water intake structure and the design capacity of intake structure is not increased; or (4) any facility constructed in place of such a facility if the newly constructed facility uses an existing cooling water intake structure whose design intake flow is not increased to accommodate the intake of additional cooling water.

The term commence construction is defined in 40 CFR 122.29(b)(4) and January 17, 2002 is the effective date of the new facility rule. EPA has specified that any modification of a facility that commenced construction before January 17, 2002 remains an existing facility for purposes of this rule to clarify that significant changes to such a facility would not, absent other conditions, cause the facility to be a "new facility" subject to the Phase I rule. In addition, the proposed definition specifies that any addition of a unit at a facility that commenced construction before January 17, 2002 for purposes of the same industrial operation as the existing facility would continue to be defined as an existing facility. Further, any addition of a unit at a facility that commenced construction before January 17, 2002 for purposes of a different industrial operation would remain an existing facility provided the additional unit uses an existing cooling water intake structure and the design capacity of intake structure is not increased. Finally, under the proposed definition, any facility constructed in place of a facility that commenced construction before January 17, 2002, would remain defined as an existing facility if the newly constructed facility uses an existing cooling water intake structure whose design intake flow is not increased to accommodate the intake of additional cooling water.

Under this proposed rule certain forms of repowering could be undertaken by an existing power generating facility that uses a cooling water intake structure and it would remain subject to regulation as a Phase II existing facility. For example, the following scenarios would be existing facilities under the proposed rule:

- An existing power generating facility undergoes a modification of its process short of total replacement of the process and concurrently increases the design capacity of its existing cooling water intake structures;
- An existing power generating facility builds a new process for purposes of the same industrial operation and concurrently increases the design capacity of its existing cooling water intake structures;
- An existing power generating facility completely rebuilds its process

but uses the existing cooling water intake structure with no increase in design capacity.

Thus, in most situations, repowering an existing power generating facility would be addressed under this proposed rule.

The proposed definition of "existing facility" is sufficiently broad that it covers facilities that will be addressed under the Phase III rule (e.g., existing power generating facilities with design flows below the 50 MGD threshold, certain existing manufacturing facilities, and offshore and coastal oil and gas extraction facilities). These facilities are not covered under this proposal because they do not meet the requirements of proposed § 125.91.

#### *B. What Is a "Cooling Water Intake Structure?"*

Today's proposal would adopt for Phase II existing facilities the same definition of a "cooling water intake structure" that is part of the new facility rule, i.e., 40 CFR 125.83, the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the U.S. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps. Today's proposal also would adopt the new facility rule's definition of "cooling water," i.e., water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The definition specifies that the intended use of cooling water is to absorb waste heat from production processes or auxiliary operations. The definition also specifies that water used for both cooling and non-cooling purposes would not be considered cooling water for purposes of determining whether 25% or more of the flow is cooling water.

This definition differs from the definition of "cooling water intake structure" that is included in the 1977 Draft Guidance. The proposed definition clarifies that the cooling water intake structure includes the physical structure and technologies that extend up to and include the intake pumps. Inclusion of the term "associated constructed waterways" is intended to clarify that the definition includes those canals, channels, connecting waterways, and similar structures that may be built or modified to facilitate the withdrawal of cooling water. The explicit inclusion of the intake pumps in the definition reflects the key role pumps play in determining the capacity (i.e., dynamic capacity) of the intake. These pumps,

which bring in water, are an essential component of the cooling water intake structure since without them the intake could not work as designed.

In addition, the definition would apply to structures that bring water in for both contact and noncontact cooling purposes. This clarification is necessary because cooling water intake structures typically bring water into a facility for numerous purposes, including industrial processes; use as circulating water, service water, or evaporative cooling tower makeup water; dilution of effluent heat content; equipment cooling; and air conditioning.

Finally, at § 125.91(b), consistent with the new facility rule, this proposed rule provides that use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with an independent supplier (or multiple suppliers) of cooling water if the supplier or suppliers withdraw(s) water from waters of the United States. This provision is intended to prevent circumvention of these requirements by creating arrangements to receive cooling water from an entity that is not itself a point source. It also provides that use of cooling water does not include obtaining cooling water from a public water system or the use of treated effluent that otherwise would be discharged to a water of the U.S.

#### *C. Is My Facility Covered If It Withdraws From Waters of the U.S.?*

The requirements proposed today would apply to cooling water intake structures that withdraw amounts of water greater than the proposed flow threshold from "waters of the U.S." Waters of the U.S. include the broad range of surface waters that meet the regulatory definition at 40 CFR 122.2, which includes lakes, ponds, reservoirs, nontidal rivers or streams, tidal rivers, estuaries, fjords, oceans, bays, and coves. These potential sources of cooling water may be adversely affected by impingement and entrainment.

Some facilities discharge heated water to cooling ponds, then withdraw water from the ponds for cooling purposes. EPA does not intend this proposal to change the regulatory status of cooling ponds. Cooling ponds are neither categorically included nor categorically excluded from the definition of "waters of the United States" at 40 CFR 122.2. EPA interprets 40 CFR 122.2 to give permit writers discretion to regulate cooling ponds as "waters of the United States" where cooling ponds meet the definition of "waters of the United States." The determination whether a particular cooling pond is or is not

"waters of the United States" is to be made by the permit writer on a case-by-case basis, informed by the principles enunciated in *Solid Waste Agency of Northern Cook County v. US Army Corps of Engineers*, 531 U.S. 159 (2001). Therefore, facilities that withdraw cooling water from cooling ponds that are "waters of the U.S." and that meet today's other proposed criteria for coverage (including the requirement that the facility have or be required to obtain an NPDES permit) would be subject to today's proposed rule.

#### *D. Is My Facility Covered If It Is a Point Source Discharger Subject to an NPDES Permit?*

Today's proposed rule would apply only to facilities that have an NPDES permit or are required to obtain one because they discharge or might discharge pollutants, including storm water, from a point source to waters of the U.S. This is the same requirement EPA included in the new facility rule. 40 CFR 125.81(a)(1). Requirements for minimizing the adverse environmental impact of cooling water intake structures would continue to be applied through NPDES permits.

Based on the Agency's review of potential Phase II existing facilities that employ cooling water intake structures, the Agency anticipates that most existing power generating facilities that would be subject to this rule will control the intake structure that supplies them with cooling water, and discharge some combination of their cooling water, wastewater, and storm water to a water of the U.S. through a point source regulated by an NPDES permit. In this scenario, the requirements for the cooling water intake structure would be specified in the facility's NPDES permit. In the event that a Phase II existing facility's only NPDES permit is a general permit for storm water discharges, the Agency anticipates that the Director would write an individual NPDES permit containing requirements for the facility's cooling water intake structure. The Agency invites comment on this approach for applying cooling water intake structure requirements to the facility. Alternatively, requirements applicable to cooling water intake structures could be incorporated into general permits. The Agency also invites comment on this approach.

The Agency also recognizes that some facilities that have or are required to have an NPDES permit might not directly control the intake structure that supplies their facility with cooling water. For example, facilities operated by separate entities might be located on

the same, adjacent, or nearby property; one of these facilities might take in cooling water and then transfer it to other facilities prior to discharge of the cooling water to a water of the U.S. Proposed § 125.91(c) addresses such a situation. It provides that use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with an independent supplier (or multiple suppliers) of cooling water if the supplier or suppliers withdraw(s) water from waters of the United States. This provision is intended to prevent circumvention of the proposed requirements by creating arrangements to receive cooling water from an entity that is not itself a point source discharger. It is the same as in the final new facility rule. 40 CFR 125.81(b).

Proposed § 125.91(c) also provides, as in the new facility rule, that facilities that obtain cooling water from a public water system or use treated effluent that otherwise would be discharged to a water of the U.S. would not be subject to this proposed rule.

In addition, as EPA stated in the preamble to the final new facility rule, the Agency would encourage the Director to closely examine scenarios in which a potential Phase II existing facility withdraws significant amounts of cooling water but does not have an NPDES permit. As appropriate, the Director should apply other legal requirements, such as section 404 or 401 of the Clean Water Act, the Coastal Zone Management Act, the National Environmental Policy Act, or similar State authorities to address adverse environmental impact caused by cooling water intake structures at those existing facilities.

#### *E. Who Is Covered Under the Thresholds Included in This Proposed Rule?*

This proposed rule applies to facilities that (1) withdraw cooling water from water of the U.S. and use at least twenty-five (25) percent of the water withdrawn for cooling purposes and (2) have at least one cooling water intake structure with a design intake capacity of 50 MGD or more. Proposed § 125.91.

EPA is proposing to include a provision, like that specified in the new facility rule, that facilities that use less than twenty-five (25) percent of the water withdrawn for cooling purposes are not subject to this rule. This threshold ensures that nearly all cooling water and the most significant facilities using cooling water intake structures are addressed by these requirements to minimize adverse environmental impact (see 66 FR 65338). Phase II existing

facilities typically use far more than 25 percent of the water they withdraw for cooling. As in the new facility rule, water used for both cooling and non-cooling purposes would not count towards the 25 percent threshold.

In addition, at § 125.91, EPA is proposing that this rule would apply to facilities that have a cooling water intake structure with a design intake capacity of 50 million gallons per day (MGD) or greater of source water. EPA chose the 50 MGD threshold to focus the proposed rule on the largest existing power generating facilities. Existing power generating facilities with design flows below this threshold, as well as certain existing manufacturing facilities, and offshore and coastal oil and gas extraction facilities, would not be subject to this proposed rule but will be addressed under the Phase III rule. To clarify that manufacturing and commercial facilities are not subject to the Phase II rule as a result of their relationship as a host plant to a cogeneration facility, only that portion of the cooling water intake flow that is used in the cogeneration process would be considered in determining whether the 50 MGD and 25 percent criteria are met. EPA estimates that the 50 MGD threshold would subject approximately 539 of 942 (57 percent) of existing power generating facilities to the proposal and would address 99.04 percent of the total flow withdrawn by existing steam electric power generating facilities.<sup>4</sup> EPA believes the regulation of existing facilities with flows of 50 MGD or greater in Phase II will address those existing power generating facilities with the greatest potential to cause or contribute to adverse environmental impact. In addition, EPA has limited data on impacts at facilities withdrawing less than 50 MGD. Deferring regulation of such facilities to Phase III provides additional opportunity for the Agency to collect impingement and entrainment data for these smaller facilities. EPA requests comment on both the 50 MGD and 25 percent cooling water thresholds.

#### *F. When Must a Phase II Existing Facility Comply With the Proposed Requirements?*

If your facility is subject to the rule, proposed § 125.92 would require that you must comply when an NPDES permit containing requirements consistent with this subpart is issued to you.

#### *G. What Special Definitions Apply to This Proposal?*

Definitions specific to this proposal are set forth in proposed § 125.93. Except for the definitions of “cooling water” and “existing facility,” which are separately defined for Phase II facilities in proposed § 125.93, the definitions in the new facility rule, 40 CFR 125.83, also apply to this proposed rule. The definitions in the new facility rule that would apply to Phase II existing facilities are as follows:

*Annual mean flow* means the average of daily flows over a calendar year. Historical data (up to 10 years) must be used where available.

*Closed-cycle recirculating system* means a system designed, using minimized makeup and blowdown flows, to withdraw water from a natural or other water source to support contact and/or noncontact cooling uses within a facility. The water is usually sent to a cooling canal or channel, lake, pond, or tower to allow waste heat to be dissipated to the atmosphere and then is returned to the system. (Some facilities divert the waste heat to other process operations.) New source water (make-up water) is added to the system to replenish losses that have occurred due to blowdown, drift, and evaporation.

*Cooling water intake structure* means the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the U.S. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps.

*Design intake flow* means the value assigned (during the facility's design) to the total volume of water withdrawn from a source waterbody over a specific time period.

*Design intake velocity* means the value assigned (during the design of a cooling water intake structure) to the average speed at which intake water passes through the open area of the intake screen (or other device) against which organisms might be impinged or through which they might be entrained.

*Entrainment* means the incorporation of all life stages of fish and shellfish with intake water flow entering and passing through a cooling water intake structure and into a cooling water system.

*Estuary* means a semi-enclosed body of water that has a free connection with open seas and within which the seawater is measurably diluted with fresh water derived from land drainage. The salinity of an estuary exceeds 0.5 parts per thousand (by mass) but is

typically less than 30 parts per thousand (by mass).

*Freshwater river or stream* means a lotic (free-flowing) system that does not receive significant inflows of water from oceans or bays due to tidal action. For the purposes of this rule, a flow-through reservoir with a retention time of 7 days or less will be considered a freshwater river or stream.

*Hydraulic zone of influence* means that portion of the source waterbody hydraulically affected by the cooling water intake structure withdrawal of water.

*Impingement* means the entrapment of all life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal.

*Lake or reservoir* means any inland body of open water with some minimum surface area free of rooted vegetation and with an average hydraulic retention time of more than 7 days. Lakes or reservoirs might be natural water bodies or impounded streams, usually fresh, surrounded by land or by land and a man-made retainer (e.g., a dam). Lakes or reservoirs might be fed by rivers, streams, springs, and/or local precipitation. Flow-through reservoirs with an average hydraulic retention time of 7 days or less should be considered a freshwater river or stream.

*Maximize* means to increase to the greatest amount, extent, or degree reasonably possible.

*Minimum ambient source water surface elevation* means the elevation of the 7Q10 flow for freshwater streams or rivers; the conservation pool level for lakes or reservoirs; or the mean low tidal water level for estuaries or oceans. The 7Q10 flow is the lowest average 7 consecutive day low flow with an average frequency of one in 10 years determined hydrologically. The conservation pool is the minimum depth of water needed in a reservoir to ensure proper performance of the system relying upon the reservoir. The mean low tidal water level is the average height of the low water over at least 19 years.

*Minimize* means to reduce to the smallest amount, extent, or degree reasonably possible.

*Natural thermal stratification* means the naturally-occurring division of a waterbody into horizontal layers of differing densities as a result of variations in temperature at different depths.

*New facility* means any building, structure, facility, or installation that meets the definition of a “new source” or “new discharger” in 40 CFR 122.2

<sup>4</sup> Source: Initial SBREFA Analysis, 6/01.

and 122.29(b)(1), (2), and (4) and is a greenfield or stand-alone facility; commences construction after January 17, 2002; and uses either a newly constructed cooling water intake structure, or an existing cooling water intake structure whose design capacity is increased to accommodate the intake of additional cooling water. New facilities include only "greenfield" and "stand-alone" facilities. A greenfield facility is a facility that is constructed at a site at which no other source is located, or that totally replaces the process or production equipment at an existing facility (see 40 CFR 122.29(b)(1)(i) and (ii)). A stand-alone facility is a new, separate facility that is constructed on property where an existing facility is located and whose processes are substantially independent of the existing facility at the same site (see 40 CFR 122.29(b)(1)(iii)). New facility does not include new units that are added to a facility for purposes of the same general industrial operation (for example, a new peaking unit at an electrical generating station).

(1) Examples of "new facilities" include, but are not limited to the following scenarios: (i) A new facility is constructed on a site that has never been used for industrial or commercial activity. It has a new cooling water intake structure for its own use. (ii) A facility is demolished and another facility is constructed in its place. The newly-constructed facility uses the original facility's cooling water intake structure, but modifies it to increase the design capacity to accommodate the intake of additional cooling water. (iii) A facility is constructed on the same property as an existing facility, but is a separate and independent industrial operation. The cooling water intake structure used by the original facility is modified by constructing a new intake bay for the use of the newly constructed facility or is otherwise modified to increase the intake capacity for the new facility.

(2) Examples of facilities that would NOT be considered a "new facility" include, but are not limited to, the following scenarios: (i) A facility in commercial or industrial operation is modified and either continues to use its original cooling water intake structure or uses a new or modified cooling water intake structure. (ii) A facility has an existing intake structure. Another facility (a separate and independent industrial operation), is constructed on the same property and connects to the facility's cooling water intake structure behind the intake pumps, and the design capacity of the cooling water intake structure has not been increased.

This facility would not be considered a "new facility" even if routine maintenance or repairs that do not increase the design capacity were performed on the intake structure.

*Ocean* means marine open coastal waters with a salinity greater than or equal to 30 parts per thousand (by mass).

*Source* water means the waterbody (waters of the U.S.) from which the cooling water is withdrawn.

*Thermocline* means the middle layer of a thermally stratified lake or reservoir. In this layer, there is a rapid decrease in temperatures.

*Tidal excursion* means the horizontal distance along the estuary or tidal river that a particle moves during one tidal cycle of ebb and flow.

*Tidal river* means the most seaward reach of a river or stream where the salinity is typically less than or equal to 0.5 parts per thousand (by mass) at a time of annual low flow and whose surface elevation responds to the effects of coastal lunar tides.

### III Summary of Data Collection Activities

EPA focused its data collection activities on traditional utilities and nonutility power producers. Based on the 1982 *Census of Manufacturers*, these industries account for more than 90 percent of cooling water use in the United States. Traditional utilities and nonutility power producers that use cooling water were further limited to those plants that generate electricity by means of steam as the thermodynamic medium (steam electric) because they are associated with large cooling water needs. Other power producers generate electricity by means other than steam (e.g., gas turbines) and typically require only small amounts of cooling water, if any.

Facilities in the traditional steam electric utility category are classified under Standard Industrial Classification (SIC) codes 4911 and 493, while nonutility power producers are classified under the major code that corresponds to the primary purpose of the facility. Nonutility facilities are classified under SIC codes 4911 and 493 if the primary purpose of the facility is to generate electricity, and it is these nonutility facilities that are potentially subject to this rule.

#### A. Existing Data Sources

EPA collected data from multiple sources, both public and proprietary, in order to compile an accurate profile of the potentially regulated community. EPA reviewed information collected by other Federal agencies, as well as data

compiled by private companies. In those instances where databases are considered confidential, or where raw data was unavailable for review, EPA did not consider the information. Summaries of the reviewed data sources are listed below.

#### 1. Traditional Steam Electric Utilities

*Federal Energy Regulatory Commission Data Sources.* The Federal Energy Regulatory Commission (FERC) is an independent agency that oversees America's natural gas industry, electric utilities, nonfederal hydroelectric projects, and oil pipeline transportation system. FERC requires that utilities, companies, or individuals subject to its regulations periodically file data or information relating to such matters as financial operations, energy production or supply, and compliance with applicable regulations. Following are brief descriptions of the relevant FERC data collection forms associated with traditional steam electric utilities:

- *FERC Form 1, the Annual Report for Major Electric Utilities, Licensees and Others*, collects extensive accounting, financial, and operating data from major privately-owned electric utilities. A privately-owned electric utility is considered "major" if its sales and transmission services, in each of the three previous calendar years, exceeded one of the following: (1) One million megawatt hours of total annual sales; (2) 100 megawatt hours of annual sales for resale; (3) 500 megawatt hours of annual power exchanges delivered; or (4) 500 megawatt hours of annual wheeling for others. Utility-level information (e.g., number of employees, detailed revenue and expense information, balance sheet information, and electricity generation information) and plant-level information (e.g., production expenses, balance sheet information, and electricity generation information) was used in the economic analysis of the proposed regulation. EPA used FERC Form 1 data as compiled and distributed by other organizations than FERC (see below). (Note that FERC Form 1 applies only to *privately-owned utilities*. Publicly-owned utilities and rural electric cooperatives are discussed below.)

- *FERC Form 1-F, the Annual Report of Nonmajor Public Utilities and Licensees*, collects accounting, financial, and operating data from nonmajor privately-owned electric utilities. A privately-owned electric utility is considered "nonmajor" if it had total annual sales of 10,000 megawatt hours or more in the previous calendar year but is not classified as "major" under the FERC Form 1 definition. FERC Form

1-F collects utility- and plant-level data similar to that on FERC Form 1, albeit less detailed.

*Energy Information Administration Data Sources.* The Energy Information Administration (EIA) is an independent statistical and analytical agency within the U.S. Department of Energy (DOE). In support of its analytic activities, the EIA administers a series of data collection efforts including extensive surveys of electric utilities' financial operations, and their production and disposition of electricity. Following are brief descriptions of the EIA data collection forms associated with traditional steam electric utilities that EPA has used as data sources:

- *Form EIA-412, the Annual Report of Public Electric Utilities*, collects accounting, financial, and operating data from publicly-owned electric utilities. The information collected in Form EIA-412 is similar to, but less detailed than data collected from major privately-owned electric utilities in FERC Form 1. EPA use of Form EIA-412 data included both utility-level information (e.g., number of employees, detailed revenue and expense information, balance sheet information, and electricity generation information) and plant-level information (e.g., production expenses, balance sheet information, and electricity generation information).

- *Form EIA-767, the Steam-Electric Plant Operation and Design Report*, collects data on air and water quality from steam-electric power plants with generating capacity of 100 megawatts or greater. A subset of these data are provided for steam-electric power plants with generating capacity between 10 and 100 megawatts. EPA use of Form EIA-767 data included unit-level information on net electricity generation, hours in operation, and the quantity of fuel burned.

- *Form EIA-860, the Annual Electric Generator Report*, collects data on the status of electric generating plants and associated equipment in operation and those scheduled to be in operation within the next 10 years of filing the report. Each utility that operates or plans to operate a power plant in the United States is required to file Form EIA-860. EPA use of Form EIA-860 data included unit-level information on operating status, nameplate capacity, and ownership percentage.

- *Form EIA-861, the Annual Electric Utility Report*, collects data on generation, wholesale purchases, and sales and revenue by class of consumer and State. Respondents include each electric utility that is engaged in the generation, transmission, distribution,

or sale of electric energy primarily for use by the public. Data used from Form EIA-861 included sales and revenue by consumer class, the utility's NERC region, and address information. In addition, EPA used data on utility ownership to classify each utility as either a privately-owned utility, a publicly-owned utility, or a rural electric cooperative.

In addition to data from the EIA data collection forms outlined above, EPA used EIA's database of FERC Form 1 data, containing the majority of utility-level financial and operating data submitted on the FERC Form 1. While these data are directly available from FERC, the EIA database is published in an electronic format that is more convenient to use than the FERC data. Because EIA conducts basic quality assurance activities, EPA expects that the EIA data is more reliable than the FERC data.

*Rural Utility Service Data Sources.* The Rural Utility Service (RUS) is a Federal agency that provides rural infrastructure assistance in electricity, water and telecommunications. As a Federal credit agency in the U.S. Department of Agriculture, RUS plays a leadership role in financial lending and technical guidance for the rural utilities industries. Rural utilities that borrow from RUS are subject to annual reporting requirements administered by RUS. Following are brief descriptions of the relevant RUS data collection forms associated with traditional steam electric utilities:

- *RUS Form 12, the Electric Operating Report*, collects accounting, financial, and operating data from rural electric cooperatives<sup>7</sup>. The information collected in RUS Form 12 is similar to data collected from major privately-owned electric utilities in FERC Form 1. EPA use of RUS Form 12 data included utility-level information (e.g., number of employees, detailed revenue and expense information, balance sheet information, and electricity generation information), plant-level information (e.g., production expenses, balance sheet information, and electricity generation information), as well as unit-level information (e.g., fuel consumption, operating hours, and electricity generation).

*U.S. Nuclear Regulatory Commission Data Sources.* The U.S. Nuclear Regulatory Commission (NRC) is an independent agency established to ensure the protection of the public

health and safety, the common defense and security, and the environment in the use of nuclear materials in the United States. In carrying out its responsibilities of regulating commercial nuclear power reactors, the NRC compiles and publishes data and reports regarding the operation and maintenance of commercial nuclear power plants around the country. EPA collected information from the NRC regarding the configuration of cooling water intake structures to assist in estimating the capacities of condenser flows.

*Opri Data Sources.* Opri is a private firm located in Boulder, Colorado, that has compiled extensive databases related to the traditional steam electric utility industry. Opri's *Electric Generating Plant Database* includes plant-level data for privately-owned utilities, publicly-owned utilities, and cooperatives for 1988-1997. While these data are available from FERC, EIA, and RUS, these agencies do not make the information available in an easily accessible electronic format. As a consequence, EPA purchased plant-level data from Opri to support its economic analyses. Because the compilation of data in the Electric Generating Plant Database is proprietary, EPA has included a summary of the data utilized in its analyses in the public record.

## 2. Steam Electric Nonutility Power Producers

*Energy Information Administration Data Sources.* Form EIA-867, the *Annual Nonutility Power Producer Report*, collects data on electricity generation, installed capacity, and energy consumption from nonutility power producers that own or plan on installing electric generation equipment with a total capacity of one megawatt or more. The form does not collect any economic or financial data. EPA did not utilize company-level data from the Form EIA-867 because the confidential nature of this data prevented EIA from releasing it. EPA did use Form EIA-867 to assess the population of potentially affected facilities and to identify survey recipients.

*Utility Data Institute Data Sources.* The *UDI Directory of U.S. Cogeneration, Small Power, and Industrial Power Plants* contains data for more than 4,300 nonutility power producer plants. The database, however, is not exclusive to facilities that have steam electric generators. The database also contains nonutility power producers with turbines that do not use cooling water such as gas turbines, geothermal units, wind and solar installations, and a

<sup>7</sup> Note that this data collection form only applies to rural electric cooperatives. Corresponding data collection forms for privately-owned and publicly-owned utilities are discussed in other parts of this section.

variety of other plant types. The primary focus of the UDI nonutility database is on facilities that provide at least some electricity for sale to utilities. EPA used the UDI database to compare the names and addresses of steam electric plants with those in the Form EIA-867 database to ensure comprehensive coverage of nonutility power producers.

*Edison Electric Institute Data Sources.* EEI conducts an annual survey and presents statistics on nonutility power producers in a document entitled, *Capacity and Generation of Nonutility Sources of Energy*. However, the data are considered confidential and EEI will only disseminate data in an aggregated form. Because EPA must have the raw data on a facility-specific basis for this rulemaking, EPA was unable to use this database.

3. Repowering of Steam Electric Power Generating Facilities (Utility and Nonutility)

As discussed in part B of this Section, the section 316(b) Survey acquired technological and economic information from facilities for the years 1998 and 1999. With this information, the Agency established a subset of facilities potentially subject to this rule. Since 1999, some existing facilities have proposed and/or enacted changes to their facilities in the form of repowering that could potentially affect the applicability of today's proposal or a facility's compliance costs. The Agency therefore conducted research into repowering facilities for the section 316(b) existing facility rule and any information available on proposed changes to their cooling water intake structures. The Agency defines repowering as existing facilities either undertaking replacement of existing generating capacity or making additions to existing capacity. The Agency used two separate databases to assemble available information for the repowering facilities: RDI's NEWGen Database, November 2001 version and the Section 316(b) Survey.

In January 2000, EPA conducted a survey of the technological and economic characteristics of 961 steam-electric generating plants. Only the detailed questionnaire, filled out by 283 utility plants and 50 nonutility plants, contains information on planned changes to the facilities' cooling systems (Part 2, Section E). Of the respondents to the detailed questionnaire, only six facilities (three utility plants and three nonutility plants) indicated that their future plans would lead to changes in the operation of their cooling water intake structures.

The NEWGen database is a compilation of detailed information on new electric generating capacity proposed over the next several years. The database differentiates between proposed capacity at new (greenfield) facilities and additions/modifications to existing facilities. To identify repowering facilities of interest, the Agency screened the 1,530 facilities in the NEWGen database with respect to the following criteria: Facility status, country, and steam electric additions. The Agency then identified 124 NEWGen facilities as potential repowering facilities.

Because the NEWGen database provides more information on repowering than the section 316(b) survey, the Agency used it as the starting point for the analysis of repowering facilities. Of the 124 NEWGen facilities identified as repowering facilities, 85 responded to the section 316(b) survey. Of these 85 facilities, 65 are in-scope and 20 are out of scope of this proposal. For each of the 65 in scope facilities, the NEWGen database provided an estimation of the type and extent of the capacity additions. The Agency found that 36 of the 65 facilities would be combined-cycle facilities after the repowering changes. Of these, 34 facilities are projected to decrease their cooling water intake after repowering (through the conversion from a simple steam cycle to a combined-cycle plant). The other 31 facilities within the scope of the rule would increase their cooling water intake. The Agency examined the characteristics of these facilities projected to undergo repowering and determined the waterbody type from which they withdraw cooling water. The results of this analysis are presented in Exhibit 1.

Of the 65 in-scope facilities identified as repowering facilities in the NEWGen database, 24 received the detailed questionnaire, which requested information about planned cooling water intake structures and changes to capacity. Nineteen of these 24 facilities are utilities and the remaining five are nonutilities. The Agency analyzed the section 316(b) detailed questionnaire data for these 24 facilities to identify facilities that indicated planned modifications to their cooling systems which will change the capacity of intake water collected for the plant and the estimated cost to comply with today's proposal. Four such facilities were identified, two utilities and two nonutilities. Both utilities responded that the planned modifications will decrease their cooling water intake capacity and that they do not have any planned cooling water intake structures that will directly withdraw cooling water from surface water. The two nonutilities, on the other hand, indicated that the planned modifications will increase their cooling water intake capacity and that they do have planned cooling water intake structures that will directly withdraw cooling water from surface water.

Using the NEWGen and section 316(b) detailed questionnaire information on repowering facilities, the Agency examined the extent to which planned and/or enacted repowering changes would effect cooling water withdrawals and, therefore, the potential costs of compliance with this proposal. Because the Agency developed a cost estimating methodology that primarily utilizes design intake flow as the independent variable, the Agency examined the extent to which compliance costs would change if the repowering data summarized above were incorporated into the cost analysis of this rule. The Agency determined that projected compliance costs for facilities withdrawing from estuaries could be lower after incorporating the repowering changes. The primary reason for this is the fact that the majority of estuary repowering facilities would change from a full-steam cycle to a combined-cycle, thereby maintaining or decreasing their cooling water withdrawals (note that a combined-cycle facility generally will withdraw one-third of the cooling water of a comparably sized full-steam facility). Therefore, the portion of compliance costs for regulatory options that included flow reduction requirements or technologies would significantly decrease if the Agency incorporated repowering changes into the analysis. As shown in Exhibit 1 the

EXHIBIT 1.—IN-SCOPE EXISTING FACILITIES PROJECTED TO ENACT REPOWERING CHANGES

Waterbody type	Number of plants projected to increase cooling water withdrawal	Number of plants projected to decrease or maintain cooling water withdrawal
Ocean .....	N/A	N/A
Estuary/Tidal River .....	3	17
Freshwater River/Stream .....	14	10
Freshwater Lake/Reservoir .....	10	1
Great Lake .....	0	1

majority of facilities projected to increase cooling water withdrawals due to the repowering changes use freshwater sources. In turn, the compliance costs for these facilities would increase if the Agency incorporated repowering for this proposal.

For the final rule, the Agency intends to continue its research into repowering at existing facilities. The Agency will consider the results of its repowering research and any comments provided on this subject for the final rule. The Agency therefore requests comment on planned and enacted repowering activities and the above summary of its repowering research to date. The Agency is especially interested in information from facilities that have enacted repowering changes and the degree to which these changes have changed their design intake flow.

#### B. Survey Questionnaires

EPA's industry survey effort consists of a two-phase process. EPA administered a screener questionnaire focused on nonutility and manufacturing facilities as the first phase of this data collection process. The screener questionnaire provides information on cooling-water intake capacity, sources of the water, intake structure types, and technologies used to minimize adverse environmental impacts. It also provides data on facility and parent-firm employee numbers and revenues. This information was used to design a sampling plan for the subsequent detailed questionnaire. Following the screener survey, the Agency sent out and collected either a short technical or a detailed questionnaire to utility, nonutility, and manufacturing facilities, as described below. The two-phase survey was designed to collect representative data from a sample group of those categories of facilities potentially subject to section 316(b) regulation for use in rule development.

In 1997, EPA estimated that over 400,000 facilities could potentially be subject to a cooling water intake regulation. Given the large number of facilities potentially subject to regulation, EPA decided to focus its data collection efforts on six industrial categories that, as a whole, are estimated to account for over 99 percent of all cooling water withdrawals. These six sectors are: Utility Steam Electric, Nonutility Steam Electric, Chemicals & Allied Products, Primary Metals Industries, Petroleum & Coal Products, and Paper & Allied Products. There are about 48,500 facilities in these six categories. EPA believes that this

approach provides a sound basis for assessing best technologies available for minimizing adverse environmental impacts.

The screener survey focused on nonutility and manufacturing facilities. EPA developed the sample frame (list of facilities) for the screener questionnaire using public data sources as described in the Information Collection Request (DCN 3-3084-R2 in Docket W-00-03). Facilities chosen for the screener questionnaire represented a statistical sample of the entire universe of nonutility and manufacturing facilities potentially subject to cooling water intake regulations. EPA did not conduct a census of all facilities (i.e. send a survey to all facilities) for the screener questionnaire because of the burden associated with surveying a large number of facilities. Rather, EPA refined the industry data using industry-specific sources to develop sample frames and mailing lists. EPA believes the sample frame was sufficient to characterize the operations of each industrial category. EPA sent the screener questionnaire to 2600 facilities identified in the sample frame as follows: (1) All identified steam electric nonutility power producers, both industrial self-generators and nonindustrial generators (1050 facilities, of which 853 responded); (2) and a sample of manufacturers that fell under four other industrial categories: Paper and allied products, chemical and allied products, petroleum and coal products, and primary metals (1550 facilities, of which 1217 responded). EPA adjusted the sample frame for the screener questionnaire to account for several categories of non-respondents, including facilities with incorrect address information, facilities no longer in operation, and duplicate mailings. Through follow-up phone calls and mailings, EPA increased the response rate for the screener questionnaire to 95 percent. The screener questionnaire was not sent to utilities, all of which were believed to be identified accurately using the publically-available data described above.

A sample of manufacturing and nonutility facilities identified as in-scope (subject to regulation) with the screener questionnaire, and all utilities then were sent either a short technical or a detailed questionnaire. A total of 878 utility facilities, 343 nonutility facilities and 191 manufacturing facilities received one of the two questionnaires (short technical or detailed) during the second phase of the survey. For utilities, nonutilities, and other manufacturing facilities, EPA selected a random sample of these

eligible facilities to receive a detailed questionnaire. The sample included 282 utility facilities and 181 nonutility facilities. All 191 manufacturing facilities received a detailed questionnaire. For nonutilities and utilities, those facilities not selected to receive a detailed questionnaire were sent a Short Technical Questionnaire. EPA's approach in selecting a sample involved the identification of population strata, the calculation of sample sizes based on desired levels of precision, and the random selection of sites given the sample size calculations within each stratum. More detail is provided in a report, *Statistical Summary for Cooling Water Intakes Structures Surveys* (See DCN 3-3077 in Docket W-00-03).

Five questionnaires were distributed to different industrial groups. They were: (1) Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures—Traditional Steam Electric Utilities, (2) Short Technical Industry Questionnaire: Phase II Cooling Water Intake Structures—Traditional Steam Electric Utilities, (3) Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures—Steam Electric Nonutility Power Producers, (4) Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures—Manufacturers, (5) Watershed Case Study Short Questionnaire.

The questionnaires provided EPA with technical and financial data necessary for developing this proposed regulation. Specific details about the questions may be found in EPA's Information Collection Request (DCN 3-3084-R2 in Docket W-00-03) and in the questionnaires (see DCN 3-0030 and 3-0031 in Docket W-00-03 and Docket for today's proposal); these documents are also available on EPA's web site (<http://www.epa.gov/waterscience/316b/question/>).

#### C. Site Visits

From 1993 to the present, EPA has conducted site visits to numerous power generating stations around the country to observe cooling water intake structure design and operations and document examples of different cooling water intake structure configurations. EPA has visited the plants (each with either a once-through or closed-cycle, recirculating cooling system, except as noted) listed below:

- California: Moss Landing Power Plant and Pittsburg Power Plant
- Florida: Big Bend Power Station, St. Lucie Plant, Martin Plant, and Riviera Beach Power Plant
- Illinois: Will County Station and Zion Nuclear Power Station

- Indiana: Clifty Creek Station and Tanners Creek Plant
- Maryland: Calvert Cliffs Nuclear Power Plant and Chalk Point Generating Station
- Massachusetts: Pilgrim Nuclear Power Station
- Nevada: El Dorado Energy Power Plant (dry cooling)
- New York: Indian Point Nuclear Power Plant and Lovett Generating Station
- New Jersey: Salem Generating Station
- Ohio: Cardinal Plant, W.H. Zimmer Plant, and W.C. Beckjord Station
- Wisconsin: Valley Power Plant and Pleasant Prairie Power Plant

*D. Data Provided to EPA by Industrial, Trade, Consulting, Scientific or Environmental Organizations or by the General Public*

#### 1. Public Participation

EPA has worked extensively with stakeholders from industry, public interest groups, state agencies, and other Federal agencies in the development of this proposed rule. These public participation activities have focused on various section 316(b) issues, including general issues, as well as issues relevant to development of the Phase I rule and issues relevant to the proposed Phase II rule. See section I.C.5 of this preamble for a discussion of key public participation activities.

#### 2. Data and Documents Collected by EPA

Since 1993, EPA has developed cooling water regulations as part of a collaborative effort with industry and environmental stakeholders, other Federal agencies, the academic and scientific communities as well as the general public. As such, EPA has reviewed and considered the many documents, demonstration studies, scientific analyses and historical perspectives offered in support of each phase of the regulatory process. For example, during the early stages of data gathering EPA created an internal library of reference documents addressing cooling water intake structure issues. This library currently holds over 2,800 documents, many of which were referenced in the rulemaking process and are contained in the record (see below for further information on the record). The library contains a thorough collection of a wide variety of documents, including over 80 316(b) demonstration documents, over 300 impingement and entrainment studies, over 100 population modeling studies, over 500 fish biology and stock assessment documents, over 350

biological studies commissioned by power generators, over 80 NPDES decisions and NPDES or SPDES-related documents, over 120 intake technology reports, over 10 databases on the electric power industry, and documents from interagency committees such as the Ohio River Valley Water Sanitation Commission (ORSANCO).

The record for the new facility rule contains nearly 1,000 documents (research articles, databases, legal references, memorandums, meeting notes, and other documents), consisting of approximately 47,000 pages of supporting material available for public review. The record for this proposed rule contains over 40 additional documents.

For a more complete list of reference and technical documents, see the record for this proposed rule.

#### **IV. Overview of Facility Characteristics (Cooling Water Systems & Intakes) for Industries Potentially Subject to Proposed Rule**

As discussed above, today's proposed rule would apply to Phase II existing facilities, which include any existing facility that both generates and transmits electric power, or generates electric power but sells it to another entity existing for transmission and that meets the other applicability criteria in § 125.91: (1) They are a point source that uses or proposes to use a cooling water intake structure; (2) they have at least one cooling water intake structure that uses at least 25 percent of the water it withdraws for cooling purposes; (3) they have a design intake flow of 50 million gallons per day (MGD) or greater; and (4) they have an NPDES permit or are required to obtain one. Today's rule does not apply to facilities whose primary business activity is not power generation, such as manufacturing facilities that produce electricity by co-generation.

Based on data collected from the Short Technical Industry Questionnaire and Detailed Questionnaire, and compliance requirements in today's proposed rule, EPA has identified 539 facilities to which today's rule will apply, and estimates that the total number could be 549. The Agency has identified 420 plants owned by utilities that are potentially subject to proposed rule. The Agency estimates that 129 nonutilities may potentially be subject to the proposed rule. This number, however, is subject to some uncertainty. The Agency has identified 119 plants owned by nonutilities that are potentially subject to the proposed rule, and after taking into account a small non-response rate to the survey among

nonutilities, the Agency's best estimate of the total number is 129.

*Sources of Surface Water.* The source of surface water withdrawn for cooling is an important factor in determining potential environmental impacts. An estimated 8 nonutility facilities and 15 utility facilities withdraw all cooling water from an ocean. An estimated 55 nonutility facilities and 50 utility facilities withdraw all cooling water from an estuary or tidal river. An estimated 50 nonutility facilities and 203 utility facilities withdraw all cooling water from a freshwater stream or river. An estimated 12 or 13 nonutility facilities and 136 utility facilities withdraw all cooling water from a lake or reservoir, including 15 utilities on the Great Lakes. Fewer than 20 plants withdraw cooling water from a combination of these sources.

*Average Daily Cooling Water Intake in 1998.* Of the estimated 129 nonutility plants that are potentially subject to this proposed rule, EPA estimates that in 1998, 4 plants had an average intake of not more than 10 million gallons per day (MGD), 12 had an average intake more than 10 MGD and not over 50 MGD, 20 had an average intake more than 50 MGD but not over 100 MGD, and 90 had an average intake over 100 MGD (three had zero or unreported intake). Note that coverage under the rule is based on design intake, not average intake flow. Of the 420 utility plants that are potentially subject to this proposed rule, EPA found that in 1998, 8 plants had an average intake of not more than 10 million gallons per day (MGD), 59 had an average intake more than 10 MGD and not over 50 MGD, 58 had an average intake more than 50 MGD but not over 100 MGD, and 288 had an average intake over 100 MGD (seven had zero or unreported intake).

*Cooling Water Systems.* Facilities may have more than one cooling water system. Therefore, in providing the information on cooling water systems, a plant may be counted multiple times (as many times as it has distinct cooling water systems). Thus, of the plants that are potentially subject to this proposed rule, the 129 nonutility plants are counted 165 times; the 420 utility plants are counted 599 times. As a consequence, the percentages reported sum to more than 100 percent. Among nonutility plants, 110 plants (85 percent) use once-through cooling systems, 16 plants (12 percent) use closed-cycle, recirculating cooling systems, and an estimated 6 plants (5 percent) use another type of system. Of the estimated 599 utility plants, 314 plants (75 percent) use once-through cooling systems, 65 plants (15 percent)

use closed-cycle, recirculating cooling systems, and 49 plants (12 percent) use another type of system.

**Cooling Water Intake Structure Configurations.** Facilities may have more than one cooling water intake structure configuration. Therefore, in providing the information on cooling water systems, a plant may be counted multiple times (as many times as it has distinct cooling water intake structure configurations). Thus, of the plants that are potentially subject to this proposed rule, the 129 nonutility plants are counted 194 times and the 420 utility plants are counted 690 times. As a consequence, the percentages reported sum to more than 100 percent. Of the estimated 129 nonutility plants that are potentially subject to this proposed rule, 30 (23 percent) withdraw cooling water through a canal or channel, 13 (10 percent) have an intake structure situated in a natural or constructed bay or cove, 96 (74 percent) have an intake structure (surface or submerged) that is flush with the shoreline, and 16 (12 percent) have a submerged offshore intake structure. Of the 420 utility plants that are potentially subject to this proposed rule, 142 (34 percent) withdraw cooling water through a canal or channel, 41 (10 percent) have an intake situated in a bay or cove, 251 (60 percent) have a shoreline intake, 59 (14 percent) have a submerged offshore intake, and 6 (1 percent) have another type of configuration or reported no information.

## V. Environmental Impacts Associated With Cooling Water Intake Structures

The majority of environmental impacts associated with intake structures are caused by water withdrawals that ultimately result in aquatic organism losses. This section describes the general nature of these biological impacts; discusses specific types of impacts that are of concern to the Agency; and presents examples of documented impacts from a broad range of facilities. EPA believes that in light of the national scope of today's proposed rule, it is important to present the variety of impacts observed for facilities located on different waterbody types, under high and low flow withdrawal regimes, and operating with and without technologies designed to reduce environmental impacts.

Based on preliminary estimates from the questionnaire sent to more than 1,200 existing power plants and factories, industrial facilities in the United States withdraw more than 279 billion gallons of cooling water a day

from waters of the U.S.<sup>8</sup> The withdrawal of such large quantities of cooling water affects large quantities of aquatic organisms annually, including phytoplankton (tiny, free-floating photosynthetic organisms suspended in the water column), zooplankton (small aquatic animals, including fish eggs and larvae, that consume phytoplankton and other zooplankton), fish, crustaceans, shellfish, and many other forms of aquatic life. Aquatic organisms drawn into cooling water intake structures are either impinged on components of the cooling water intake structure or entrained in the cooling water system itself.

Impingement takes place when organisms are trapped against intake screens by the force of the water passing through the cooling water intake structure. Impingement can result in starvation and exhaustion (organisms are trapped against an intake screen or other barrier at the entrance to the cooling water intake structure), asphyxiation (organisms are pressed against an intake screen or other barrier at the entrance to the cooling water intake structure by velocity forces that prevent proper gill movement, or organisms are removed from the water for prolonged periods of time), and descaling (fish lose scales when removed from an intake screen by a wash system) as well as other physical harms.

Entrainment occurs when organisms are drawn through the cooling water intake structure into the cooling system. Organisms that become entrained are normally relatively small benthic,<sup>9</sup> planktonic,<sup>10</sup> and nektonic<sup>11</sup> organisms, including early life stages of fish and shellfish. Many of these small organisms serve as prey for larger organisms that are found higher on the food chain. As entrained organisms pass through a plant's cooling system they are subject to mechanical, thermal, and/or toxic stress. Sources of such stress include

<sup>8</sup> EPA 2000. Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures. U.S. Environmental Protection Agency, Office of Wastewater Management, Washington, DC. OMB Control No. 2040-0213.

<sup>9</sup> Refers to bottom dwellers that are generally small and sessile (attached) such as mussels and anemones, but can include certain large motile (able to move) species such as crabs and shrimp. These species can be important members of the food chain.

<sup>10</sup> Refers to free-floating microscopic plants and animals, including the egg and larval stages of fish and invertebrates that have limited swimming abilities. Plankton are also an important source of food for other aquatic organisms and an essential component of the food chain in aquatic ecosystems.

<sup>11</sup> Refers to free-swimming organisms (e.g., fish, turtles, marine mammals) that move actively through the water column and against currents.

physical impacts in the pumps and condenser tubing, pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers, sheer stress, thermal shock in the condenser and discharge tunnel, and chemical toxemia induced by antifouling agents such as chlorine. The mortality rate of entrained organisms varies by species; mortality rates for fish can vary from 2 to 97 percent depending on the species and life stage entrained.<sup>12, 13</sup> Naked goby larvae demonstrated mortality rates as low as 2 percent whereas bay anchovy larvae mortality rates were as high as 97 percent.<sup>14</sup> Macroinvertebrate mortality ranged from 0 to 84 percent for several species evaluated, but rates were usually less than 29 percent.<sup>15, 16</sup>

In addition to impingement and entrainment losses associated with the operation of the cooling water intake structure, EPA is concerned about the cumulative overall degradation of the aquatic environment as a consequence of (1) multiple intake structures operating in the same watershed or in the same or nearby reaches and (2) intakes located within or adjacent to an impaired waterbody. Historically, impacts related to cooling water intake structures have been evaluated on a facility-by-facility basis. The potential cumulative effects of multiple intakes located within a specific waterbody or along a coastal segment were not typically assessed and thus are largely unknown. (One relevant example is provided for the Hudson River; see discussion below. Also see recently completed case studies for the Delaware Estuary and Ohio River in the Case Study Document). There is concern, however, about the effects of multiple intakes on fishery stocks. As an example, the Atlantic States Marine Fisheries Commission has been requested by its member States to investigate the cumulative impacts on commercial fishery stocks, particularly overutilized stocks, attributable to

<sup>12</sup> Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig. 2000. A comparative review of entrainment survival studies at power plants in estuarine environments. *Environmental Science and Policy* 3:S295-S301.

<sup>13</sup> EPRI. 2000. Review of entrainment survival studies: 1970-2000. Prepared by EA Engineering Science and Technology for the Electric Power Research Institute, Palo Alto, CA.

<sup>14</sup> *Ibid.*

<sup>15</sup> Mayhew, D.A., L.D. Jensen, D.F. Hanson, and P.H. Muessig. 2000. A comparative review of entrainment survival studies at power plants in estuarine environments. *Environmental Science and Policy* 3:S295-S301.

<sup>16</sup> EPRI. 2000. Review of entrainment survival studies: 1970-2000. Prepared by EA Engineering Science and Technology for the Electric Power Research Institute, Palo Alto, CA.

cooling water intakes located in coastal regions of the Atlantic.<sup>17</sup> Specifically, the study will focus on revising existing fishery management models so that they accurately consider and account for fish losses from multiple intake structures.

Further, the Agency believes that cooling water intakes potentially contribute additional stress to waters already showing aquatic life impairment from other sources such as industrial discharges and urban stormwater. EPA notes that the top four leading causes of waterbody impairment (siltation, nutrients, bacteria, and metals) affect the aquatic life uses of a waterbody. Thus, the Agency is concerned that many of the aquatic organisms subject to the effects of cooling water withdrawals reside in impaired waterbodies and are therefore potentially more vulnerable to cumulative impacts from an array of physical and chemical anthropogenic stressors.

When enough individual aquatic organisms are subject to lethal or function-impairing stressors, whether from cooling water intake structures or water pollutants, the structure of their ecosystem can change significantly in response. Changes in ecosystem structure can then affect all organisms within the ecosystem, including those organisms a cooling water intake structure does not directly impact.

Decreased numbers of aquatic organisms can have any or several of the following ecosystem-level effects: (1) Disruption of food webs,<sup>18</sup> (2) disruption of nutrient, carbon, and energy transfers among the physical and biological ecosystem compartments,<sup>19</sup> (3) alteration of overall aquatic habitat,<sup>20</sup> and (4) alteration of species composition and overall levels of biodiversity.<sup>21</sup>

<sup>17</sup> Personal communication, D. Hart (EPA) and L. Kline (ASMFC), 2001.

<sup>18</sup> Food webs are modified by cooling water intake structure impacts because (1) some species within the ecosystem suffer heavier mortality impacts than others, and (2) cooling water intake structures convert living organisms to various forms of organic matter, thereby removing food resources from consumers of living organisms, and increasing food resources for scavengers and decomposers.

<sup>19</sup> Cooling water intake structures can transfer large amounts of nutrients, carbon, and energy from living organisms (in some cases highly mobile or migratory organisms) to the physical environment. Nutrients, carbon, and energy may re-enter the biological compartment, but they will do so via different pathways than those used prior to cooling water intake structures operation (see alteration of food webs).

<sup>20</sup> In addition to altering the physical nature of aquatic habitat directly (e.g., current modification and water withdrawal), cooling water intake structure may modify habitat by reducing numbers of habitat-modifying organisms (e.g., Pacific salmon).

<sup>21</sup> Species may disappear from a site in response to cooling water intake structure impacts. Threatened and endangered or otherwise rare or

The nature and extent of the ecosystem-level effect depends on the characteristics of the aquatic organism and its interactions with other members of the ecosystem. Some species, known as "keystone species," have a larger impact on ecosystem structure and function than other species. Examples of keystone species from cooling water intake structure-impacted water bodies include menhaden, Pacific salmon, and Eastern oysters.

As discussed above, structural changes at the ecosystem level are influenced by a large number of forces at work within the ecosystem. Because of the large number of these forces and the complexity of their interactions, ecologists can find it difficult to determine the contribution of any one stressor to a structural change in an ecosystem. Much work remains to be done to determine the extent to which cooling water intake structures induce structural change in their host ecosystems through impingement and entrainment of aquatic organisms. Nevertheless, EPA believes that many cooling water intake structures clearly have a significant negative impact on aquatic organisms at the individual level. The studies discussed below suggest that these individual-level impacts can lead to negative impacts at higher organizational levels.

In addition to ecosystem-level impacts, EPA is concerned about the potential impacts of cooling water intake structures located in or near habitat areas that support threatened, endangered, or other protected species. Although limited information is available on locations of threatened or endangered species that are vulnerable to impingement or entrainment, such impacts do occur. For example, EPA is aware that from 1976 to 1994, approximately 3,200 threatened or endangered sea turtles entered enclosed cooling water intake canals at the St. Lucie Nuclear Generating Plant in Florida.<sup>22</sup> The plant developed a capture-and-release program in response to these events. Most of the entrapped turtles were captured and released alive; however, approximately 160 turtles did not survive. More recently, the number of sea turtles being drawn into the intake canal increased to approximately 600 per year. Elevated numbers of sea

sensitive species may be at greater risk. New species (including invasive species), may establish themselves within the disrupted area if they are able to withstand cooling water intake structure impacts.

<sup>22</sup> Florida Power and Light Company, 1995. Assessment of the impacts at the St. Lucie Nuclear Generating Plant on sea turtle species found in the inshore waters of Florida.

turtles found within nearshore waters are thought to be part of the reason for the rising numbers of turtles entering facility waters. In response to this increase, Florida Power and Light Co. proposed installation of nets with smaller size mesh (5-inch square mesh rather than 8-inch square mesh) at the St. Lucie facility to minimize entrapment.<sup>23</sup>

Finally, EPA is concerned about environmental impacts associated with re-siting or modification of existing cooling water intake structures. Three main factors contribute to the environmental impacts: Displacement of biota and habitat resulting from the physical siting or modification of a cooling water intake structure in an aquatic environment, increased levels of turbidity in the aquatic environment, and effects on biota and habitat associated with aquatic disposal of materials excavated during re-siting or modification activities. Existing programs, such as the CWA section 404 program, National Environmental Policy Act (NEPA) program, and programs under State/Tribal law, include requirements that address many of the environmental impact concerns associated with the intake modifications (see Section X for applicable Federal statutes).

#### A. Facility Examples

The following discussion provides a number of examples of impingement and entrainment impacts that can be associated with existing facilities. It is important to note that these examples are meant to illustrate the range of impacts that can occur nationally at facilities sited at diverse geographic locations, differing waterbody types, and with a variety of control technologies in place. In some cases, the number of organisms impinged and entrained by a facility can be substantial and in other examples impingement and entrainment may be minimal due to historical impacts from anthropogenic activities such as stream or river channelization. EPA notes that these examples are not representative of all sites whose facilities use cooling water intake structures and that these examples may not always reflect subsequent action that may have been taken to address these impacts on a site-specific basis. (Facility reports documenting the efficacy of more recently installed control technologies are not always available to the Agency.) With this background, EPA provides the following examples, illustrating that the impacts attributable to impingement

<sup>23</sup> *Ibid.*

and entrainment at individual facilities may result in appreciable losses of early life stages of fish and shellfish (e.g., three to four billion individuals annually<sup>24</sup>), serious reductions in forage species and recreational and commercial landings (e.g., 23 tons lost per year<sup>25</sup>), and extensive losses over relatively short intervals of time (e.g., one million fish lost during a three-week study period).<sup>26</sup>

In addition, some studies estimating the impact of impingement and entrainment on populations of key commercial or recreational fish have predicted substantial declines in population size. This has led to concerns that some populations may be altered beyond recovery. For example, a modeling effort evaluating the impact of entrainment mortality on a representative fish species in the Cape Fear estuarine system predicted a 15 to 35 percent reduction in the species population.<sup>27</sup> More recent modeling studies of Mount Hope Bay, Massachusetts, predicted 87 percent reductions in overall finfish abundance (see Brayton Point Generating Station discussion below for additional detail.) EPA acknowledges that existing fishery resource baselines may be inaccurate.<sup>28</sup> Further, according to one article, “[e]ven seemingly gloomy estimates of the global percentage of fish stocks that are overfished are almost certainly far too low.”<sup>29</sup> Thus, EPA is concerned that historical overfishing may have increased the sensitivity of aquatic ecosystems to subsequent disturbance,

making them more vulnerable to human impact and potential collapse.

Further, studies of entrainment at five Hudson River power plants during the 1980s predicted year-class reductions ranging from six percent to 79 percent, depending on the fish species.<sup>30</sup> An updated analysis completed in 2000 of entrainment at three of these power plants predicted year-class reductions of up to 20 percent for striped bass, 25 percent for bay anchovy, and 43 percent for Atlantic tom cod, even without assuming 100 percent mortality of entrained organisms.<sup>31</sup> The New York Department of Environmental Conservation concluded that these reductions in year-class strength were “wholly unacceptable” and that any “compensatory responses to this level of power plant mortality could seriously deplete any resilience or compensatory capacity of the species needed to survive unfavorable environmental conditions.”<sup>32</sup>

In contrast, facilities sited on waterbodies previously impaired by anthropogenic activities such as channelization may demonstrate limited entrainment and impingement losses. The Neal Generating Complex facility, located near Sioux City, Iowa, on the Missouri River is coal-fired and utilizes once-through cooling systems. According to a ten-year study conducted from 1972–82, the Missouri River aquatic environment near the Neal complex was previously heavily impacted by channelization and very high flow rates meant to enhance barge traffic and navigation.<sup>33</sup> These anthropogenic changes to the natural river system resulted in significant losses of habitat necessary for spawning, nursery, and feeding. At this facility, fish impingement and entrainment by cooling water intakes were found to be minimal.

The following are summaries of other, documented examples of impacts occurring at existing facilities sited on a range of waterbody types. Also, see the

Case Study Document and the benefits discussion in Section IX of this notice.

*Brayton Point Generating Station.* The Brayton Point Generating Station is located on Mt. Hope Bay, in Somerset, Massachusetts, within the northeastern reach of Narragansett Bay. Because of problems with electric arcing caused by salt drift from an open spray pod design located near transmission wires, and lack of fresh water to replace the salt water used for the closed-cycle recirculating spray pod cooling water system, the company converted Unit 4 from a closed-cycle, recirculating system to a once-through cooling water system in July 1984. The modification of Unit 4 resulted in a 41 percent increase in coolant flow, amounting to a maximum average intake flow of approximately 1.3 billion gallons per day and increased thermal discharge to the bay.<sup>34</sup> An analysis of fisheries data by the Rhode Island Division of Fish and Wildlife using a time series-intervention model showed an 87 percent reduction in finfish abundance in Mt. Hope Bay coincident with the Unit 4 modification.<sup>35</sup> The analysis also indicated that, in contrast, finfish abundance trends have been relatively stable in adjacent coastal areas and portions of Narragansett Bay that are not influenced by the operation of Brayton Point station. Thus, overall finfish biomass and finfish species diversity declined in Mount Hope Bay but not in Narragansett Bay. There appear to be multiple, interacting factors that influence these declines including overfishing and climate change as well as temperature increases from thermal discharges and impingement and entrainment losses associated with the Brayton Point facility.

*San Onofre Nuclear Generating Station.* The San Onofre Nuclear Generating Station (SONGS) is located on the coastline of the Southern California Bight, approximately 2.5 miles southeast of San Clemente, California.<sup>36</sup> The marine portions of Units 2 and 3, which are once-through, open-cycle cooling systems, began commercial operation in August 1983 and April 1984, respectively.<sup>37</sup> Since

<sup>24</sup> EPA Region IV. 1979. Brunswick Nuclear Steam Electric Generating Plant of Carolina Power and Light Company, historical summary and review of section 316(b) issues.

<sup>25</sup> EPA Region IV. 1986. Findings and determination under 33 U.S.C. 1326, In the Matter of Florida Power Corporation Crystal River Power Plant Units 1, 2, and 3, NPDES permit no. FL0000159.

<sup>26</sup> Thurber, N.J. and D.J. Jude. 1985. Impingement losses at the D.C. Cook Nuclear Power Plant during 1975–1982 with a discussion of factors responsible and possible impact on local populations. Special report no. 115 of the Great Lakes Research Division, Great Lakes and Marine Waters Center, University of Michigan.

<sup>27</sup> EPA Region IV. 1979. Brunswick Nuclear Steam Electric Generating Plant of Carolina Power and Light Company, historical summary and review of section 316(b) issues.

<sup>28</sup> Watson, R. and D. Pauly. 2001. Systematic distortions in world fisheries catch trends. *Nature* 414:534–536.

<sup>29</sup> Jackson J.B.C., M.X. Kirby, W.H. Berger, K.A. Bjorndal, L.W. Botsford, B.J. Bourque, R.H. Bradbury, R. Cooke, J. Erlandson, J.A. Estes, T.P. Hughes, S. Kidwell, C.B. Lange, H.S. Lenihan, J.M. Pandolfi, C.H. Peterson, R.S. Steneck, M.J. Tegner, and R.R. Warner, 2001. Historical overfishing and the recent collapse of coastal ecosystems. *Science* 293(5530): 629–638.

<sup>30</sup> Boreman J. and P. Goodyear. 1988. Estimates of entrainment mortality for striped bass and other fish species inhabiting the Hudson River Estuary. *American Fisheries Society Monograph* 4:152–160.

<sup>31</sup> Consolidated Edison Company of New York. 2000. Draft environmental impact statement for the state pollutant discharge elimination system permits for Bowline Point, Indian Point 2 & 3, and Roseton steam electric generating stations.

<sup>32</sup> New York Department of Environmental Conservation (NYDEC). 2000. Internal memorandum provided to the USEPA on NYDEC’s position on SPDES permit renewals for Roseton, Bowline Point 1 & 2, and Indian Point 2 & 3 generating stations.

<sup>33</sup> Morningside College. 1982. Missouri River aquatic ecology studies. Prepared for Iowa Public Service Company, Sioux City, Iowa.

<sup>34</sup> Metcalf & Eddy. 1992. Brayton Point station monitoring program technical review. Prepared for USEPA.

<sup>35</sup> Gibson, M. 1995 (revised 1996). Comparison of trends in the finfish assemblages of Mt. Hope Bay and Narragansett Bay in relation to operations of the New England Power Brayton Point station. Rhode Island Division of Fish and Wildlife, Marine Fisheries Office.

<sup>36</sup> Southern California Edison. 1988. Report on 1987 data: marine environmental analysis and interpretation. San Onofre Nuclear Generating Station.

<sup>37</sup> *Ibid.*

then, many studies evaluated the impact of the SONGS facility on the marine environment.

In a normal (non-El Niño) year, an estimated 121 tons of midwater fish (primarily northern anchovy, queenfish, and white croaker) may be entrained at SONGS.<sup>38</sup> The fish lost include approximately 350,000 juveniles of white croaker, a popular sport fish; this number represents 33,000 adult individuals or 3.5 tons of adult fish. Within 3 kilometers of SONGS, the density of queenfish and white croaker in shallow-water samples decreased by 34 and 36 percent, respectively. Queenfish declined by 50 to 70 percent in deepwater samples.<sup>39</sup> In contrast, relative abundances of bottom-dwelling adult queenfish and white croaker increased in the vicinity of SONGS.<sup>40</sup> Increased numbers of these and other bottom-dwelling species were believed to be related to the enriching nature of SONGS discharges, which in turn support elevated numbers of prey items for bottom fish.<sup>41</sup>

*Pittsburg and Contra Costa Power Plants.* The Pittsburg and Contra Costa Power Plants are located in the San Francisco Bay-Delta Estuary, California. Several local fish species (e.g., Delta smelt, Sacramento splittail, chinook salmon, and steelhead) found in the vicinity of the facilities are now considered threatened or endangered by State and/or Federal authorities. EPA evaluated facility data on impingement and entrainment rates for these species and estimated that potential losses of special status fish species at the two facilities may reach 145,003 age 1 equivalents per year resulting from impingement and 269,334 age 1 equivalents per year due to entrainment.<sup>42</sup> Based on restoration costs for these species, EPA estimates that the value of the potential impingement losses of these species is \$12.8 to 43.2 million per year and the value of potential entrainment is \$25.6

million to \$83.2 million per year (all in \$2001).

*Lovett Generating Station.* The Lovett Generating Station is located in Tompkins Cove, New York, on the western shore of the Hudson River. As a method of reducing ichthyoplankton (free floating fish eggs and larvae) entrainment at the Lovett station, the Gunderboom Marine Life Exclusion System was installed in 1995 at the Unit 3 intake structure. Gunderboom is a woven mesh material initially designed to prevent waterborne pollutants from entering shoreline environments during construction or dredging activities. Since its initial installation, the Gunderboom system has undergone a series of tests and modifications to resolve problems with fabric clogging, anchoring, and the boom system. Data from testing in 1998 demonstrated that with the Gunderboom system in place, entrainment of eggs, larvae, and juveniles was reduced by 80 percent.<sup>43</sup>

*Ohio River.* EPA evaluated entrainment and impingement impacts at nine in-scope facilities along a 500-mile stretch of the Ohio River as one of its case studies. Results from these nine facilities were extrapolated to 20 additional in-scope facilities. All in-scope facilities spanned a stretch of the Ohio River that extended from the western portion of Pennsylvania, along the southern border of Ohio, and into eastern Indiana. Impingement losses for all in-scope facilities were approximately 11.3 million fish (age 1 equivalents) annually; entrainment losses totaled approximately 23.0 million fish (age 1 equivalents) annually.<sup>44</sup> EPA believes that the results from this case study may not be representative of entrainment and impingement losses along major U.S. rivers because they are based on limited data collected nearly 25 years ago. In addition, due to improvements in water quality and implementation of fishery management plans, fish populations near these facilities may have increased and therefore these results may underestimate current entrainment and impingement at Ohio River facilities.

*Power Plants with Flows Less Than 500 MGD.* The following results from the case studies conducted by EPA under this rulemaking effort provide an indication of impingement and entrainment rates for facilities with lower flows than the previous examples.

Impingement and entrainment rates are expressed as numbers of age 1 equivalents, calculated by EPA from the impingement and entrainment data provided in facility monitoring reports.<sup>45</sup>

- The Pilgrim Nuclear Power Station, located on Cape Cod Bay, Massachusetts, has an intake flow of 446 MGD.<sup>46</sup> The average annual number of age 1 equivalents impinged at Pilgrim from 1974–1999 was 52,800 fish. The average annual number entrained was 14.4 million fish.

- The Miami Fort Power Plant, located on the Ohio River about 20 miles downstream of Cincinnati, has an intake flow of about 98.7 MGD<sup>47</sup> and combined average impingement and entrainment of about 1.8 million age 1 equivalent fish per year (298,027 impinged and 1,519,679 entrained).

- The JR Whiting Plant, located in Michigan on Lake Erie has an intake flow of 308 MGD.<sup>48</sup> The average annual number of age 1 equivalent fish entrained was 1.8 million. Before installation of a deterrent net in 1980 to reduce impingement, some 21.5 million age 1 equivalents were lost to impingement at the facility each year. These losses were reduced by nearly 90 percent with application of the deterrent net.<sup>49</sup>

Studies like those described in this section may provide only a partial picture of the severity of environmental impact associated with cooling water intake structures. Most important, the methods for evaluating adverse environmental impact used in the 1970s and 1980s, when most section 316(b) evaluations were performed, were often inconsistent and incomplete, making detection and consideration of all impacts difficult in some cases, and making cross-facility comparison difficult for developing a national rule. For example, some studies reported only gross fish losses; others reported fish losses on the basis of species and life stage; still others reported percent losses of the associated population or subpopulation (e.g., young-of-year fish). Recent advances in environmental assessment techniques provide new and in some cases better tools for monitoring impingement and entrainment and detecting impacts associated with the

<sup>38</sup> Swarbrick, S. and R.F. Ambrose. 1989. Technical report C: entrapment of juvenile and adult fish at SONGS. Prepared for Marine Review Committee.

<sup>39</sup> Kastendiek, J. and K. Parker. 1988. Interim technical report: midwater and benthic fish. Prepared for Marine Review Committee.

<sup>40</sup> Swarbrick, S. and R.F. Ambrose. 1989. Technical report C: entrapment of juvenile and adult fish at SONGS. Prepared for Marine Review Committee.

<sup>41</sup> Kastendiek, J. and K. Parker. 1988. Interim technical report: midwater and benthic fish. Prepared for Marine Review Committee.

<sup>42</sup> Impingement and entrainment data were obtained from the 2000 Draft Habitat Conservation Plan for the Pittsburg and Contra Costa facilities. Please see EPA's Case Study Document for detailed information on EPA's evaluation of impingement and entrainment at these facilities.

<sup>43</sup> Lawler, Matusky & Skelly Engineers. 1998. Lovett Generating Station Gunderboom system evaluation program 1998.

<sup>44</sup> Please see EPA's Case Study Document for more detailed information on these facilities and the data and methods used by EPA to calculate age 1 equivalent losses.

<sup>45</sup> *Ibid.*

<sup>46</sup> U.S. Department of Energy. 1999. Form EIA-767 (1999). Steam-electric plant operation and design report. Edison Electric Institute.

<sup>47</sup> *Ibid.*

<sup>48</sup> *Ibid.*

<sup>49</sup> Consumers Power Company. 1984, 1988, and 1992 reports of deterrent net performance, J.R. Whiting Plant. Prepared for the Michigan Water Resources Commission.

operation of cooling water intake structures.<sup>50 51</sup>

## VI. Best Technology Available for Minimizing Adverse Environmental Impact at Phase II Existing Facilities

### A. What Is the Best Technology Available for Minimizing Adverse Environmental Impact at Phase II Existing Facilities?

#### 1. How Will Requirements Reflecting Best Technology Available for Minimizing Adverse Environmental Impact Be Established for My Phase II Existing Facility?

Today's proposed rule would establish national minimum performance requirements for the location, design, construction, and capacity of cooling water intake structures at Phase II existing facilities. These requirements would represent best technology available for minimizing adverse environmental impact based on the type of waterbody in which the intake structure is located, the volume of water withdrawn by a facility, and the facility's capacity utilization rate. Under this proposal, EPA would set technology-based performance requirements, but the Agency would not mandate the use of any specific technology.

A facility may use one of three different methods for establishing the best technology available for minimizing adverse environmental impact. Under the first method, a facility would demonstrate to the Director issuing the permit that the facility's existing design and construction technologies, operational measures, and/or restoration measures already meet the national minimum performance requirements that EPA is proposing.

Under the second method, a facility would select design and construction technology, operational measures, restoration measures or some combination thereof. The facility would then demonstrate to the Director that its selected approach would meet the performance requirements EPA is proposing.

Under the third method, a facility would calculate its cost of complying with the presumptive performance requirements and compare those costs either to the compliance costs EPA estimated in the analysis for this

proposed rule or to a site-specific determination of the benefits of meeting the presumptive performance requirements. If the facility's costs are significantly greater than EPA's estimated costs or site-specific benefits, the facility would qualify for a site-specific determination of best technology available.

The Agency discusses each of these three methods for compliance and the proposed presumptive minimum performance requirements in greater detail below. EPA invites comments on all aspects of this proposed regulatory framework as well as the alternative regulatory approaches discussed later in this section.

#### a. What Are the Performance Standards for the Location, Design, Construction, and Capacity of Cooling Water Intake Structures To Reflect Best Technology Available for Minimizing Adverse Environmental Impact?

EPA is proposing four performance standards at § 125.94(b), all of which reflect best technology available for minimizing adverse environmental impact from cooling water intake structures. Under proposed § 125.94(b)(1), any owner or operator able to demonstrate that a facility employs technology that reduces intake capacity to a level commensurate with the use of a closed-cycle, recirculating cooling system would meet the performance requirements proposed in today's rule. Use of this type of technology satisfies both impingement and entrainment performance requirements for all waterbodies.

The performance standards at proposed § 125.94(b)(2), (3), and (4) are based on the type of waterbody in which the intake structure is located, the volume of water withdrawn by a facility, the facility capacity utilization rate, and the location of a facility's intake structure in relation to fishery resources of concern to permit authorities or fishery managers. Under the proposed rule, EPA would group waterbodies into five categories: (1) Freshwater rivers or streams, (2) lakes or reservoirs, (3) Great Lakes, (4) tidal rivers and estuaries, and (5) oceans. The Agency considers location to be an important factor in addressing adverse environmental impact caused by cooling water intake structures. Because different waterbody types have different potential for adverse environmental impact, the requirements proposed to minimize adverse environmental impact would vary by waterbody type. For example, estuaries and tidal rivers have a higher potential for adverse impact because they contain essential habitat

and nursery areas for the vast majority of commercial and recreational important species of shell and fin fish, including many species that are subject to intensive fishing pressures. Therefore, these areas require a higher level of control that includes both impingement and entrainment controls. Organisms entrained may include small species of fish and immature life stages (eggs and larvae) of many species that lack sufficient mobility to move away from the area of the intake structure. The reproductive strategies of many estuarine species include pelagic or planktonic larvae, which are very susceptible to entrainment.

EPA discussed these concepts in a Notice of Data Availability (NODA) for the new facility rule (66 FR 28853, May 25, 2001) and invited comment on a number of documents which may support a judgment that the reproductive strategies of tidal river and estuarine species, together with other physical and biological characteristics of those waters, which make them more susceptible than other waterbodies to impacts from cooling water intake structures. In addition to these documents, the NODA presented information regarding the low entrainment susceptibility of non-tidal freshwater rivers and streams to cooling water intake structure impacts. This information also may be relevant in determining whether tidal rivers and estuaries are more sensitive to cooling water intake structures than some parts of other waterbodies.

In general, commenters on the NODA agreed that location is an important factor in assessing the impacts of cooling water intake structure, but that creating a regulatory framework to specifically address locational issues would be extremely difficult. In the end, EPA elected not to vary requirements for new facilities on the basis of whether a cooling water intake structure is located in one or another broad category of waterbody type. Instead, EPA promulgated the same technology-based performance requirements for all new facilities, regardless of the waterbody type after finding this approach to be economically practicable.

For the Phase II existing facility rule, which would establish the best technology available for minimizing adverse environmental impact in all waterbody types, EPA is again proposing an approach that it believes is economically practicable, but is proposing to require the most control in areas where such controls would yield the greatest reduction in impingement and entrainment. EPA believes that section 316(b) affords EPA such

<sup>50</sup> Schmitt, R.J. and C.W. Osenberg. 1996. *Detecting ecological impacts*. Academic Press, San Diego, CA.

<sup>51</sup> EPRI. 1999. *Catalog of assessment methods for evaluating the effects of power plant operations on aquatic communities*. TR-112013, EPRI, Palo Alto, CA.

discretion because unlike the sections authorizing technology-based effluent limitations guidelines and new source performance standards for the discharge of pollutants, section 316(b) expressly states that its objective is to require best technology available for minimizing adverse environmental impact. EPA believes this language affords the Agency discretion to consider the environmental effects of various technology options. Therefore, EPA is proposing to vary technology-based performance requirements by waterbody type, requiring more effective controls in waterbodies with higher overall productivity or greater sensitivity to impingement and entrainment. (Appendix 1 to the preamble presents the proposed regulatory framework in a flow chart).

Under this approach, facilities that operate at less than 15 percent capacity utilization would be required to have only impingement control technology. This level of control was found to be the most economically practicable given these facilities' reduced operating levels. In addition, these facilities tend to operate most often in mid-winter or late summer, times of peak energy demand but periods of generally low abundance of entrainable life stages of fish and shellfish. The flow or capacity of a cooling water intake structure is also a primary factor affecting the entrainment of organisms. The lower the intake flow at a site, the lesser the potential for entrained organisms.

As in the Phase I (new facility) rule, EPA is proposing to set performance standards for minimizing adverse environmental impact based on a relatively easy to measure and certain metric—reduction of impingement mortality and entrainment. EPA is choosing this approach to provide certainty about permitting requirements and to streamline and speed the issuance of permits.

Facilities with cooling water intake structures located in a freshwater river or stream would have different requirements depending on the proportion of the source waterbody that is withdrawn. If the intake flow is 5 percent or less of the source water annual mean flow, then the facility would be required to reduce fish and shellfish impingement mortality by 80 to 95 percent. If the intake flow is 5 percent or more of the source water annual mean flow, then the facility would be required to reduce fish and shellfish impingement mortality by 80 to 95 percent and reduce entrainment by 60 to 90 percent. As described in the new facility proposed rule (65 FR 49060) and NODA (66 FR 28853), EPA

believes that, absent entrainment control technologies entrainment, at a particular site is proportional to intake flow at that site. As we discuss above, EPA believes it is reasonable to vary the suite of technologies by the potential for adverse environmental impact in a waterbody type. EPA is therefore proposing to limit the requirement for entrainment control in fresh waters to those facilities that withdraw the largest proportion of water from freshwater rivers or streams.

Facilities with cooling water intake structures located in a lake or reservoir would have to implement impingement control technology to reduce impingement mortality by 80 to 95 percent for fish and shellfish, and, if they expand their design intake capacity, the increase in intake flow must not disrupt the natural thermal stratification or turnover pattern of the source water. Cooling water intake structures withdrawing from the Great Lakes would be required to reduce fish and shellfish impingement mortality by 80 to 95 percent and to reduce entrainment by 60 to 90 percent. As described in the new facility proposed rule (65 FR 49060) and NODA (66 FR 28853), EPA believes that the Great Lakes are a unique system that should be protected to a greater extent than other lakes and reservoirs. The Agency is therefore proposing to specify entrainment controls as well as impingement controls for the Great Lakes.

Facilities with cooling water intake structures located in a tidal river or estuary would need to implement impingement control technology to reduce impingement mortality by 80 to 95 percent and entrainment by 60 to 90 percent for fish and shellfish. As discussed above, estuaries and tidal rivers are more susceptible than other water bodies to adverse impacts from impingement and entrainment.

Facilities with cooling water intake structures located in an ocean would have to implement impingement control technology to reduce impingement mortality by 80 to 95 percent and entrainment by 60 to 90 percent for fish and shellfish. EPA is establishing requirements for facilities withdrawing from oceans that are similar to those proposed for tidal rivers and estuaries because the coastal zone of oceans (where cooling water intakes withdraw) are highly productive areas. (See the new facility proposed rule (65 FR 45060) and documents in the record (Docket # W-00-03) such as 2-013A through O, 2-019A-R11, 2-019A-R12, 2-019A-R33, 2-019A-R44, 2-020A, 3-0059.) EPA is also concerned about the

extent to which fishery stocks that rely upon tidal rivers, estuaries and oceans for habitat are overutilized and seeks to minimize the impact that cooling water intake structures may have on these species or forage species on which these fishery stocks may depend. (See documents 2-019A-R11, 2-019A-R12, 2-019A-R33, 2-019A-R44, 2-020A, 2-024A through O, and 3-0059 through 3-0063 in the record of the Final New Facility Rule (66 FR 65256), Docket # W-00-03).

EPA is proposing a range of impingement mortality and entrainment reduction in its requirements for facilities that are required to select and implement design and construction technologies or operational or restoration measures to minimize potential impact from their cooling water intake structures. The calculation baseline against which compliance with the performance standards should be assessed is a shoreline intake with the capacity to support once-through cooling and no impingement mortality or entrainment controls. In many cases existing technologies at the site achieve some reduction in impingement and entrainment when compared to this baseline. In such cases, impingement mortality and entrainment reductions (relative to the calculated baseline) achieved by these existing technologies should be counted toward compliance with the performance standards.

EPA is proposing performance ranges rather than a single performance benchmark because of the uncertainty inherent in predicting the efficacy of a technology on a site-specific basis. The lower end of the range is being proposed as the percent reduction that EPA, based on the available efficacy data, has determined that all facilities could achieve if they were to implement available technologies and operational measures on which the performance standards are based. (See Chapter 5, "Efficacy of Cooling Water Intake Structure Technologies," of the Technical Development Document for the Final Rule for New Facilities, EPA-821-R-01-036, November 2001). The baseline for assessing performance is a Phase II existing facility with a shoreline intake with the capacity to support once-through cooling and no impingement or entrainment controls. The lower end of the range would take into account sites where there may be more fragile species that may not have a high survival rate after coming in contact with fish protection technologies at the cooling water intake structure (i.e., fine mesh screens). The higher end of the range is being proposed as a percent reduction that

available data show many facilities can and have achieved with the available technologies on which the performance standards are based. Some facilities may be able to exceed the high end of the performance range, though they would not be required to do so by today's proposed rule. In specifying a range, EPA anticipates that facilities will select technologies or operational measures to achieve the greatest cost-effective reduction possible (within today's proposed performance range) based on conditions found at their site, and that Directors will review the facility's application to ensure that appropriate alternatives were considered. EPA also expects that some facilities may be able to meet these performance requirements by selecting and implementing a suite (i.e., more than one) of technologies and operational measures and/or, as discussed below, by undertaking restoration measures. EPA invites comment on whether the Agency should establish regulatory requirements to ensure that facilities achieve the greatest possible reduction (within the proposed ranges) that can be achieved at their site using the technologies on which the performance standards are based. EPA also invites comment on whether EPA should leave decisions about appropriate performance levels for a facility to the Director, provided that the facility will achieve performance that is no lower than the bottom of the performance ranges in today's proposal.

EPA based the presumptive performance standards specified at 125.94(b), (c), and (d) for impingement mortality reduction, compared with conventional once-through systems, on the following technologies: (1) Design and construction technologies such as fine and wide-mesh wedgewire screens, as well as aquatic filter barrier systems, that can reduce mortality from impingement by up to 99 percent or greater compared with conventional once-through systems; (2) barrier nets that may achieve reductions of 80 to 90 percent; and (3) modified screens and fish return systems, fish diversion systems, and fine mesh traveling screens and fish return systems that have achieved reductions in impingement mortality ranging from 60 to 90 percent as compared to conventional once-through systems. (See Chapter 5 of the Technical Development Document for the Final Rule for New Facilities.)

Less full-scale performance data are available for entrainment reduction. Aquatic filter barrier systems, fine mesh wedgewire screens, and fine mesh traveling screens with fish return systems achieve 80 to 90 percent greater reduction in entrainment compared

with conventional once-through systems. EPA notes that screening to prevent organism entrainment may cause impingement of those organisms instead. Questions regarding impingement survival of relatively delicate fish, larvae, and eggs would need to be considered by the Director and the facility in evaluating the efficacy of the technology. In addition, all of these screening-and-return technologies would need to be evaluated on a case-by-case basis to determine if they are capable of screening and protecting the specific species of fish, larvae and eggs that are of concern at a particular facility.

Several additional factors suggest that the performance levels discussed above and described in more detail in Chapter 5 of the Technical Development Document for the Final New Facility Rule can be improved. First, some of the performance data reviewed is from the 1970's and 1980's and does not reflect recent developments and innovations (e.g., aquatic filter barrier systems, sound barriers). Second, these conventional barrier and return system technologies have not been optimized on a widespread level to date, as would be encouraged by this rule. Third, EPA believes that many facilities could achieve further reductions (estimated at 15–30 percent) in impingement mortality and entrainment by providing for seasonal flow restrictions, variable speed pumps, and other operational measures and innovative flow reduction alternatives. For additional discussion, see section 5.5.11 in the Technical Development Document for the new facility rule.

EPA notes that available data described in Chapter 5 of the Technical Development Document for the Final Rule for New Facilities suggest that closed-cycle, recirculating cooling systems (e.g., cooling towers or ponds) can reduce mortality from impingement by up to 98 percent and entrainment by up to 98 percent when compared with conventional once-through systems. Therefore, although closed-cycle, recirculating cooling is not one of the technologies on which the presumptive standards are based, use of a closed-cycle, recirculating cooling system would achieve the presumptive standards. The proposed rule, at § 124.94(b)(1) would thus establish the use of a closed-cycle, recirculating cooling system as one method for meeting the presumptive standards.

Based on an analysis of data collected through the detailed industry questionnaire and the short technical questionnaire, EPA believes that today's proposed rule would apply to 539

existing steam electric power generating facilities. Of these, 53 facilities that operate at less than 15 percent capacity utilization would potentially require only impingement controls, with 34 of these estimated to actually require such controls. (The remaining 19 facilities have existing impingement controls). Of the remaining 486 facilities, the proposed rule would not require any changes at approximately 69 large existing facilities with recirculating wet cooling systems (e.g., wet cooling towers or ponds).

Of the remaining 417 steam electric power generating facilities (i.e., those that exceed 15 percent capacity utilization and have non-recirculating systems), EPA estimates that 94 are located on freshwater lakes or reservoirs, 13 are located on the Great Lakes, 109 are located on oceans, estuaries, or tidal rivers, and 201 are located on freshwater rivers or streams.

Of the 94 Phase II existing facilities located on freshwater lakes or reservoirs, EPA estimates that 67 of these facilities would have to install impingement controls and that 27 facilities already have impingement controls that meet the proposed rule requirements. As for existing steam electric power generating facilities located on the Great Lakes, EPA estimates that the proposed rule would require all 13 such facilities to install impingement and entrainment controls.

Of the 109 facilities located on estuaries, tidal rivers, or oceans, EPA estimates that 15 facilities would already meet today's proposed impingement and entrainment controls. The remaining 94 facilities would need to install additional technologies to reduce impingement, entrainment, or both.

For Phase II existing facilities located on freshwater river or streams, the proposed rule would establish an intake flow threshold of five (5) percent of the mean annual flow. Facilities withdrawing more than this threshold would have to meet performance standards for reducing both impingement mortality and entrainment. Facilities withdrawing less than the threshold would only have to meet performance standards for reducing impingement mortality. EPA estimates that of 201 facilities located on freshwater river or streams, 94 are at or below the flow threshold, and that only 53 of these facilities would have to install additional impingement controls (the remaining facilities have controls in place to meet the proposed rule requirements). EPA estimates that 107 facilities exceed the flow threshold. Twenty one (21) of these facilities have

sufficient controls in place; 86 would require entrainment or impingement and entrainment controls.

b. How Could a Phase II Existing Facility Use Existing Design and Construction Technologies, Operational Measures, and/or Restoration Measures To Establish Best Technology Available for Minimizing Adverse Environmental Impact?

Under the first option for determination of best technology available, as specified in proposed § 125.94(a)(1), an owner or operator of a Phase II existing facility may demonstrate to the permit-issuing Director that it already employs design and construction technologies, operational measures, or restoration measures that meet the performance requirements proposed today. To do this the owner or operator would calculate impingement mortality and entrainment reductions of existing technologies and measures relative to the calculation baseline and compare these reductions to those specified in the applicable performance standards. EPA expects that owners and operators of some facilities may be able to demonstrate compliance through a suite of (i.e., multiple) existing technologies, operational measures, and/or restoration measures.

To adequately demonstrate the efficacy of existing technologies, operational measures, and/or restoration measures, a facility owner or operator must conduct and submit for the Director's review a Comprehensive Demonstration Study as specified in proposed § 125.95(b) and described in section VII of today's preamble. In this Study, the owner or operator would characterize the impingement mortality and entrainment due to the cooling water intake structure, describe the nature and operation of the intake structure, and describe the nature and performance levels of the existing technologies, operational measures, and restoration measures for mitigating impingement and entrainment impacts. Owners and operators may use existing data for the Study as long as it adequately reflects current conditions at the facility and in the waterbody from which the facility withdraws cooling water.

c. How Could a Phase II Existing Facility Use Newly Selected Design and Construction Technologies, Operational Measures, and/or Restoration Measures To Establish Best Technology Available for Minimizing Adverse Environmental Impact?

Under the second option for determination of best technology available specified in proposed § 125.94(a)(2), an owner or operator of a Phase II existing facility that does not already employ sufficient design and construction technologies, operational measures, or restoration measures to meet the proposed performance standards must select additional technologies and operational or restoration measures. The owner or operator must demonstrate to the permit-issuing Director that these additions will, in conjunction with any existing technologies and measures at the site, meet today's proposed performance standards. EPA expects that some facilities may be able to meet their performance requirements by selecting and implementing a suite (i.e., more than one) of technologies, operational, or restoration measures.

To adequately demonstrate the efficacy of the selected technologies, operational measures, and/or restoration measures, a facility must conduct and submit for the Director's review a Comprehensive Demonstration Study as specified in proposed § 125.95(b) and described in section VII of today's preamble. In this Study, the owner or operator would characterize the impingement mortality and entrainment due to the cooling water intake structure, describe the nature and operation of the intake structure, and describe the nature and performance levels of both the existing and proposed technologies, operational measures, and restoration measures for mitigating impingement and entrainment impacts. Owners and operators may use existing data for the Study as long as it adequately reflects current conditions at the facility and in the waterbody from which the facility withdraws cooling water.

If compliance monitoring determines that the design and construction, operating measures, or restoration measures prescribed by the permit have been properly installed and were properly operated and maintained, but were not achieving compliance with the applicable performance standards, the Director could modify permit requirements consistent with existing NPDES program regulations (e.g., 40 CFR 122.62, 122.63, and 122.41) and the provisions of this proposal. In the

meantime, the facility would be considered in compliance with its permit as long as it was satisfying all permit conditions. EPA solicits comment on whether the proposed regulation should specify that proper design, installation, operation and maintenance would satisfy the terms of the permit until the permit is reissued pursuant to a revised Design and Construction Technology Plan. If EPA were to adopt this approach, EPA would specify in the regulations that the Director should require as a permit condition the proper design, installation, operation and maintenance of design and construction technologies and operational measures rather than compliance with performance standards.

d. How Could a Phase II Existing Facility Qualify for a Site-Specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact?

Under the third option for determination of best technology available, specified in proposed § 125.94(a)(3), the owner or operator of a Phase II existing facility may demonstrate to the Director that a site-specific determination of best technology available is appropriate for the cooling water intake structure(s) at that facility if the owner or operator can meet one of the two cost tests specified in proposed § 125.94(c)(1). To be eligible to pursue this approach, the facility must first demonstrate to the Director either: (1) that its costs of compliance with the applicable performance standards specified in § 125.94(b) would be significantly greater than the costs considered by the Administrator in establishing such performance standards; or (2) that the facility's costs would be significantly greater than the benefits of complying with the performance standards at the facility's site. A discussion of applying the cost test is provided in section VI.A.12 of this proposed rule. A discussion of applying the test in which costs are compared to benefits is provided in Section VI.A.8.

To adequately demonstrate the efficacy of the selected technologies, operational measures, and/or restoration measures considered in the site-specific cost tests, a facility must conduct and submit for the Director's review a Comprehensive Demonstration Study as specified in proposed § 125.95(b) and described in section VII of today's preamble. In this Study, the owner or operator would characterize the impingement mortality and entrainment due to the cooling water intake

structure, describe the nature and operation of the intake structure, and describe the nature and performance levels of the existing technologies, operational measures, and restoration measures for mitigating impingement and entrainment impacts. Owners or operators would also need to document the costs to the facility of any additional technologies or measures that would be needed to meet the performance standards and in the case of the site-specific cost to benefits test, the monetized benefits of meeting the standards. Owners and operators may use existing data for the Study as long as it adequately reflects current conditions at the facility and in the waterbody from which the facility withdraws cooling water.

Where a Phase II existing facility demonstrates that it meets either of the cost tests, the Director is to make a site-specific determination of best technology available for minimizing adverse environmental impact. This determination would be based on less costly design and construction technologies, operational measures, and/or restoration measures proposed by the facility and approved by the Director. The Director would approve less costly technologies to the extent justified by the significantly greater cost.

Phase II Existing facilities that pursue this option would have to assess the nature and degree of adverse environmental impact associated with their cooling water intake structures, and then identify the best technology available to minimize such impact. Owners and operators would be required to submit to the Director for approval a Site-Specific Technology Plan. This plan would be based on a Comprehensive Cost Evaluation Study and a Valuation of Monetized Benefits of Reducing Impingement and Entrainment, as required by proposed § 125.95(b)(6)(i) and (ii). (See section VII). The Plan would describe the design and operation of all design and construction technologies, operational measures, and restoration measures selected, and provide information that demonstrates the effectiveness of the selected technologies or measures for reducing the impacts on the species of concern.

To document that its site-specific costs would be significantly greater than those EPA considered, the facility would need to develop engineering cost estimates as part of its Comprehensive Cost Evaluation Study. The facility would then consider the model plants presented in EPA's Technical Development Document, determine which model plant most closely

matches its fuel source, mode of electricity generation, existing intake technologies, waterbody type, geographic location, and intake flow and compare its engineering estimates to EPA's estimated cost for this model plant.

## 2. What Available Technologies Are Proposed as Best Technology Available for Minimizing Adverse Environmental Impact?

Currently, 14 percent of Phase II existing facilities potentially subject to this proposal already have a closed-cycle recirculating cooling water system (69 facilities operating at 15 percent capacity utilization or more and 4 facilities operating at less than 15 percent capacity utilization). In addition, 50 percent of the remaining potentially regulated facilities have some other technology in place that reduces impingement or entrainment. Thirty-three percent of these facilities have fish handling or return systems that reduce the mortality of impinged organisms.

EPA finds that the design and construction technologies necessary to meet the proposed requirements are commercially available and economically practicable, because facilities can and have installed many of these technologies years after a facility began operation. Typically, additional design and construction technologies such as fine mesh screens, wedgewire screens, fish handling and return systems, and aquatic fabric barrier systems can be installed during a scheduled outage (operational shutdown). Referenced below are examples of facilities that installed these technologies after they initially started operating.

*Lovett Generating Station.* A 495 MW facility (nameplate, gas-fired steam), Lovett is located in Tomkins Cove, New York, along the Hudson River. The facility first began operations in 1949 and has 3 generating units with once-through cooling systems. In 1994, Lovett began the testing of an aquatic filter fabric barrier system to reduce entrainment, with a permanent system being installed the following year. Improvements and additions were made to the system in 1997, 1998, and 1999, with some adjustments being accepted as universal improvements for all subsequent installations of this vendor's technology at other locations.

*Big Bend Power Station.* Situated on Tampa Bay, Big Bend is a 1998 MW (nameplate, coal-fired steam) facility with 4 generating units. The facility first began operations in 1970 and added generating units in 1973, 1976, and

1985. Big Bend supplies cooling water to its once-through cooling water systems via two intake structures. When the facility added Unit 4 in 1985, regulators required the facility to install additional intake technologies. A fish handling and return system, as well as a fine-mesh traveling screen (used only during months with potentially high entrainment rates), were installed on the intake structure serving both the new Unit 4 and the existing Unit 3.

*Salem Generating Station.* A 2381 MW facility (nameplate, nuclear), Salem is located on the Delaware River in Lower Alloways Creek Township, New Jersey. The facility has two generating units, both of which use once-through cooling and began operations in 1977. In 1995, the facility installed modified Ristroph screens and a low-pressure spray wash with a fish return system. The facility also redesigned the fish return troughs to reduce fish trauma.

*Chalk Point Generating Station.* Located on the Patuxent River in Prince George's County, Maryland, Chalk Point has a nameplate capacity of 2647 MW (oil-fired steam). The facility has 4 generating units and uses a combination of once-through and closed cycle cooling (two once-through systems serving two generating units and one recirculating system with a tower serving the other two generating units). In 1983, the facility installed a barrier net, followed by a second set of netting in 1985, giving the facility a coarse mesh (1.25") outer net and a fine mesh (.75") inner net. The barrier nets are anchored to a series of pilings at the mouth of the intake canal that supplies the cooling water to the facility and serve to reduce both entrainment and the volume of trash taken in at the facility.

EPA believes that the technologies used as the basis for today's proposal are commercially available and economically practicable (see discussion below) for the industries affected as a whole, and have negligible non-water quality environmental impacts, including energy impacts. The proposed option would meet the requirement of section 316(b) of the CWA that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

## 3. Economic Practicability

EPA believes that the requirements of this proposal are economically practicable. EPA examined the annualized post-tax compliance costs of the proposed rule as a percentage of annual revenues to determine whether

the options are economically practicable. This analysis was conducted both at the facility and firm levels.

a. Facility Level

EPA examined the annualized post-tax compliance costs of the proposed rule as a percentage of annual revenues, for each of the 550 facilities subject to this proposed rule.<sup>52</sup> The revenue estimates are facility-specific baseline projections from the Integrated Planning Model (IPM) for 2008 (see Section VIII. Economic Analysis of this document for a discussion of EPA's analyses using the IPM). The results of this analysis show that the vast majority of facilities subject to the proposed rule, 409 out of 550, or approximately 74 percent, would incur annualized costs of less than 1 percent of revenues. Of these, 331 facilities would incur compliance costs of less than 0.5 percent of revenues. Eighty-two facilities, or 15 percent, would incur costs of between 1 and 3 percent of revenues, and 46 facilities, or 8 percent, would incur costs of greater than 3 percent. Eleven facilities are estimated to be baseline closures, and for one facility, revenues are unknown.<sup>53</sup> Exhibit 2 below summarizes these findings.

EXHIBIT 2.—PROPOSED RULE (FACILITY LEVEL)

Annualized cost-to-revenue ratio	All phase II	Percent of total phase II
<0.5% .....	331	60
0.5–1.0% .....	78	14
1.0–3.0% .....	82	15
>3.0% .....	46	8
Baseline Closure .....	11	2
n/a .....	1	0
<b>Total .....</b>	<b>550</b>	<b>100</b>

b. Firm Level

Facility-level compliance costs are low compared to facility-level revenues. However, the firms owning the facilities subject to the proposed rule may

<sup>52</sup> EPA's 2000 Section 316(b) Industry Survey identified 539 facilities that are subject to this proposed rule. EPA applied sample weights to the 539 facilities to account for non-sampled facilities and facilities that did not respond to the survey. The 539 analyzed facilities represent 550 facilities in the industry.

<sup>53</sup> IPM revenues for 2008 were not available for 11 facilities estimated to be baseline closures, 10 facilities not modeled by the IPM, and 9 facilities projected to have zero baseline revenues. EPA used facility-specific electricity generation and firm-specific wholesale prices as reported to the Energy Information Administration (EIA) to calculate the cost-to-revenue ratio for the 19 non-baseline closure facilities with missing information. The revenues for one of these facilities remained unknown.

experience greater impacts if they own more than one facility with compliance costs. EPA therefore also analyzed the economic practicability of this proposed rule at the firm level. EPA identified the domestic parent entity of each in-scope facility and obtained their sales revenue from publicly available data sources (the 1999 Forms EIA-860A, EIA-860B, and EIA-861; and the Dun and Bradstreet database) as well as EPA's 2000 Section 316(b) Industry Survey. This analysis showed that 131 unique domestic parent entities own the facilities subject to this proposed rule. EPA compared the aggregated annualized post-tax compliance costs for each facility owned by the 131 parent entities to the firms' total sales revenue. Based on the results from this analysis, EPA concludes that the proposed rule will be economically practicable at the firm level.

EPA estimates that the compliance costs will comprise a very low percentage of firm-level revenues. Of the 131 unique entities, 3 would incur compliance costs of greater than 3 percent of revenues; 10 entities would incur compliance costs of between 1 and 3 percent of revenues; 12 entities would incur compliance costs of between 0.5 and 1 percent of revenues; and the remaining 104 entities would incur compliance costs of less than 0.5 percent of revenues.<sup>54</sup> The estimated annualized compliance costs represent between 0.002 and 5.3 percent of the entities' annual sales revenue. Exhibit 3 below summarizes these findings.

EXHIBIT 3.—PROPOSED RULE (FACILITY LEVEL)

Annualized cost-to-revenue ratio	Number of phase II entities	Percentage of total phase II
<0.5% .....	104	79
0.5–1.0% .....	12	9
1.0%–3.0 .....	10	8
>3.0% .....	3	2
Baseline Closures .....	2	2
<b>Total .....</b>	<b>131</b>	<b>100</b>

c. Additional Impacts

As described in Sections VIII and X.J below, EPA also considered the potential effects of the proposed rule on installed electric generation capacity, electrical production, production costs, and electricity prices. EPA determined that the proposed rule would not lead

<sup>54</sup> Two entities only own Phase II facilities that are projected to be baseline closures. EPA estimated that for both entities, the compliance costs incurred would have been less than 0.5 percent of revenues.

to the early retirement of any existing generating capacity, and would have very small or no energy effects. After considering all of these factors, EPA concludes that the costs of the proposed rule are economically practicable.

d. Benefits

As described in Section IX., EPA estimates the annualized benefits of the proposed rule would be \$70.3 million for impingement reductions and \$632.4 million for reduced entrainment. For a more detailed discussion, also see the Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule.

4. Site-Specific Determination of Best Technology Available

Under today's proposed rule, the owner or operator of an Phase II existing facility may demonstrate to the Director that a site-specific determination of best technology available is appropriate for the cooling water intake structures at that facility if the owner or operator can meet one of the two cost tests specified under § 125.94(c)(1). To be eligible to pursue this approach, the facility must first demonstrate to the Director either (1) that its costs of compliance with the applicable performance standards specified in § 125.94(b) would be significantly greater than the costs considered by the Administrator in establishing such performance standards, or (2) that its costs of complying with such standards would be significantly greater than the environmental benefits at the site.

The proposed factors that may justify a site-specific determination of the best technology available requirements for Phase II existing facilities differ in two major ways from those in EPA's recently promulgated rule for new facilities. First, the new facility rule required costs to be "wholly disproportionate" to the costs EPA considered when establishing the requirement at issue rather than "significantly greater" as proposed today. EPA's record for the Phase I rule shows that those facilities could technically achieve and economically afford the requirements of the Phase I rule. New facilities have greater flexibility than existing facilities in selecting the location of their intakes and technologies for minimizing adverse environmental impact so as to avoid potentially high costs. Therefore, EPA believes it appropriate to push new facilities to a more stringent economic standard. Additionally, looking at the question in terms of its national effects on the economy, EPA notes that in contrast to the Phase I rule, this rule would affect facilities responsible for a

significant portion (about 55 percent) of existing electric generating capacity, whereas the new facility rule only affects a small portion of electric generating capacity projected to be available in the future (about 5 percent). EPA believes it is appropriate to set a lower cost threshold in this rule to avoid economically impracticable impacts on energy prices, production costs, and energy production that could occur if large numbers of Phase II existing facilities incurred costs that are more than significantly greater than but not wholly disproportionate to the costs in EPA's record. EPA invites comment on whether a "significantly greater" cost test is appropriate for evaluating requests for alternative requirements by Phase II existing facilities.

Second, today's proposal includes an opportunity for a facility to demonstrate significantly greater costs as compared to environmental benefits at a specific site. As stated above, EPA's record for the Phase I rule shows that new facilities could technically achieve and economically afford the requirements of the Phase I rule. At the same time, EPA was interested in expeditious permitting for these new facilities, due to increased energy demand, and particular energy issues facing large portions of the country. For this reason, EPA chose not to engage in a site-specific analysis of costs and benefits, because to do this properly would take time. Balancing the desire for expeditious permitting with a record that supported the achievability of the Phase I requirements, EPA believes it was reasonable not to adopt a cost benefit alternative for the Phase I rule. By contrast, Phase II existing facilities will be able to continue operating under their existing permits pending receipt of a permit implementing the Phase II regulations, even where their existing permit has expired (Permits may be administratively continued under section 558(c) of the Administrative Procedure Act if the facility has filed a timely application for a new permit). Therefore, delay in permitting, which could affect the ability of a new facility to begin operations while such a site-specific analysis is conducted, is not an issue for existing facilities. Also, EPA recognizes that Phase II existing facilities have already been subject to requirements under section 316(b). EPA is not certain that it is necessary to overturn the work done in making those determinations by necessarily requiring retrofit of the existing system without allowing facilities and permit authorities to examine what the associated costs and benefits. Once

again, because today's proposal would affect so many facilities that are responsible for such a significant portion of the country's electric generating capacity, EPA is interested in reducing costs where it can do so without significantly impacting aquatic communities (recognizing this could increase permitting work loads for the State and Federal permit writers).

EPA invites comment on whether the standards proposed today might allow for backsliding by facilities that have technologies or operational measures in place that are more effective than in today's proposal. EPA invites comment on approaches EPA might adopt to ensure that backsliding from more effective technologies does not occur.

If a facility satisfies one of the two cost tests in the proposed § 125.94(c)(1), it must propose less costly design and construction technologies, operational measures, and restoration measures to the extent justified by the significantly greater costs. In some cases the significantly greater costs may justify a determination that no additional technologies or measures are appropriate. This would be most likely in cases where either (1) the monetized benefits at the site were very small (e.g., a facility with little impingement mortality and entrainment, even in the calculated baseline), or (2) the costs of implementing any additional technologies or measures at the site were unusually high.

##### 5. What Is the Role of Restoration Under Today's Preferred Option?

Under today's preferred option, restoration measures can be implemented by a facility in lieu of or in combination with reductions in impingement mortality and entrainment. Thus, should a facility choose to employ restoration measures rather than reduce impingement mortality or entrainment, the facility could demonstrate to the Director that the restoration efforts will maintain the fish and shellfish in the waterbody, including the community structure and function, at a level comparable to that which would be achieved through § 125.94 (b) and (c). In those cases where it is not possible to quantify restoration measures, the facility may demonstrate that such restoration measures will maintain fish and shellfish in the waterbody at a level substantially similar to that which would be achieved under § 125.94 (b) and (c).

Similarly, should a facility choose to implement restoration measures in conjunction with reducing impingement mortality and entrainment through use

of design and construction technologies or operational measures, the facility would demonstrate to the Director that the control technologies combined with restoration efforts will maintain the fish and shellfish, including the community structure and function, in the waterbody at a comparable or substantially similar level to that which would be achieved through § 125.94 (b) and (c). EPA invites comment on all aspects of this approach. EPA specifically invites comment on whether restoration measures should be allowed only as a supplement to technologies or operational measures. EPA also seeks comment on the most appropriate spatial scale under which restoration efforts should be allowed "should restoration measures be limited to the waterbody at which a facility's intakes are sited, or should they be implemented on a broader scale, such as at the watershed or State boundary level.

Under today's preferred option, any restoration demonstration must address species of concern identified by the permit director in consultation with Federal, State, and Tribal fish and wildlife management agencies that have responsibility for aquatic species potentially affected by a facility's cooling water intake structure(s). EPA invites comment on the nature and extent of consultations with Federal, State, and Tribal fish and wildlife management agencies that would be appropriate in order to achieve the objectives of section 316(b) of the CWA. In general, EPA believes that consultations should seek to identify the current status of species of concern located within the subject waterbody and provide general life history information for those species, including preferred habitats for all life stages. Consultations also should include discussion of potential threats to species of concern found within the waterbody other than cooling water intake structures (i.e., identify all additional stressors for the species of concern), appropriate restoration methods, and monitoring requirements to assess the overall effectiveness of proposed restoration projects. EPA believes that it is important that the consultation occur because natural resource management agencies typically have the most accurate information available and thus are the most knowledgeable about the status of the aquatic resources they manage. EPA seeks comment on the type of information that would be appropriate to include in a written request for consultation submitted to the State, Tribal, and Federal agencies

responsible for management of aquatic resources within the waterbody at which the cooling water intake is sited. A copy of the request and any agency responses would be included in the permit application.

Under the preferred option, an applicant who wishes to include restoration measures as part of its demonstration of comparable performance would submit the following information to the Director for review and approval:

- A list and narrative description of the proposed restoration measures;
- A summary of the combined benefits resulting from implementation of technology and operational controls and/or restoration measures and the proportion of the benefits that can be attributed to these;
- A plan for implementing and maintaining the efficacy of selected restoration measures and supporting documentation that shows that restoration measures or restoration measures in combination with control technologies and operational measures will maintain the fish and shellfish, including community structure, at substantially similar levels to those specified at § 125.94 (b) and (c);
- A summary of any past or voluntary consultation with appropriate Federal, State, and Tribal fish and wildlife management agencies related to proposed restoration measures and a copy of any written comments received as a result of consultations; and
- Design and engineering calculations, drawings, and maps documenting that proposed restoration measures will meet the performance standard at § 125.94 (d).

EPA believes this information is necessary and sufficient for the proper evaluation of a restoration plan designed to achieve comparable performance for species of concern identified by the Director in consultation with fish and wildlife management agencies. EPA invites comment on whether this information is appropriate and adequate or if it should be augmented or streamlined. EPA invites comment on what specific, additional information should be included in a facility's restoration plan and/or which of the proposed information requirements are unnecessary.

For restoration measures such as fish restocking programs, EPA expects that applicants will be able to quantitatively demonstrate increases in fish and shellfish that are comparable to the performance that would be achieved by meeting the performance standards for reducing impingement and entrainment.

However, as it did in the preamble to the final new facility rule, EPA recognizes that, due to data and modeling limitations as well as the uncertainty associated with restoration measures such as creation of new habitats to serve as spawning or nursery areas, it may be difficult to establish quantitatively that some restoration measures adequately compensate for entrainment and impingement losses from cooling water withdrawals. The success of many approaches to restoration depends on the functions, behavior, and dynamics of complex biological systems that are often not scientifically understood as well as engineered technologies.

There are, however, several steps that can be taken to increase the certainty of attainment of performance levels by restoration measures. Most of these steps require detailed planning prior to initiation of restoration efforts. Under today's preferred option, restoration planners would take care to incorporate allowances in their plans for the uncertainties stemming from incomplete knowledge of the dynamics underlying aquatic organism survival and habitat creation. Plans would include provisions for monitoring and evaluating the performance of restoration measures over the lifetime of the measures. Provisions would also be made for mid-course corrections as necessary. Unexpected natural forces can alter the direction of a restoration project.<sup>55</sup> If uncertainty regarding levels of performance is high enough, restoration planners would consider restoration measures in addition to those otherwise calculated as sufficient in order to ensure adequate levels of performance. EPA invites comment on how to measure "substantially similar performance" of restoration measures and methods that can be used to reduce the uncertainty of restoration activities undertaken as part of today's preferred option.

EPA recognizes that substantial information exists regarding wetlands mitigation and restoration. For example, tools and procedures exist to assess wetlands in the context of section 404 of the Clean Water Act.<sup>56</sup> However, restoration of other aquatic systems such as estuaries is complex and continues to evolve. EPA seeks

comment on how it may measure the success or failure of restoration activities given the high degree of uncertainty associated with many areas of this developing science and that many of these activities do not produce measurable results for many months or years after they are implemented. For these reasons, EPA requests comment on whether to require that a facility using restoration measures restore more fish and shellfish than the number subjected to impingement mortality or entrainment. EPA believes that restoring or mitigating above the level that reflects best technology available for minimizing adverse environmental impact (e.g., restocking higher numbers of fish than those impinged or entrained by facility intakes or restoring aquatic system acreages at ratios greater than one-to-one) would help build a margin of safety, particularly when the uncertainties associated with a particular restoration activity are known to be high.

The concept of compensatory mitigation ratios being greater than one-to-one is found in other programs. For example, under the CWA section 404 program no set mitigation ratio exists, however, current policies require no net loss of aquatic resources on a programmatic basis. The permitting authority often requires permit applicants to provide more than one-to-one mitigation on an acreage basis to address the time lapse between when the permitted destruction of wetlands takes place and when the newly restored or created wetlands are in place and ecologically functioning. The permit may also require more than one-to-one replacement to reflect the fact that mitigation is often only partially successful. Alternatively, in circumstances where there is a high confidence that the mitigation will be ecologically successful, the restoration/creation has already been completed prior to permitted impacts, or when the replacement wetlands will be of greater ecological value than those they are replacing, the permitting authority may require less than one-to-one replacement.

In the case of section 316(b), restocking numbers and restoration ratios could be established either by the Director on a permit-by-permit basis or by EPA in the final rule. EPA requests comment on establishing margins of safety for restoration measures (particularly for activities associated with outcomes having a high degree of uncertainty) and identifying the appropriate authority for establishing safety measures. EPA also seeks comment on an appropriate basis for

<sup>55</sup> For a discussion of the extensive range of experience with wetland restoration efforts, see *Wetlands*, Third Edition, William J. Mitsch and James G. Gosselink, pp. 653–686.

<sup>56</sup> For a general discussion on different assessment procedures see *The Process of Selecting a Wetland Assessment Procedure: Steps and Considerations*, by Candy C. Bartoldus, *Wetland Journal*, Vol. 12, No. 4, Fall 2000.

establishing safety margins (e.g., based exclusively on project uncertainty, relative functional value or rareness of the system being restored, or a combination of these) to ensure that restoration measures achieve performance comparable to intake technologies.

EPA also recognizes that restoration measures may in some cases provide additional environmental benefits that design and construction technologies and operational measures focused solely on reducing impingement and entrainment would not provide. For example, fish restocking facilities may be able to respond, on relatively short notice, to species-specific needs or threats, as identified by fish and wildlife management agencies. Habitat restoration measures may provide important benefits beyond direct effects on fish and shellfish numbers, such as flood control, habitat for other wildlife species, pollution reduction, and recreation. EPA requests comment on whether and how additional environmental benefits should also be considered in determining appropriate fish and shellfish rates for restoration projects.

Assessing the full range of requirements necessary for the survival of aquatic organisms requires understanding and use of knowledge from multiple scientific disciplines (aquatic biology, hydrology, landscape ecology) that together address the biological and physical requirements of particular species. Under today's preferred option, restoration planners would utilize the full range of disciplines available when designing restoration measures for a facility. Plans utilizing an insufficient range of knowledge are more likely to fail to account for all aquatic organism survival requirements.

For some aquatic organisms, or for certain life stages of some aquatic organisms, there may not be sufficient knowledge of the factors required for that organism's survival and thus restoration planners would be unable to address those factors directly in a restoration plan. In such cases, it may be necessary for restoration planners to plan to create habitat that replicates as closely as possible those habitats in which the aquatic organisms are found to thrive naturally. Suitable habitat can be created or restored, or existing habitats can be enhanced in order to provide suitable habitat for the organisms of concern. In this manner, appropriate conditions can be created even without full understanding of an organism's requirements. Habitat approaches also have the benefit, when

properly designed, of simultaneously providing suitable survival conditions for multiple species. In contrast, measures such as stocking and fish ladders provide benefits for much more limited number of species and life stages.

In some cases, conservation of existing, functional habitats—particularly conservation of habitats that are vulnerable to human encroachment and other anthropogenic impacts—may be desirable as part of a facility's restoration effort. In the case of conservation, the functionality of the habitat would not be compromised, therefore eliminating much of the uncertainty associated with measuring the success of other restoration efforts such as habitat enhancement or creation. However, because conserved habitat is already contributing to the relative productivity and diversity of an aquatic system, conservation measures would not necessarily ensure a net benefit to the waterbody or watershed of concern. EPA seeks comment on whether habitat conservation would be an appropriate component of a facility's restoration efforts.

Restoration projects should not unduly compromise the health of already-existing aquatic organisms in order to restore aquatic organisms for purposes of section 316(b). Such alterations could negate or detract from accomplishments under a restoration plan and produce an insufficient net benefit. For example, fish stocking programs might introduce disease or weaken the genetic diversity of an ecosystem. Habitat creation programs should not alter well-functioning habitats to better support species of concern identified in the restoration plan, but rather should focus on restoring degraded habitats that historically supported the types of aquatic organisms currently impacted by a facility's cooling water intake.

Another issue to consider when relying on restoration projects that involve habitat creation is that many such projects can take months or years to reach their full level of performance. The performance of these projects often relies heavily on establishment and growth of higher vegetation and of the natural communities that rely on such vegetation. Establishment and growth of both vegetation and natural communities can take months to years depending on the type of habitat under development. Restoration planners need to ensure that performance levels are met at all points in a mitigation process. Where facilities are depending in part on habitat creation, this may entail supplementing habitat creation

measures with other restoration measures during the early stages of habitat creation in order to ensure all facility impacts are properly mitigated.

Under the preferred option, restoration plans should be developed in sufficient detail to address the issues above before significant resources are committed or other actions taken that are difficult to reverse. EPA invites comment on the role of restoration in addressing the impact of cooling water intake structures. EPA invites commenters to suggest alternative approaches to ensuring that restoration efforts are successful.

## 6. Impingement and Entrainment Assessments

### a. What Are the Minimum Elements of an Impingement Mortality and Entrainment Characterization Study?

Today's proposal requires the permit applicant to conduct an Impingement Mortality and Entrainment Characterization Study § 125.95(b)(3) to support many important analyses and decisions. The data from this Study supports development of the calculation baseline for evaluating reductions in impingement mortality and entrainment, documents current impingement mortality and entrainment, and provides the basis for evaluating the performance of potential technologies, operational measures and/or restoration measures. Should a facility request a site-specific determination of best technology available for minimizing adverse environmental impact, the Study would provide the critical biological data for estimating monetized benefits.

EPA invites comment on whether the narrative criteria at § 125.95(b)(1) are sufficiently comprehensive and specific to ensure that scientifically valid, representative data are used to support the various approaches for determining best technology available for minimizing adverse environmental impact in today's proposal. EPA recognizes the difficulties in obtaining accurate and precise samples of aquatic organisms potentially subject to impingement and entrainment. EPA also recognizes that biological activity in the vicinity of a cooling water intake structure can vary to great degree, both within and between years, seasons and intervals including time-of-day. EPA invites comment on whether it should set specific, minimum monitoring frequencies and/or whether it should specify requirements for ensuring appropriate consideration of uncertainty in the impingement mortality and entrainment estimates.

b. What Should Be the Minimum Frequencies for Impingement and Entrainment Compliance Monitoring?

Today's proposal requires compliance monitoring as specified by the Director in § 125.96, but does not specify minimum sampling frequencies or durations. EPA is considering specifying minimum frequencies for impingement and entrainment sampling for determining compliance. EPA invites comment on including minimum sampling frequencies and durations as follows: for at least two years following the initial permit issuance, impingement samples must be collected at least once per month over a 24 hour period and entrainment samples must be collected at least biweekly over a 24 hour period during the primary period of reproduction, larval recruitment and peak abundance. These samples would need to be collected when the cooling water intake structure is in operation. Impingement and entrainment samples would be sufficient in number to give an accurate representation of the annual and seasonal impingement and entrainment losses for all commercial, recreational and forage based fish and shellfish species and their life stages at the Phase II existing facility as identified in the Impingement Mortality and Entrainment Characterization Study required under § 125.95(b)(3). Sample sets would be of sufficient size to adequately address inter-annual variation of impingement and entrainment losses. Sampling would be planned to eliminate variation in data due to changes in sampling methods. Data would also be collected using appropriate quality assurance/quality control procedures.

EPA invites comment on whether more frequent sampling would be appropriate to accurately assess diel, seasonal, and annual variation in impingement and entrainment losses. EPA also invites comment on whether less frequent compliance biological monitoring would be appropriate (perhaps depending on the technologies selected and implemented by a facility).

7. How Is Entrainment Mortality and Survival Considered in Determining Compliance With the Proposed Rule?

Today's proposed rule sets a performance standard for reducing entrainment rather than reducing entrainment mortality. EPA choose this approach because EPA does not have sufficient data to establish performance standards based on entrainment mortality for the technologies used as the basis for today's proposal. Entrainment mortality studies can be

very difficult to conduct and interpret for use in decisionmaking (see section VI.A.8.b.below). EPA invites comment on regulatory approaches that would allow Phase II existing facilities to incorporate estimates of entrainment mortality and survival when determining compliance with the applicable performance standards proposed in § 125.94(b) of today's proposed rule. EPA invites commenters to submit any studies that document entrainment survival rates for the technologies used as the basis for today's performance standards and for other technologies.

8. What Should Be Included in a Demonstration To Compare Benefits to Costs?

As part of a Site-Specific Determination of Best Technology Available specified proposed in § 125.94(c) of today's proposed rule, a Phase II existing facility can attempt to demonstrate to the Director that the costs of compliance with the applicable performance standards proposed in § 125.94(b) would be significantly greater than the benefits of complying with such performance standards at the site. EPA is considering whether it should develop regulatory requirements or guidance to outline appropriate methodologies to ensure that a reliable and objective valuation of benefits is derived from the best available information. The elements in the benefit assessment guidance would, at a minimum, include standards for data quality, acceptable methodologies, technical peer review, and public comment.

a. What Should Be the Appropriate Methodology for Benefits Assessment?

EPA believes that a rigorous environmental and economic analysis should be performed when a facility seeks a site-specific determination of best technology available due to significantly greater cost as compared to the benefits of compliance with the applicable performance standards. EPA invites comment on which of these methodologies, or any other, is the most appropriate for determining a fair estimate of the benefits that would occur should the Phase II existing facility implement technology to comply with the applicable performance standards. In addition, EPA invites comment on whether narrative benefits assessments should supplement these methodologies to properly account for those benefits which cannot be quantified and monetized.

(1) Quantified and Monetized Baseline Impingement and Entrainment Losses

To evaluate the total economic impact to fisheries with regard to impingement and entrainment losses at an existing facility, the impacts on commercial, recreational, and forage species must be evaluated. Commercial fishery impacts are relatively easy to value because commercially caught fish are a commodity with a market price for the individual species. Recreation fishery impacts are based on benefits transfer methods, applying the results from nonmarket valuation studies. Valuing recreational impacts involves the use of willingness-to-pay values for increases in recreational catch rates. The analysis of the economic impact of forage species losses can be determined by estimating the replacement costs of these fish if they were to be restocked with hatchery fish, or by considering the foregone biomass production of forage fish resulting from impingement and entrainment losses and the consequential foregone production of commercial and recreation species that prey on the forage species. Trophic transfer efficiency is used to estimate the value of forage fish in terms of the foregone biomass production and the consequential foregone production of commercial and recreational species that prey upon them. This methodology can also incorporate nonuse or passive values. Nonuse or passive use values include the concepts of existence (stewardship) and bequest (intergenerational equity) motives to value environmental changes. In Regulatory Impact Analyses, EPA values nonuse impacts at 50% of value of the recreational use impact.<sup>57</sup> EPA invites comment on the inclusion of this approach for estimating nonuse or passive values. Examples of the use of this method for evaluating benefits are provided in the Case Study Document.

EPA notes that in locations where fisheries have been depleted by cumulative and long term impingement and entrainment losses from cooling water intake structures, this methodology may not be the most appropriate as it may have a tendency to underestimate the long term benefits associated with technology implementation.

(2) Random Utility Model

The Random Utility Model (RUM) estimates the effect of improved fishing opportunities to determine recreational

<sup>57</sup> Fisher, A. and R. Raucher. 1984. Intrinsic benefits of improved water quality: Conceptual and empirical perspectives. *Advances in Applied Micro-Economics*. 3:37-66.

fishing benefits due to reduced impingement and entrainment. The main assumption of this model is that anglers will get greater satisfaction, and thus greater economic value, from sites where the catch rate is higher. When anglers enjoy fishing trips with higher catch rates, they may take more fishing trips resulting in a greater overall value for fishing in the region. This method requires information on the socioeconomic characteristics of anglers and their fishing preference in terms of location and target species, information on site characteristics that are important determinants of anglers' behavior, and the estimated price of visiting the sites. Two models are used for estimating the total economic value of recreational fish to anglers, the discrete choice model which focuses on the choice of fishing site by individual anglers and the trip participation model which estimates the number of trips that an angler will take annually. A more thorough description of the RUM can be found in Chapter A10 of the Case Study Document. Examples of its use are provided in Chapter 5 of the case studies for Delaware Bay (Part B), Ohio River (Part C) and Tampa Bay (Part F).

The greatest strength of this model is that it is able to estimate a theoretically defensible monetary value for recreational fishing benefits. The weakness in the model is its dependence on the availability of survey data on angler preferences, and the bias associated with conducting a survey. This approach is also limited to estimating recreational benefits only, and should be used in conjunction with another methodology that values commercial and forage species impacts and other benefit categories where these are significant.

### (3) Contingent Valuation Approach

Stated preference methods attempt to measure willingness-to-pay values directly. Unlike the revealed preference methods, such as the RUM described above, that determine values for environmental goods and services from observed behavior, stated preference methods rely on data from surveys that directly question respondents about their preferences to measure the value of environmental goods and services. Contingent valuation is one of the most well developed of the stated preference methods. Contingent valuation surveys either ask respondents if they would pay a specified amount for a described commodity (usually a change in environmental quality) or ask their highest willingness-to-pay for that commodity. For example, in the case of section 316(b), a contingent valuation

survey might ask how much individuals would be willing to have their electricity bill increase from their utility's power plants to avoid the impacts of impingement and entrainment on fish and shellfish, as well as impacts on threatened and endangered species. One strength of contingent valuation estimates is that they include the nonuse values such as option, existence, and bequest values, so adjustments to the estimates to cover these values are not needed. A weakness of this approach is that respondents are asked to value a hypothetical good and they do not have to back up their stated willingness-to-pay with actual expenditures. However, this concern can be minimized by placing the valuation questions in the context of familiar economic transactions (e.g., increases in electricity bills).

### b. Should Estimates of Entrainment Mortality and Survival Be Included in Benefits Assessments?

The proposed rule language for Phase II existing facilities does not preclude the use of estimates of entrainment mortality and survival when presenting a fair estimation of the monetary benefits achieved through the installation of the best technology available, instead of assuming 100 percent entrainment mortality. In EPA's view, estimates of entrainment mortality and survival used for this purpose should be based on sound scientific studies. EPA believes such studies should address times of both full facility capacity and peak abundance of entrained organisms. EPA requests comment on whether it is appropriate to allow consideration of entrainment mortality and survival in benefit estimates, and if so, should EPA set minimum data quality objectives and standards for a study of entrainment mortality and survival used to support a site-specific determination of best technology available for minimizing adverse environmental impact. EPA may decide to specify such data quality objectives and standards either in the final rule language or through guidance.

A more thorough discussion of entrainment survival is provided in Chapter D7 of the EBA. In this chapter, EPA has reviewed a number of entrainment survival studies (see DCN 2-017A-R7 in Docket W-00-03). EPA's preliminary review of these studies has raised a number of concerns regarding the quality of data used to develop some estimates of entrainment survival. Specifically, the majority of studies reviewed collected samples at times of low organismal abundance, at times when the facility was not operating at

full capacity, at times when biocides were not in use, and at times which may not reflect current entrainment rates at the facility. These sampling conditions may lead to overestimation of entrainment survival. In addition, the majority of studies reviewed had very low sample sizes and calculated survival for only a few of all species entrained. EPA is also concerned that entrainment survival estimates were based on mortal effects only and did not address sub-lethal entrainment effects, which can include changes to organismal growth, development, and reproduction. EPA invites comment on its preliminary review of the data quality of entrainment survival studies provided in Chapter D7. EPA also requests that commenters submit additional entrainment survival or mortality studies for review.

### 9. When Could the Director Impose More Stringent Requirements?

Proposed § 125.94(e) provides that the Director could establish more stringent requirements relating to the location, design, construction, or capacity of a cooling water intake structure at a Phase II existing facility than those that would be required based on the proposed performance standards in the rule (§ 125.94(b)), or based on the proposed site-specific determination of best technology allowed under the rule (§ 125.94(c)), where compliance with the proposed requirements of § 125.94(b) or (c) would not meet the requirements of applicable Tribal, State or other Federal law. The relevant State law may include, but is not necessarily limited to, State or Tribal water quality standards, including designated uses, criteria, and antidegradation provisions; endangered or threatened species or habitat protection provisions; and other resource protection requirements. The term "other Federal law" is intended to denote Federal laws others than section 316(b), and could include, but not be limited to, the Endangered Species Act, 16 U.S.C. 1531 *et seq.*, the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.*, the Fish and Wildlife Coordination Act, 16 U.S.C. 661 *et seq.*, the Wild and Scenic Rivers Act, 16 U.S.C. 1273 *et seq.*, and potentially the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.* See 40 CFR 122.49 for a brief description of these and certain other laws. Note that these laws may apply to federally issued NPDES permits independent of this proposed rule.

EPA expects that Federal, State, and Tribal resource protection agencies will work with Federal and State Directors and permittees to identify and assess

situations where Federal, State, or Tribal law might be violated, particularly where such violations involve impacts to species of concern. For example, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service implement the Endangered Species Act. Where a NPDES permit for a cooling water intake structure would comply with the performance requirements of § 125.94(b) or (c) but may harm endangered species or critical habitat, EPA expects the resource agencies to contribute their expertise to the evaluation and decisionmaking process.

EPA is considering whether to establish additional criteria for when the Director could establish more stringent requirements. EPA requests comment on specifying that more stringent requirements would be appropriate when compliance with the applicable requirements in § 125.94(b) and (c) would (1) result in unacceptable effects on migratory and/or sport or commercial species of concern to the Director; and (2) not adequately address cumulative impacts caused by multiple intakes or multiple stressors within the waterbody of concern. Unacceptable effects on sport or commercial species of concern might include a significant reduction in one or more such species due to direct or indirect effects of one or more cooling water intake structures. Examples of unacceptable effects on migratory species of concern might include the interference with or disruption of migratory pathways, patterns, or behavior. Multiple stressors within the waterbody of concern might include toxics, nutrients, low dissolved oxygen, habitat loss, non-point source runoff, and pathogen introductions. EPA is also concerned about the potential stress from multiple intakes because demonstration studies are typically conducted on an individual facility basis and do not consider the effects of multiple intakes on local aquatic organisms.

EPA notes that under section 510 of the CWA, States already have the authority to establish more stringent conditions in any permit in accordance with State law. However, this provision does not apply in cases where EPA is the permitting authority. EPA requests comment on whether any explicit regulatory provision for more stringent requirements is needed in light of section 510.

EPA also notes that States have designated many waterbodies for the propagation of fish and shellfish that are not attaining such uses due to pollution, and that, in these waters, aquatic communities may be significantly

stressed or under-populated. EPA also believes that in some waterbodies, heavy fishing pressures have greatly altered and reduced aquatic communities. EPA anticipates that studies valuing the monetized benefits of reducing impingement and entrainment may not identify significant site-specific benefits in such areas and, should one or more permit applicants request site-specific determinations of less-costly best technology available for minimizing adverse environmental impact, a State may not have authority to deny such requests. EPA requests comment on whether recovery of aquatic communities in such waterbodies might be delayed by use of the significantly greater cost-to-benefit test proposed today. EPA requests comment on an regulatory alternative that would explicitly allow the Director to require more stringent technologies or measures where not doing so would delay recovery of an aquatic species or community that fish and wildlife agencies are taking active measures to restore, such as imposing significant harvesting restrictions.

#### 10. Discussion of the 5% Flow Threshold in Freshwater Rivers

The withdrawal threshold is based on the concept that, absent any other controls, withdrawal of a unit volume of water from a waterbody will result in the entrainment of an equivalent unit of aquatic life (such as eggs and larval organisms) suspended in that volume of the water column. This, in turn, is related to the idea that, absent any controls, the density of aquatic organisms withdrawn by a cooling water intake structure is equivalent to the density of organisms in the water column. Thus, if 5% of the mean annual flow is withdrawn, it would generally result in the entrainment of 5% of the aquatic life within the area of hydraulic influence of the intake. EPA believes that it is unacceptable to impact more than 5% of the organisms within the area of an intake structure. Hence, if the facility withdraws more than 5% of the mean annual flow of a freshwater river or stream, the facility would be required to reduce entrainment by 60–90%. EPA discussed these concepts in more detail and invited comment on the use of this threshold and supporting documents in its NODA for the New Facility Rule (66 FR 28863). In today's proposed rule, EPA again invites comment on use of this threshold for Phase II existing facilities and on the supporting documents for this threshold that were referenced in the NODA.

EPA also requests comment on the following alternative withdrawal

thresholds for triggering the requirement for entrainment controls: (1) 5% of the mean flow measured during the spawning season (to be determined by the average of flows during the spawning season, but remaining applicable to non-spawning time periods); (2) 10% or 15% of the mean annual or spawning season flow; (3) 25% of the 7Q10; and (4) a species-specific flow threshold that would use minimum flow requirements of a representative species to determine allowable withdrawals from the waterbody.

#### 11. State or Tribal Alternative Requirements That Achieve Comparable Environmental Performance to the Regulatory Standards Within a Watershed

In § 125.90, today's proposal includes an alternative where an authorized State or Tribe may choose to demonstrate to the Administrator that it has adopted alternative regulatory requirements that will result in environmental performance within a watershed that is comparable to the reductions in impingement mortality and entrainment that would otherwise be achieved under § 125.94. If a State or Tribe can successfully make this demonstration, the Administrator is to approve the State or Tribe's alternative regulatory requirements.

EPA is proposing that such alternative requirements achieve comparable performance at the watershed level, rather than at larger geographic scales or at the individual facility-level, to allow States and Tribes greater flexibility and, potentially, greater efficiency in efforts to prevent or compensate for impingement mortality and entrainment losses, while still coordinating those efforts within defined ecological boundaries where the increased impacts are directly offset by controls or restoration efforts. Requiring performance level assessment to take place at the watershed level ensures that facility mitigation efforts take the overall health of the waterbody in the target watershed into account.

The Agency requests comment on all aspects of this approach, including the appropriate definition of watershed. A watershed is generally a hydrologically-delineated geographic area, typically the area that drains to a surface waterbody or that recharges or overlays ground waters or a combination of both. Watersheds can be defined at a variety of geographic scales. The United States Geological Survey (USGS) defines watersheds (hydrologic units) in the United States at scales ranging from the drainage areas of major rivers, such as

the Missouri, to small surface drainage basins, combinations of drainage basins, or distinct hydrologic features. The USGS is currently defining additional, more detailed subdivisions of currently existing hydrologic units. (See <http://water.usgs.gov/GIS/huc.html>.) Watersheds have been defined for other natural resource programs as well (e.g., the Total Maximum Daily Load program, actions under section 306 of the Coastal Zone Management Act).

In general, the appropriate scale at which to define a watershed depends on a program's goals. EPA believes that the watershed scale selected for the purposes of determining comparability of a State or Tribal alternative requirements should allow confident accounting of impingement and entrainment levels at facilities within the watershed and of the results of the actions taken to prevent or compensate for impingement and entrainment losses. EPA invites comment on use of the USGS eight-digit hydrologic unit (generally about the size of a county) as the maximum geographic scale at which an authorized State or Tribe could establish alternative regulatory requirements. A State or Tribe could seek to establish the comparability of alternative regulatory requirements for as many eight-digit hydrologic units as it saw fit, but would need to demonstrate that its alternative requirements achieve environmental performance comparable to the performance standards proposed in today's rule within each such unit.

EPA believes that defining watersheds at too small a scale might not allow sufficient flexibility. However, EPA is concerned that defining watersheds at a very large scale increases the potential that there will be no direct ecological connection between increased impacts in one area and compensatory efforts in another.

EPA also recognizes that States sometimes assign higher priority to protecting some waters over others. This may be due to the exceptional environmental, historic, or cultural value of some waters, or conversely to a concern with multiple stresses already occurring in a watershed. It could also be based on the presence of individual species of particular commercial, recreational, or ecological importance. For these reasons, States with alternative requirements might choose to provide more protection that would be achieved under § 125.94 in some watersheds and less protection in others. Under current language in proposed § 125.90, States could not use such an approach because they would not be able to demonstrate comparable

environmental performance within each watershed. EPA requests comment on whether it should instead allow States to demonstrate comparable environmental performance at the State level, thus allowing States the flexibility to focus protection on priority watersheds.

The standard provided in proposed § 125.90 for evaluating alternate State requirements is "environmental performance that is comparable to the reductions that would otherwise be achieved under § 125.94." EPA recognizes that it may not always be possible to determine precisely the reductions in impingement and entrainment associated with either § 125.94 or the alternate State requirements, particularly at the watershed level or State-wide. Furthermore, alternate State requirements may provide additional environmental benefits, beyond impingement and entrainment reductions, that the State may wish to factor into its comparability demonstration. However, in making this demonstration, the State should make a reasonable effort to estimate impingement and entrainment reductions that would occur under § 125.94 and under its alternate requirements, and should clearly identify any other environmental benefits it is taking into account and explain how their comparability to impingement and entrainment reduction under § 125.94 is being evaluated. EPA invites comment on the most appropriate scale at which to define a watershed to reflect the variability of the nature of the ecosystems impacted by cooling water intake structures within a State or Tribal area and on methods for ensuring ecological comparability within watershed-level assessments. EPA also invites comment on whether defined watershed boundaries for the purpose of section 316(b) programs should lie entirely within the political boundaries of a Tribe or State unless adjoining States and/or Tribes jointly propose to establish alternative regulatory requirements for shared watersheds.

## 12. Comprehensive Cost Evaluation Study

Section 125.94 of today's proposal allows a facility to request a site-specific determination of best technology available for minimizing adverse environmental impact based on costs significantly greater than in EPA's record, or significantly greater than site-specific benefits. Section 125.95(b)(6)(i) requires a facility seeking such a

determination to conduct a Comprehensive Cost Evaluation Study.

To adequately demonstrate site-specific compliance costs, EPA believes that a facility would need to provide engineering cost estimates that are sufficiently detailed to allow review by a third party. The preferred cost estimating methodology, in the Agency's view, is the adaption of empirical costs from similar projects tailored to the facility's characteristics. The submission of generic costs relying on engineering judgment should be verified with empirical data wherever possible. In the cases where empirical demonstration costs are not available, the level of detail should allow the costs to be reproduced using standard construction engineering unit cost databases. These costs should be supported by estimates from architectural and engineering firms. Further, the engineering assumptions forming the basis of the cost estimates should be clearly documented for the key cost items.

The Agency and other regulatory entities have reviewed recent cost estimates submitted by permittees for several section 316(b) and 316(a) demonstrations. As discussed in Chapter X of the Technical Development Document, in several cases where the level of detail provided by the permittee was sufficient to afford a detailed review, EPA has some concerns about the magnitude of these cost estimates. In other cases, the engineering assumptions that formed the basis of the cost submissions were insufficiently documented to afford a critical review. Based in part on these examples, the Agency emphasizes the importance of empirically verified and well documented engineering cost submissions.

The Agency anticipates that the inclusion of a site-specific cost to benefit test will continue to be of concern to local regulatory entities and the regulated community in light of the associated burden on permit writers. In two recent cases, significant burden was associated with engineering cost reviews. In one case, a regional authority utilized a significant portion of its annual permitting budget (over \$80,000) and significant man-hours (approximately 500 hours) to review the engineering cost estimates submitted in a single permit demonstration. In another case, EPA conducted approximately 200 hours of senior-level review of a single engineering estimate that had already undergone significant, and costly, local regulatory review. In each of these cases, the reviewers identified areas where they believed the

permit applicant had significantly overestimated costs of a potential compliance option. The level of effort was sufficient to identify the areas of concern, but not to develop counter proposals for cost estimates.

However, EPA believes it is important to have a site-specific option in the rule to cover cases of exceptionally high costs and/or minimal benefits. By EPA's estimates, the costs for some of the technologies on which the presumptive performance standards are based may be several million dollars. In cases where, due to the site-specific factors, an individual facility's costs are significantly higher, or the benefits are minimal, the additional permitting burden hours (upwards of several hundred hours) associated with the site-specific estimate may be appropriate. EPA anticipates that many, if not most, facilities will choose to comply with the presumptive standards, but believes that for those facilities with exceptionally high costs or exceptionally low benefits, the site-specific provisions provide an important "safety valve."

EPA invites comment on whether the Agency should establish minimum standards for a Comprehensive Cost Evaluation Study and on whether such standards should be established by regulation or as guidance only. EPA also invites comment on the above discussion of the burden that reviewing site-specific cost studies poses for permitting authorities and on its belief that site-specific provisions to address cases of unusually high costs or unusually low benefits are necessary.

### 13. Cost-Benefit Test

EPA requests comment on the cost-benefit provision in § 124.95. EPA placed several documents in the docket for the new facilities final rule (see docket items 2-034A and 2-034B) that summarized information from several States on the burdens of site-specific decisionmaking. To make section 316(b) determinations for large power plants in the Southeast in the late 1970s and early 1980s, EPA estimates a workload of as much as 650 person hours per permit and \$25,000 contract dollars, with an additional (and potentially larger) resource investment by State permitting authorities. To reissue a permit to the Salem Nuclear Generating Station, the New Jersey Department of Environment Protection recently reviewed and considered a 36-volume permit application supported by 137 volumes of technical and reference materials. The facility filed its application in 1994; NJDEP made its decision in 2001. EPA invites comments on these burden estimates.

As noted above, however, while concerned about the burden of site-specific section 316(b) determinations, EPA also recognizes the much larger costs of complying with the presumptive performance standards and believes that some provision for situations where costs are significantly greater than benefits is appropriate. EPA notes that at some sites, impingement and entrainment losses are minimal. In such cases it may not make sense to require a facility to spend a lot of dollars to comply with presumptive performance requirements. EPA is also concerned about the potential for members of the public who object to the authority's site-specific determinations to raise challenges that must be resolved in administrative appeals that can be very lengthy and burdensome, followed in some cases by judicial challenges. An ongoing State study of permitting workloads estimates that appeals of NPDES permits issued to major facilities require 40 hours to resolve in a simple case and up to 240 hours for a very complex permit.<sup>58</sup> EPA Region 1 estimates that one year is required to resolve a complex administrative appeal, involving significant amounts of technical and legal resources. Should the permit appeal be followed by a judicial challenge, EPA Region 1 estimates an additional two years or more of significant investment of technical and legal resources in one decision, with additional time and resources needed if the initial judicial decision is appealed.<sup>59</sup> Again, however, EPA notes that these burdens may be small compared to the potential costs of complying with presumptive performance standards. EPA invites comments on ways to incorporate site-specific consideration of costs and benefits without undue burden on the Director. In particular, EPA invites comment on decision factors and criteria for weighing and balancing these factors that could be included in a regulation or guidance that would streamline the workload for evaluating site-specific applications and minimize the potential for legal challenges.

<sup>58</sup> State Water Quality Management Resource Model, ver.3.16 (9/00). (See Docket for today's proposal.) This is an on-going joint effort between states and EPA to develop information on the resource "gap" facing State water quality management programs. The information included in the model reflects the consensus of the participating states and is intended to reflect averages.

<sup>59</sup> Communication from Mr. Mark Stein, Office of Regional Counsel, US EPA Region I, Boston, MA, dated January 24, 2002. (See Docket for today's proposal.)

### 14. Capacity Utilization

In § 125.94 (b)(2), the Agency proposes standards for reducing impingement mortality but not entrainment when a facility operates less than 15 percent of the available operating time over the course of several years. Fifteen percent capacity utilization corresponds to facility operation for roughly 55 days in a year (that is, less than two months). The Agency refers to this differentiation between facilities based on their operating time as a capacity utilization cut-off. The Agency's record demonstrates that facilities operating at capacity utilization factors of less than 15 percent are generally facilities of significant age, including the oldest facilities within the scope of the rule. Frequently, entities will refer to these facilities as peaker plants, though the definition extends to a broader range of facilities. These peaker plants are less efficient and more costly to operate than other facilities. Therefore, operating companies generally utilize them only when demand is highest and, therefore, economic conditions are favorable. Because these facilities operate only a fraction of the time compared to other facilities, such as base-load plants, the peaking plants achieve sizable flow reductions over their maximum design annual intake flows. Therefore, the concept of an entrainment reduction requirement for such facilities does not appear necessary. Additionally, the plants typically operate during two specific periods: the extreme winter and the extreme summer demand periods. Each of these periods can, in some cases, coincide with periods of abundant aquatic concentrations and/or sensitive spawning events. However, it is generally accepted that peak winter and summer periods will not be the most crucial for aquatic organism communities on a national basis.

Of the facilities exceeding the capacity utilization cut-off, the median and average capacity utilization is 50 percent. As a general rule, steam plants operate cyclically between 100 percent load and standby. In turn, the intake flow rate of a typical steam plant cycles between full design intake flow and standby. Facilities operating with an average capacity utilization of 50 percent would generally withdraw more than three times as much water over the course of time than a facility with a capacity utilization of less than 15. Therefore, the capacity utilization cut-off coincides with an approximate flow reduction, and hence entrainment reduction, of roughly 70 percent as compared to the average facility above

the cut-off, which is within the range of the performance standard for entrainment reduction. Of the 539 facilities for which the Agency has detailed intake flow information, 53 would fall under the capacity utilization cut-off. Were the Agency to establish the cut-off at less than 20 percent capacity utilization, an additional 18 facilities would be subject to the reduced requirements and the comparable flow reduction would be roughly 60 percent. However, the operating period would extend to approximately 75 days (that is, 2.5 months). Were the Agency to establish the cut-off at less than 25 percent capacity, 108 of the 539 facilities would be subject to the reduced standards, and the comparable entrainment reduction would be roughly 54 percent. For a hypothetical 25 percent capacity utilization cut-off, the operating period would extend to approximately three months.

EPA invites comment on its proposed approach to regulating Phase II existing facilities with limited capacity utilization. EPA specifically invites comment on the above alternative thresholds for using capacity utilization to establish performance standard that address impingement mortality but not entrainment.

#### *B. Other Technology-Based Options Under Consideration*

EPA also considered a number of other technology-based options for regulating Phase II existing facilities. As in the proposed option, any technology-based options considered below would allow for voluntary implementation of restoration measures by facilities that choose to reduce their intake flow to a level commensurate with performance requirements. Thus, under these options, facilities would be able to implement restoration measures that would result in increases in fish and shellfish if a demonstration of comparable performance is made for species of concern identified by the Director in consultation with national, State, and Tribal fish and wildlife management agencies with responsibility for aquatic resources potentially affected by the cooling water intake structure.

Similarly, any technology-based options considered also would allow facilities to request alternative requirements that are less stringent than those specified, but only if the Director determines that data specific to the facility indicate that compliance with the relevant requirement would result in compliance costs significantly greater than those EPA considered in establishing the requirement at issue, or

would result in significant adverse impacts on local air quality or local energy markets. The alternative requirement could be no less stringent than justified by the significantly greater cost or the significant adverse impacts on local air quality or local energy markets. EPA invites comment on these provisions and on other factors that might form the basis for alternative regulations.

The example regulatory language presented in section VI.B.3 below does not include a provision similar to the 40 CFR 125.85 in the new facility final rule for alternative requirements based on significant adverse impact on local water resources other than impingement and entrainment. In EPA's judgement, this provision would primarily be used to address water allocation and quantity issues which do not arise in tidal rivers, estuaries and oceans, where salinity limits competing water uses.

#### **1. Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System for All Facilities**

EPA considered a regulatory option that would require Phase II existing facilities having a design intake flow 50 MGD or more to reduce the total design intake flow to a level, at a minimum, commensurate with that which can be attained by a closed-cycle recirculating cooling system using minimized make-up and blowdown flows. In addition, facilities in specified circumstances (e.g., located where additional protection is needed due to concerns regarding threatened, endangered, or protected species or habitat; migratory, sport or commercial species of concern) would have to select and implement design and construction technologies to minimize impingement mortality and entrainment. This option does not distinguish between facilities on the basis of the waterbody from which they withdraw cooling water. Rather, it would ensure that the same stringent controls are the nationally applicable minimum for all waterbody types. This is the regulatory approach EPA adopted for new facilities.

Reducing the cooling water intake structure's capacity is one of the most effective means of reducing entrainment (and impingement). For the traditional steam electric utility industry, facilities located in freshwater areas that have closed-cycle, recirculating cooling water systems can, depending on the quality of the make-up water, reduce water use by 96 to 98 percent from the amount they would use if they had once-through cooling water systems, though many of these areas generally contain species that are less susceptible to entrainment.

Steam electric generating facilities that have closed-cycle, recirculating cooling systems using salt water can reduce water usage by 70 to 96 percent when make-up and blowdown flows are minimized.<sup>60</sup>

Of the 539 existing steam electric power generating facilities that EPA believes would potentially be subject to the Phase II existing facility proposed rule, 73 of these facilities already have a recirculating wet cooling system (e.g., wet cooling towers or ponds). These facilities would meet the requirements under this option unless they are located in areas where the director or fisheries managers determine that fisheries need additional protection. Therefore, under this option, 466 steam electric power generating facilities would be required to meet performance standards for reducing impingement mortality and entrainment based on a reduction in intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system.

A closed-cycle recirculating cooling system is an available technology for facilities that currently have once-through cooling water systems. There are a few examples of existing facilities converting from one type of cooling system to another (e.g., from once-through to closed-cycle recirculating cooling system). Converting to a different type of cooling water system, however, is significantly more expensive than the technologies on which the proposed performance standards are based (generally by a factor of 10 or greater) and significantly more expensive than designing new facilities to run on recirculating systems. EPA has identified four power plants that would be regulated by today's proposal that have converted from once-through to closed-cycle recirculating cooling systems. Three of these facilities—Palisades Nuclear Plant in Michigan, Jefferies Coal in South Carolina, and Canadys Steam in South Carolina—converted from once-through to closed-cycle recirculating cooling systems after significant periods of operation utilizing the once-through system. The fourth facility—Pittsburg Unit 7—is not a full conversion in that it never operated with its once-through system. In this case, the "conversion" occurred just prior to construction, after initial design of the once-through system design and power plant had

<sup>60</sup> The lower range would be appropriate where State water quality standards limit chloride to a maximum increase of 10 percent over background and therefore require a 1.1 cycle of concentration. The higher range may be attained where cycles of concentration up to 2.0 are used for the design.

occurred. A brief description of these conversions follows. The Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule provides additional detail.

*The Palisades Nuclear Plant.* Located in Covert, Michigan, the Palisades Nuclear Plant is a 812 MW (nameplate, steam capacity) facility with a pressurized water reactor, utilizing a mechanical draft wood cooling tower to condense the steam load of the plant. The reactor began operation in 1972 utilizing a once-through cooling system and subsequently converted to a closed-cycle, recirculating system at the beginning of 1974.

*Canadys Steam Plant.* This 490 MW (nameplate, steam capacity) coal-fired facility with three generating units is located in Colleton County, South Carolina. The first unit initially came online in 1962, the second in 1964, and the third in 1967. All three units operated with a once-through cooling water system for many years. The Canadys Steam plant was converted from a once-through to a closed-cycle recirculating cooling system in two separate projects. Unit 3 (218 MW) was first converted in 1972. Units 1 and 2, both with nameplate capacities of 136 MW, were converted from a once-through to a closed-cycle, recirculating cooling system in 1992.

*Jefferies Coal Units 3 & 4.* Located in Moncks Corner, South Carolina, this facility has a combined, coal-fired capacity of 346 MW (nameplate, steam). The coal units came online in 1970 and operated for approximately 15 years utilizing once-through cooling. After the Army Corps of Engineers re-diverted the Santee Cooper River, thereby limiting the plant's available water supply, the cooling system was converted from once-through to recirculating towers. The plant conducted an empirical energy-penalty study over several years to determine the economic impact of the cooling system conversion.

*Pittsburg Power Plant, Unit 7.* Located in Contra Costa County, California, this 750 MW (nameplate, gas-fired steam) unit was designed and planned with a once-through cooling water system. However, late in the construction process, the plant switched to a closed-cycle, recirculating cooling system with a mechanical draft cooling tower. The system utilizes the condenser, conduit system, and circulating pumps originally designed for the once-through cooling water system.

EPA did not select closed-cycle, recirculating cooling systems as the best technology available for existing facilities because of the generally high

costs of such conversions. According to EPA's cost estimates, capital costs for individual high-flow plants to convert to wet towers generally ranged from 130 to 200 million dollars, with annual operating costs in the range of 4 to 20 million dollars. EPA estimates that the total annualized post-tax cost of compliance for this option is approximately \$2.26 billion. Not included in this estimate are 9 facilities that are projected to be baseline closures. Including compliance costs for these 9 facilities would increase the total cost of compliance with this option to approximately \$2.32 billion. EPA also has serious concerns about the short term energy implications of a massive concurrent conversion and the potential for supply disruptions that it would entail. EPA requests comment on its decision not to base best technology available for all Phase II existing facilities on closed-cycle, recirculating technology.

The estimated annual benefits (in \$2001) for requiring all Phase II existing facilities to reduce intake capacity commensurate with the use of closed-cycle, recirculating cooling systems are \$83.9 million per year and \$1.08 billion for entrainment reductions.

#### 2. Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling Systems Based on Waterbody Type

EPA also considered an alternate technology-based option in which closed-cycle, recirculating cooling systems would be required for all facilities on certain waterbody types. Under this option, EPA would group waterbodies into the same five categories as in today's proposal: (1) Freshwater rivers or streams, (2) lakes or reservoirs, (3) Great Lakes, (4) tidal rivers or estuaries; and (5) oceans. Because oceans, estuaries and tidal rivers contain essential habitat and nursery areas for the vast majority of commercial and recreational important species of shell and fin fish, including many species that are subject to intensive fishing pressures, these waterbody types would require more stringent controls based on the performance of closed-cycle, recirculating cooling systems. EPA discussed the susceptibility of these waters in a Notice of Data Availability (NODA) for the new facility rule (66 FR 28853, May 25, 2001) and invited comment on documents that may support its judgment that these waters are particularly susceptible to adverse impacts from cooling water intake structures. In addition, the NODA presented information regarding the low susceptibility of non-tidal freshwater

rivers and streams to impacts from entrainment from cooling water intake structures.

Under this alternative option, facilities that operate at less than 15 percent capacity utilization would, as in the proposed option, only be required to have impingement control technology. Facilities that have a closed-cycle, recirculating cooling system would require additional design and construction technologies to increase the survival rate of impinged biota or to further reduce the amount of entrained biota if the intake structure was located within an ocean, tidal river, or estuary where there are fishery resources of concern to permitting authorities or fishery managers.

Facilities with cooling water intake structures located in a freshwater (including rivers and streams, the Great Lakes and other lakes) would have the same requirements as under the proposed rule. If a facility chose to comply with Track II, then the facility would have to demonstrate that alternative technologies would reduce impingement and entrainment to levels comparable to those that would be achieved with a closed-loop recirculating system (90% reduction). If such a facility chose to supplement its alternative technologies with restoration measures, it would have to demonstrate the same or substantially similar level of protection. (For additional discussion see the new facility final rule 66 FR 65256, at 65315 columns 1 and 2.)

EPA has estimated that there are 109 facilities located on oceans, estuaries, or tidal rivers that do not have a closed cycle recirculating system and would be required to meet performance standards for reducing impingement mortality and entrainment based on a reduction in intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system. The other 430 facilities would be required to meet the same performance standards in today's proposal.

The potential environmental benefits of this option have been estimated at \$87.8 million and \$1.24 billion for entrainment reductions annually. Although this option is estimated (a full cost analysis was not done for this option) to be less expensive at a national level than requiring closed-cycle, recirculating cooling systems for all Phase II existing facilities, EPA is not proposing this option. Facilities located on oceans, estuaries, and tidal rivers would incur high capital and operating and maintenance costs for conversions of their cooling water systems. Furthermore, since impacted facilities would be concentrated in coastal

regions, there is the potential for short term energy impacts and supply disruptions in these areas. EPA also invites comment on this option.

### 3. Intake Capacity Commensurate With Closed-Cycle, Recirculating Cooling System Based on Waterbody Type and Proportion of Waterbody Flow

EPA is also considering a variation on the above approach that would require only facilities withdrawing very large amounts of water from an estuary, tidal river, or ocean to reduce their intake capacity to a level commensurate with that which can be attained by a closed-cycle, recirculating cooling system.

For example, for facilities with cooling water intake structures located in a tidal river or estuary, if the intake flow is greater than 1 percent of the source water tidal excursion, then the facility would have to meet standards for reducing impingement mortality and entrainment based on the performance of wet cooling towers. These facilities would have the choice of complying with Track I or Track II requirements. If a facility on a tidal river or estuary has intake flow equal to or less than 1 percent of the source water tidal excursion, the facility would only be required to meet the performance standards in the proposed rule. These standards are based on the performance of technologies such as fine mesh screens and traveling screens with well-designed and operating fish return systems. The more stringent, closed-cycle, recirculating cooling system based requirements would also apply to a facility that has a cooling water intake structure located in an ocean with an intake flow greater than 500 MGD.

Regulatory language implementing the Waterbody Type and Intake Capacity Based Option could read as follows:

(a)(1) The owner or operator of an existing steam electric power generating facility must comply with:

(i) The requirements of (b)(1) if your cooling water intake structure has a utilization rate less than 15 percent;

(i) The requirements of (b)(2) if your cooling water intake structure withdraws water for use in a closed-cycle, recirculating system;

(ii) The requirements of (b)(3) if your cooling water intake structure is located in a freshwater river or stream;

(iii) The requirements of (b)(4) if your cooling water intake structure is located in a lake (other than one of the Great Lakes) or reservoir;

(iv) The requirements of (b)(5) or (c) if your cooling water intake structure is located in an estuary or tidal river;

(v) The requirements of (b)(6) if your cooling water intake structure is located in one of the Great Lakes;

(vi) The requirements of (b)(7) or (c) if your cooling water intake structure is located in an ocean.

(2) In addition to meeting the requirements of (b) or (c), the owner or operator of an existing steam electric power generating facility must meet any more stringent requirements imposed under (d).

(b) Track I Requirements. Based on the design characteristics of your facility and cooling water intake structure(s) you must meet the requirements of paragraphs (b)(1) through (10).

(1) Requirements for Facilities With a Capacity Utilization Rates Less Than 15 Percent. If you own or operate an existing facility with a cooling water intake structure that has a capacity utilization rate less than 15 percent, you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% for fish and shellfish.

(2) Requirements for Cooling Water Intake Structures that Withdraw Water for Closed-Cycle, Recirculating Systems Only. If you own or operate a cooling water intake structure that withdraws water from an estuary, tidal river, or ocean for a closed-cycle, recirculating system only, you must comply with the requirements in paragraphs (b)(2)(i) and (ii) as follows:

(i) Impingement Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational measures to minimize impingement mortality for fish and shellfish if:

(A) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(B) There are migratory and/or sport or commercial species of impingement concern to the Director or any fishery management agency(ies), which pass through the hydraulic zone of influence of the cooling water intake structure; or

(C) It is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to the protected species, critical habitat of those species, or species of concern.

(ii) Entrainment Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational measures to minimize entrainment for entrainable life stages of fish and shellfish if:

(A) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(B) There are or would be undesirable cumulative stressors affecting entrainable life stages of species of concern to the Director or any fishery management agency(ies), and it is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to these species of concern.

(3) Requirements for Cooling Water Intake Structures Located in Freshwater Rivers or Streams. If you own or operate an existing facility with a cooling water intake structure

located in a freshwater river or stream, you must comply with paragraphs (b)(3)(i) or (ii) as follows:

(i) If your total design intake flow is equal to or less than 5 percent of the source water annual mean flow, you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% for all life stages of fish and shellfish; or

(ii) If your total design intake flow is greater than 5 percent of the source water annual mean flow, you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% and entrainment by 60 to 90% for all life stages of fish and shellfish.

(4) Requirements for Cooling Water Intake Structures Located in Lakes (Other Than one of the Great Lakes) or Reservoirs. If you own or operate an existing facility with a cooling water intake structure located in a lake (other than one of the Great Lakes) or reservoir, you must comply with paragraphs (b)(4)(i) and (ii) as follows:

(i) Your total design intake flow must not disrupt the natural thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fisheries management agency(ies); and

(ii) You must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% for fish and shellfish.

(5) Requirements for Cooling Water Intake Structures Located in Estuaries or Tidal Rivers. If you own or operate an existing facility with a cooling water intake structure located in an estuary or tidal river you must comply with paragraphs (b)(5)(i) or (ii) as follows:

(i) If your total design intake flow over one tidal cycle of ebb and flow is equal to or less than one (1) percent of the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level, you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% and entrainment by 60 to 90% for all life stages of fish and shellfish; or

(ii) If your total design intake flow over one tidal cycle of ebb and flow is greater than one (1) percent of the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level, you must meet the requirements in paragraphs (b)(5)(ii)(A) or (B):

(A) Reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system and select and implement design and construction technologies or operational measures as follows:

(1) Impingement Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational

measures to minimize impingement mortality for fish and shellfish if:

(i) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(ii) There are migratory and/or sport or commercial species of impingement concern to the Director or any fishery management agency(ies), which pass through the hydraulic zone of influence of the cooling water intake structure; or

(iii) It is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to the protected species, critical habitat of those species, or species of concern.

(2) Entrainment Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational measures to minimize entrainment for entrainable life stages of fish and shellfish if:

(i) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(ii) There are or would be undesirable cumulative stressors affecting entrainable life stages of species of concern to the Director or any fishery management agency(ies), and it is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to these species of concern.

(B) Comply with the requirements of Track II in (c).

(6) Requirements for Cooling Water Intake Structures Located in One of the Great Lakes. If you own or operate an existing facility with a cooling water intake structure located in one of the Great Lakes you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% and entrainment by 60 to 90% for all life stages of fish and shellfish.

(7) Requirements for Cooling Water Intake Structures Located in an Ocean. If you own or operate an existing facility with a cooling water intake structure located in an ocean you must comply with paragraphs (b)(7)(i) or (ii) as follows:

(i) If your total design intake flow is less than 500 MGD, you must select and implement design and construction technologies or operational measures to reduce impingement mortality by 80 to 95% and entrainment by 60 to 90% for all life stages of fish and shellfish; or

(ii) If your total design intake flow is equal to, or greater than 500 MGD, you must meet the requirements in paragraphs (b)(7)(ii)(A) or (B):

(A) Reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system and select and implement design and construction technologies or operational measures as follows:

(1) Impingement Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational

measures to minimize impingement mortality for fish and shellfish if:

(i) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(ii) There are migratory and/or sport or commercial species of impingement concern to the Director or any fishery management agency(ies), which pass through the hydraulic zone of influence of the cooling water intake structure; or

(iii) It is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to the protected species, critical habitat of those species, or species of concern.

(2) Entrainment Design and Construction Technologies or Operational Measures. You must select and implement design and construction technologies or operational measures to minimize entrainment for entrainable life stages of fish and shellfish if:

(i) There are threatened or endangered or otherwise protected Federal, State, or Tribal species, or critical habitat for these species, within the hydraulic zone of influence of the cooling water intake structure; or

(ii) There are or would be undesirable cumulative stressors affecting entrainable life stages of species of concern to the Director or any fishery management agency(ies), and it is determined by the Director or any fishery management agency(ies) that the facility contributes unacceptable stress to these species of concern.

(B) Comply with the requirements of Track II in (c).

(8) You must submit the application information required;

(9) You must implement the monitoring requirements specified;

(10) You must implement the record-keeping requirements specified;

(c) Track II Requirements. If you are an existing steam electric power generating facility with a cooling water intake structure located in an estuary, tidal river, or ocean that chooses to meet the requirements of Track II in lieu of Track I in (b)(5)(ii) or (b)(7)(ii), you must comply with the following:

(1) You must demonstrate to the Director that the technologies, operational measures, and supplemental restoration measures employed will reduce the level of adverse environmental impact from your cooling water intake structures to a level comparable to that which you would achieve were you to reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system.

(2) Except as specified in subparagraph (c)(4) below, your demonstration must include a showing that the impacts to fish and shellfish, including important forage and predator species, within the watershed will be comparable to those which would result if you were to reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system. This showing may include consideration of impacts other than impingement mortality and entrainment.

(3) Restoration Measures. Phase II existing facilities complying with the requirements of Track II may supplement technologies with restoration measures that will result in increases in fish and shellfish if you can demonstrate that they will result in a comparable performance for species that the Director, in consultation with national, State and Tribal fishery management agencies with responsibility for fisheries potentially affected by your cooling water intake structure, identifies as species of concern.

(4) In cases where air emissions and/or energy impacts that would result from reducing your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system would result in significant adverse impacts on local air quality, or significant adverse impact on local energy markets, you may request alternative requirements.

(5) You must submit the application information required;

(6) You must implement the monitoring requirements specified;

(7) You must implement the record-keeping requirements specified;

EPA notes that of these, some facilities would likely opt to comply through Track II and estimates that 21 facilities would select this option. These facilities would perform site-specific studies and demonstrate compliance using alternative technologies, perhaps supplemented by habitat enhancement or fishery restocking efforts. Assuming as a high impact scenario that all 51 of these facilities install wet cooling towers, the energy impacts associated with these 51 facilities would comprise 0.2 percent of total existing electric generating capacity from facilities with an intake flow of 50 MGD or more. The environmental impacts associated with increased air emissions (SO<sub>2</sub>, NO<sub>x</sub>, CO<sub>2</sub>, and Hg) associated with this option would be a 0.1 percent increase of emissions of these pollutants from the total existing electric generators.

The Nuclear Regulatory Commission estimates that a steam-electric plant utilizing a once-through cooling system would consume approximately 40 percent less water than a comparably sized plant equipped with recirculating wet cooling towers because a wet cooling tower uses a small amount of water many times and evaporates most of this water to provide its cooling (which can sometimes be seen as a white vapor plume). In contrast, a once-through cooling system uses a much larger volume of water, one time. While no cooling water evaporates directly to the air, once the heated water is discharged back into the waterbody, some evaporation occurs. Thus, in some areas, conversion to closed-cycle cooling could raise water quantity issues.

Based on an analysis of data collected through the detailed industry questionnaire and the short technical questionnaire, EPA estimates there are potentially 109 Phase II existing facilities located on estuaries, tidal rivers, or oceans which may incur capital cost under this option. Of these 109 facilities, EPA estimates that 51 would exceed the applicable flow threshold and be required to meet performance standards for reducing impingement mortality and entrainment based on a reduction in intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system. Of the 58 facilities estimated to fall below the applicable flow threshold, 10 facilities already meet these performance standards and would not require any additional controls, whereas 48 facilities would require entrainment or impingement controls, or both. Because this option would only require cooling tower-based performance standards for facilities located on tidal rivers, estuaries or oceans where they withdraw saline or brackish waters, EPA does not believe that this option would raise any significant water quantity issues.

Total annualized post-tax cost of compliance for the waterbody/capacity-based option is approximately \$585 million. Not included in this estimate are 9 facilities that are projected to be baseline closures. Including compliance costs for these 9 facilities would increase the total cost of compliance with this option to approximately \$595 million.

EPA also examined the annualized post-tax compliance costs of the waterbody/capacity-based option as a percentage of annual revenues to assess the economic practicability of this alternative option. This analysis was conducted at the facility and firm levels. The revenue estimates are the same as those used in the analysis in Section VI.A.3 above: facility-specific baseline projections from the Integrated Planning Model (IPM) for 2008. The results at the facility level are similar to those of the proposed rule: 355 out of 550 facilities, or 65 percent, would incur annualized costs of less than 0.5 percent of revenues; 60 facilities would incur costs of between 0.5 and 1 percent of revenues; 57 facilities would incur costs of between 1 and 3 percent; and 67 facilities would incur costs of greater than 3 percent. Nine facilities are estimated to be baseline closures, and for one facility, revenues are unknown. Exhibit 4 below summarizes these findings.

EXHIBIT 4.—WATERBODY/CAPACITY-BASED OPTION (FACILITY LEVEL)

Annualized cost-to-revenue ratio	All phase II	Percent of total phase II
< 0.5 % .....	355	65
0.5–1.0 .....	60	11
1.0–3.0% .....	57	10
> 3.0 % .....	67	12
Baseline Closure .....	9	2
n/a .....	1	0
<b>Total .....</b>	<b>550</b>	<b>100</b>

Similar to the preferred option, EPA estimates that the compliance costs for the waterbody/capacity-based option would also be low compared to firm-level revenues. Of the 131 unique parent entities that own the facilities subject to this rule, 108 entities would incur compliance costs of less than 0.5 percent of revenues; 12 entities would incur compliance costs of between 0.5 and 1 percent of revenues; 6 entities would incur compliance costs of between 1 and 3 percent of revenues; and three entities would incur compliance costs of greater than 3 percent of revenues. Two entities only own facilities that are estimated to be baseline closures. The estimated annualized facility compliance costs for this option represent between 0.001 and 5.4 percent of the entities' annual sales revenue. Exhibit 5 below summarizes these findings.

EXHIBIT 5.—WATERBODY/CAPACITY-BASED OPTION (FIRM LEVEL)

Annualized cost-to-revenue ratio	Number of phase II entities	Percent of total phase II
< 0.5 % .....	108	82
0.5–1.0 % .....	12	9
1.0–3.0% .....	6	5
> 3.0 % .....	3	2
Baseline Closure .....	2	2
<b>Total .....</b>	<b>131</b>	<b>100</b>

The results of EPA's approach to estimating national benefits are \$79.86 million per year for impingement reduction and \$769.0 million annually for entrainment reduction. Additional details of EPA's economic practicability and benefits analysis of this and other options can be found in the Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule and the Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule.

While the national costs of this option are lower than those of requiring wet

cooling towers-based performance standard for all facilities located on oceans, estuaries and tidal rivers, the cost for facilities to meet these standards could be substantial if they installed a cooling tower. Under this option, EPA would provide an opportunity to seek alternative requirements to address locally significant air quality or energy impacts. EPA notes that the incremental costs of this option relative to the proposed option (\$413 million) significantly outweigh the incremental benefits (\$146 million). While EPA is not proposing this option, EPA is considering it for the final rule. To facilitate informed public comment, EPA has drafted sample rule language reflecting this option (see above). EPA invites comment on this alternative technology based option for establishing best technology available for minimizing adverse environmental impacts from cooling water intake structures at Phase II existing facilities.

4. Impingement Mortality and Entrainment Controls Everywhere

Under an additional alternative being considered, EPA would establish national minimum performance requirements for the location, design, construction, and capacity of cooling water intake structures based on the use of design and construction technologies that reduce impingement and entrainment at all Phase II existing facilities without regard to waterbody type and with no site-specific compliance option available. Under this alternative the Agency would set performance requirements based on the use of design and construction technologies or operational measures that reduce impingement and entrainment. EPA would specify a range of impingement mortality and entrainment reduction that is the same as the performance requirements proposed in § 125.94(b)(3) (i.e., Phase II existing facilities would be required to reduce impingement mortality by 80 to 95 percent for fish and shellfish, and to reduce entrainment by 60 to 90 percent for all life stages of fish and shellfish). However, unlike the proposed option, performance requirements under this alternative would apply to all Phase II existing facilities regardless of the category of waterbody used for cooling water withdrawals.

Like the proposed option, the percent impingement and entrainment reduction under this alternative would be relative to the calculation baseline. Thus, the baseline for assessing performance would be an existing facility with a shoreline intake with the capacity to support once-through

cooling water systems and no impingement or entrainment controls. In addition, as proposed, a Phase II existing facility could demonstrate either that it currently meets the performance requirements or that it would upgrade its facility to meet these requirements. Further, under this alternative, EPA would set technology-based performance requirements, but the Agency would not mandate the use of any specific technology.

Unlike the proposed option, this alternative would not allow for the development of best technology available on a site-specific basis (except on a best professional judgment basis). This alternative would not base requirements on the percent of source water withdrawn or restrict disruption of the natural thermal stratification of lakes or reservoirs. It also would impose entrainment performance requirements on Phase II existing facilities located on freshwater rivers or streams, and lakes or reservoirs. Finally, under this alternative, restoration could be used, but only as a supplement to the use of design and construction technologies or operational measures.

This alternative would establish clear performance-based requirements that are simpler and easier to implement than those proposed and are based on the use of available technologies to reduce adverse environmental impact. Such an alternative would be consistent with the focus on use of best technology required under section 316(b). Total annualized post-tax cost of compliance for the modified proposed option is approximately \$191 million. Not included in this estimate are 11 facilities that are projected to be baseline closures. Including compliance costs for these 11 facilities would increase the total cost of compliance with this option to approximately \$195 million. The benefits calculated for reduced impingement under this option were \$64.5 million per year; entrainment reduction benefits were estimated to be \$0.65 billion annually.

### C. Site-Specific Based Options Under Consideration

#### 1. Sample Site-Specific Rule

EPA also invites comment on site-specific approaches for determining the best technology available for minimizing adverse environmental impact at existing facilities. In general, a site-specific option is a formal process for determining the best technology available for minimizing adverse environmental impact at particular facilities that focuses on the site-specific interactions between cooling water

intakes and the affected environment and the costs of implementing controls. This approach would be based on the view that the location of each power plant and the associated intake structure design, construction, and capacity are unique, and that the optimal combination of measures to reflect best technology available for minimizing adverse environmental impact must be determined on a case-by-case basis.

In order to focus public comment, EPA, in consultation with other interested Federal agencies, has drafted sample regulatory text for a site-specific approach, which is set forth below. The Site-Specific Sample Rule omits regulatory text on two key subjects: (1) The definition of adverse environmental impact; and (2) the components of the analysis that is used to determine the best technology available for minimizing adverse environmental impact. Instead, the Sample Rule contains references to the preamble discussion of these subjects (see § 125.93, definition of "adverse environmental impact" and § 125.94(b)(2), concerning analysis of the best technology available). Regulatory text is not offered on these subjects because the various site-specific approaches described in the discussion following the Sample Rule deal with them in significantly different ways.

#### Site-Specific Alternative: Sample Rule

Sec.

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125.100 As the Director, what must I do to comply with the requirements of this subpart?

Section 125.90 What Are the Purpose and Scope of This Subpart?

(a) This subpart establishes requirements that apply to the location, design, construction, and capacity of cooling water intake structures at existing facilities that have a design intake flow of equal to or greater than 50 million gallons per day (MGD). The purpose of these requirements is to establish the best technology available for minimizing any adverse environmental impact associated with the use of cooling water intake structures. These requirements are implemented through National Pollutant Discharge Elimination System (NPDES) permits issued under section 402 of the Clean Water Act (CWA).

(b) This subpart implements section 316(b) of the CWA for existing facilities that have a design flow of equal to or greater than 50 MGD. Section 316(b) of the CWA provides that any standard established pursuant to sections 301 or 306 of the CWA and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. The process established in this subpart for determining the best technology available for intake design, location, construction, and capacity provides for a case-by-case determination based on the unique, site-specific interactions between intakes and the environment and the costs of implementing controls at existing facilities.

Section 125.91 Who Is Subject to This Subpart?

(a) This subpart applies to an existing facility if it:

(1) Is a point source that uses or proposes to use a cooling water intake structure;

(2) Has at least one cooling water intake structure that uses at least 25 percent of the water it withdraws for cooling purposes as specified in paragraph (c) of this section; and

(3) Has a design intake flow equal to or greater than 50 MGD;

(b) Use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with an independent supplier (or multiple suppliers) of cooling water if the supplier or suppliers withdraw(s) water from waters of the United States. Use of cooling water does not include obtaining cooling water from a public water system or use of treated effluent that otherwise would be discharged to a water of the U.S. This provision is intended to prevent circumvention of these requirements by creating arrangements to receive cooling water from an entity that is not itself a point source.

(c) The threshold requirement that at least 25 percent of water withdrawn be used for cooling purposes must be measured on an average monthly basis.

Section 125.92 When Must I Comply With This Subpart?

You must comply with this subpart when an NPDES permit containing requirements consistent with this subpart is issued to you.

### Section 125.93 What Special Definitions Apply to This Subpart?

The definitions in Subpart I of Part 125 apply to this subpart. The following definitions also apply to this subpart:

Adverse Environmental Impact [Reserved; see discussion at V.C.5.a below.]

Existing facility means any facility that both generates and transmits electric power and any facility that generates electric power but sells it to another entity for transmission. This definition specifically includes (1) any major modification of a facility; (2) any addition of a new unit to a facility for purposes of the same industrial operation; (3) any addition of a unit for purposes of a different industrial operation that uses an existing cooling water intake structure but does not increase the design capacity of the cooling water intake structure; and (4) any facility that is constructed in place of a facility that has been demolished, but that uses an existing cooling water intake structure whose design intake flow has not been increased to accommodate the intake of additional cooling water.

### Section 125.94 How Will Requirements Reflecting Best Technology Available for Minimizing Adverse Environmental Impact Be Established for My Existing Facility?

(a)(1) Except as provided in paragraph (a)(2) of this section, an owner or operator of an existing facility covered by this subpart must conduct a baseline biological survey and provide any other information specified in § 125.97 that the Director concludes is necessary for determining the magnitude of any adverse environmental impact occurring at the facility.

(2) A previously conducted section 316(b) demonstration may be used to determine whether the location, design, construction and capacity of the facility's cooling water intake structure reflect best technology available for minimizing adverse environmental impact if it reflects current biological conditions in the water body and the current location and design of the cooling water intake structure. A previously conducted section 316(b) demonstration generally would reflect current conditions or circumstances if:

(i) The previous section 316(b) demonstration used data collection and analytical methods consistent with guidance or requirements of the permitting agency and/or the Administrator;

(ii) The available evidence shows that there have been no significant changes in the populations of critical aquatic species; and

(iii) The owner or operator can show there have been no significant changes in the location, design, construction, and capacity of the facility's cooling water intake structure that would lead to a greater adverse environmental impact.

(b) The determination of best technology available for minimizing adverse environmental impact required by paragraph (c) of this section may be based on:

(1) A previously conducted section 316(b) demonstration that is shown to be still valid in the current circumstances, as described in paragraph (a)(2) of this section; or

(2) An analysis of best technology available based on the Design and Construction

Technology Plan, operational measures, and any restoration measures allowed under § 125.95, that are submitted pursuant to § 125.97. This analysis may include use of risk assessment. [See V.C.5.c below for a discussion of possible additional components of this analysis.]

(c) In determining the best technology available for minimizing adverse environmental impact at an existing facility, the Director shall:

(1) Minimize impingement mortality for fish and shellfish;

(2) Minimize entrainment mortality for entrainable life stages of fish and shellfish;

(3) Take into account non-aquatic environmental impacts, including energy requirements, and impacts on local air quality or water resources; and

(4) Not require any technologies for location, design, construction or capacity or operational and/or restoration measures the costs of which would be significantly greater than the estimated benefits of such technology or measures.

(d) The Director may establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that your compliance with the requirements of paragraph (c) would not ensure compliance with State or other Federal law.

(e) The owner or operator of an existing facility must comply with any permit requirements imposed by the Director pursuant to § 125.100(b) of this section.

### Section 125.95 As an Owner or Operator of an Existing Facility, May I Undertake Restoration Measures To Mitigate Adverse Environmental Impact?

(a) An owner or operator of an existing facility may undertake restoration measures (such as habitat improvement and fish stocking) that will mitigate adverse environmental impact from the facility's cooling water intake structure.

(b) In determining whether adverse environmental impact is minimized, the Director must take into account any voluntary restoration measures.

### Section 125.96 Will Alternative State Requirements and Methodologies for Determining the Best Technology Available for Minimizing Adverse Environmental Impact Be Recognized?

Notwithstanding any other provisions of this subpart, if a State demonstrates to the Administrator that it has adopted alternative regulatory requirements that will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under this subpart, the Administrator shall approve such alternative regulatory requirements.

### Section 125.97 As an Owner or Operator of an Existing Facility, What Must I Collect and Submit When I Apply for My Reissued NPDES Permit?

(a) As an owner or operator of an existing facility covered by this part, you must submit the information required by § 125.94 and this

section to the Director when you apply for a reissued NPDES permit in accordance with 40 CFR 122.21.

(b) Biological Survey. (1) The biological survey must include:

(i) A taxonomic identification and characterization of aquatic biological resources including a determination and description of the target populations of concern (those species of fish and shellfish and all life stages that are most susceptible to impingement and entrainment), and a description of the abundance and temporal/spatial characterization of the target populations based on the collection of a sufficient number of years of data to capture the seasonal and diel variations (e.g., spawning, feeding and water column migration) of all life stages of fish and shellfish found in the vicinity of the cooling water intake structure; and

(ii) An identification of threatened or endangered or otherwise protected Federal, state or tribal species that might be susceptible to impingement and entrainment by the cooling water intake structure(s); and

(iii) A description of additional chemical, water quality, and other anthropogenic stresses on the source water body based on available information.

(2) As provided in § 125.94(a)(2) and (d)(1), biological survey data previously produced to demonstrate compliance with section 316(b) of the CWA may be used in the biological survey if the data are representative of current conditions.

(c) Design and Construction Technology Plan. (1) The Design and Construction Technology Plan must explain the technologies and measures you have selected to minimize adverse environmental impact based on information collected for the biological survey.

(2) In-place technologies implemented previously to comply with section 316(b), and information regarding their effectiveness, may be included in the Design and Construction Technology Plan for an existing facility.

(3) Design and engineering calculations, drawings, maps, and costs estimates supporting the technologies and measures you have selected to minimize adverse environmental impact.

(d) Operational Measures. Operational measures that may be proposed include, but are not limited to, seasonal shutdowns or reductions in flow and continuous operation of screens.

(e) Restoration Measures. If you propose to use restoration measures to minimize adverse environmental impact as allowed in § 125.95, you must provide the following information to the Director for review:

(1) Information and data to show that you have coordinated with the appropriate fish and wildlife management agency;

(2) A plan that provides a list of the measures you have selected and will implement and how you will demonstrate that your restoration measures will maintain the fish and shellfish in the water body to the level required to offset mortality from entrainment and impingement; and

(3) Design and engineering calculations, drawings, maps, and costs estimates

supporting the proposed restoration measures.

**Section 125.98 As an Owner or Operator of an Existing Facility, Must I Perform Monitoring?**

(a) Following issuance of an NPDES permit, an owner or operator of an existing facility must submit to the Director a program for monitoring that will be adequate to verify that the location, design, construction, and capacity of the cooling water intake structure reflect the best technology available for minimizing adverse environmental impact.

(b) The Director may require modifications of the monitoring program proposed by the owner or operator based on, but not limited to, consideration of the following factors:

(1) Whether or not the facility has been determined to cause adverse environmental impacts under § 125.100;

(2) The types of modifications and restoration that are required in the NPDES permit under § 125.100;

(3) The amount and quality of the data or information available on the water body health and quality of the fishery; and

(4) The stability or flux in the environmental factors that influence biological response in the water body.

(c) The monitoring program for an existing facility that the Director has determined is not causing adverse environmental impact must provide for monitoring sufficient for the Director to make the subsequent 5-year permit decision.

(d) The monitoring program for an existing facility that the Director has determined to cause adverse environmental impact must provide for monitoring sufficient to demonstrate that the modifications to facility operations and intake technology and any restoration measures included in the NPDES permit have been effective for minimizing adverse environmental impact. The monitoring must begin during the first year following implementation of the modifications and restoration measures, and must continue until the Director is satisfied that adverse environmental impact caused by the facility's cooling water intake has been minimized.

**Section 125.99 As an Owner or Operator of an Existing Facility, Must I Keep Records and Report?**

(a) As an owner or operator of an existing facility, you must keep records of all the data used to complete the permit application and show compliance with the requirements in the permit and any compliance monitoring data for a period of at least three (3) years from the date of permit issuance.

(b) The Director may require that these records be kept for a longer period.

**Section 125.100 As the Director, What Must I Do To Comply With the Requirements of This Subpart?**

(a) Permit Applications. As the Director, you must review materials submitted by the applicant under 40 CFR 122.21(r)(3) and § 125.94 before each permit renewal or reissuance.

(1) After receiving the permit application from the owner or operator of a new facility, the Director must determine if the applicant is subject to the requirements of this subpart.

(2) For each subsequent permit renewal for a covered facility, the Director must review the application materials and monitoring data to determine whether requirements, or additional requirements, for design and construction technologies or operational measures should be included in the permit, as provided in paragraph (b) of this section.

(b) Permitting Requirements. (1) Section 316(b) requirements are implemented for a facility through an NPDES permit. As the Director, you must:

(i) Determine whether the location, design, construction and capacity of the cooling water intake structure at the existing facility reflects best technology available for minimizing adverse environmental impact, based on the information provided under § 125.94(a) and § 125.97 and any other available, relevant information; and

(ii) If the location, design, construction and capacity of the cooling water intake structure at the existing facility does not reflect best technology available for minimizing adverse environmental impact, specify the requirements and conditions for the location, design, construction, and capacity of the cooling water intake structure(s) that must be included in the permit for minimizing adverse environmental impact. This determination must be based on information provided under § 125.94 and § 125.97 and any other available, relevant information.

(2) (i) Before issuing an NPDES permit containing section 316(b) requirements, the Director must consult with and consider the views and any information provided by interested fish and wildlife management agencies.

(ii) If any fish and wildlife management agency having jurisdiction over the water body used for cooling water withdrawal determines that the cooling water intake structure(s) of an existing facility contributes to unacceptable stress to aquatic species or their habitat, the fish and wildlife management agency may recommend design, construction, or operational changes to the Director that will minimize that stress.

(c) Monitoring Requirements. At a minimum, the Director must ensure that the permit requires the permittee to perform the monitoring required in § 125.98. You may modify the monitoring program when the permit is reissued and during the term of the permit based on changes in the physical or biological conditions in the vicinity of the cooling water intake structure.

The Agency invites comment on the above framework as an appropriate approach for implementing section 316(b) as an alternative to today's proposed requirements. The Agency also invites comments on the following site-specific approaches for implementing section 316(b) on a site-specific basis within the general framework set forth in the Sample Rule.

**2. Site-Specific Alternative Based on EPA's 1977 Draft Guidance**

Since the Fourth Circuit remanded EPA's section 316(b) regulations in 1977, decisions implementing section

316(b) have been made on a case-by-case, site-specific basis. EPA published guidance addressing section 316(b) implementation in 1977. See Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92-500 (U.S. EPA, 1977). This guidance describes the studies recommended for evaluating the impact of cooling water intake structures on the aquatic environment, and it establishes a basis for determining the best technology available for minimizing adverse environmental impact. The 1977 Section 316(b) Draft Guidance states, "The environmental-intake interactions in question are highly site-specific and the decision as to best technology available for intake design, location, construction, and capacity must be made on a case-by-case basis." (Section 316(b) Draft Guidance, U.S. EPA, 1977, p. 4). This case-by-case approach also is consistent with the approach described in the 1976 Development Document referenced in the remanded regulation.

The 1977 Section 316(b) Draft Guidance recommends a general process for developing information needed to support section 316(b) decisions and presenting that information to the permitting authority. The process involves the development of a site-specific study of the environmental effects associated with each facility that uses one or more cooling water intake structures, as well as consideration of that study by the permitting authority in determining whether the facility must make any changes to minimize adverse environmental impact. Where adverse environmental impact is occurring and must be minimized by application of best technology available, the 1977 guidance suggests a "stepwise" approach that considers screening systems, size, location, capacity, and other factors.

Although the Draft Guidance describes the information to be developed, key factors to be considered, and a process for supporting section 316(b) determinations, it does not establish national standards for best technology available to minimize adverse environmental impact. Rather, the guidance leaves the decisions on the appropriate location, design, capacity, and construction of each facility to the permitting authority. Under this framework, the Director determines whether appropriate studies have been performed and whether a given facility has minimized adverse environmental impact.

### 3. The Utility Water Act Group (UWAG) Approach

The Utility Water Act Group (UWAG), an association of more than 100 individual electric utility companies and three national trade associations of electric utilities, provided EPA with a recommended site-specific regulatory framework, entitled "316(b) Decision Principles for Existing Facilities." UWAG's recommended approach for decision making under section 316(b) includes the following components:

- A definition of "Adverse Environmental Impact;
- Use of Representative Indicator Species (RIS) for the assessment of adverse environmental impact;
- Making decisions under section 316(b) that complement, but do not duplicate, other Federal, state, and local regulatory programs;
- Use of de minimis criteria to exempt small cooling water users that pose no appreciable risk of causing adverse environmental impact because only a small amount of cooling water is withdrawn from a water body at a location that does not require special protection;
- Determination of adverse environmental impact or its absence using the facility's choice of three methods, either alone or in combination: (1) Use of previously conducted section 316(b) demonstrations that are still valid in light of current circumstances; (2) use of ecological risk assessment by means of demonstration of no appreciable risk of adverse environmental impact using conservative decision criteria; or assessment of risk using a structured decision making process consistent with EPA's Ecological Risk Assessment Guidelines;
- A "maximize net benefits" approach for selecting the best technology available for minimizing adverse environmental impact;
- At the option of the permittee, recognition of voluntary enhancements such as fish stocking or habitat improvements; and
- Providing data or information with NPDES permit renewal applications if new information shows that previously conducted section 316(b) demonstrations are no longer scientifically valid.

These features of UWAG's recommended approach are discussed in the Discussion of Site-Specific Approach Issues and Questions for Comment that follows. UWAG's submission is included in the rulemaking record.

### 4. Site-Specific Alternative Suggested by PSEG

EPA also received a suggested site-specific regulatory framework from the Public Service Electricity and Gas Company (PSEG). The framework includes three alternative decision-making approaches that would allow permittees and permit writers to utilize prior analyses and data that may be appropriate and helpful, consider previous best technology available determinations that were based on these analyses and data, and take into account the benefits of prior section 316(b) implementing actions. The following summary of the framework suggested by PSEG closely tracks PSEG's submission, which is included in the rulemaking record.

PSEG's submission states that EPA guidance and other precedents have identified certain ecological criteria as relevant factors for considering adverse environmental impact, including entrainment and impingement; reductions of threatened, endangered, or other protected species; damage to critical aquatic organisms, including important elements of the food chain; diminishment of a population's compensatory reserve; losses to populations, including reductions of indigenous species populations, commercial fishery stocks, and recreational fisheries; and stresses to overall communities or ecosystems as evidenced by reductions in diversity or other changes in system structure or function. Many existing section 316(b) decisions are based upon extensive data and analyses pertaining to those factors. Those factors would remain applicable for all existing facilities.

Under PSEG's recommended approach, permitting authorities would have the authority to continue to place emphasis on the factors they believe are most relevant to a given situation. For example, when long-term data are available that meet appropriate data quality standards, and when analyses using appropriate techniques such as models that already have been developed to allow population-level analysis of the potential for adverse environmental impact, permit writers would focus on those adverse environmental impact factors related to population-level impacts. In other situations, especially where permittees do not wish to invest the time and financial resources necessary for biological data gathering and analysis, permitting authorities would have the discretion to focus on other factors by applying different decision-making paths.

### 5. Discussion of Site-Specific Approach Issues and Associated Questions for Comment

The following sections focus on several key aspects of any site-specific approach, specifically requesting comment on an appropriate definition of adverse environmental impact and associated decision-making criteria.

#### a. Determination of Adverse Environmental Impact

EPA's 1977 Draft Guidance assumes there will be adverse environmental impact whenever there is entrainment or impingement "damage" as a result of a cooling water intake structure, and focuses study on the magnitude of the impact to determine the appropriate technologies needed to minimize the impact. The evaluation criteria for assessing the magnitude of an adverse impact are broad and recommend consideration both in terms of absolute damage (e.g., numbers of fish) and percentages of populations. Although the UWAG and PSEG site-specific approaches contain different definitions of the term "adverse environmental impact," there is general agreement among them that the focus should be on the health of critical aquatic populations or ecosystems, rather than on absolute numbers of fish and other aquatic organisms impinged or entrained by the cooling water intake structure. UWAG offered the most detailed and specific recommendations for making a determination of adverse environmental impact.

#### (1) EPA's 1977 Definition of Adverse Environmental Impact and Examples of Its Current Use

In EPA's 1977 Draft Guidance, adverse environmental impact is defined as follows:

Adverse environmental impact means the adverse aquatic environmental impact that occurs whenever there will be entrainment or impingement damage as a result of the operation of a specific cooling water intake structure. The critical question is the magnitude of any adverse impact which should be estimated both in terms of short term and long term impact with respect to (1) absolute damage (number of fish impinged or percentage of larvae entrained on a monthly or yearly basis); (2) percentage damage (percentage of fish or larvae in existing populations which will be impinged or entrained, respectively); (3) absolute and percentage damage to any endangered species; (4) absolute and percentage damage to any critical aquatic organism; (5) absolute and percentage damage to commercially valuable and/or sport species yield; and (6) whether the impact would endanger (jeopardize) the protection and propagation of a balanced population of shellfish and fish

in and on the body of water from which the cooling water is withdrawn (long term impact).

Over the past 25 years, permitting agencies have interpreted this definition in a variety of ways. Some agencies consider the absolute number of organisms subjected to impingement and entrainment by facility cooling water intakes. Permitting authorities that evaluate adverse environmental impact by enumerating losses of numbers of fish individuals find this approach removes much of the uncertainty associated with evaluating effects to species at higher organizational levels such as populations, communities, or ecosystems. Other permitting authorities have focused on evaluating effects on populations in determining whether an adverse environmental impact is occurring.

## (2) An Alternative Definition

EPA solicits comment on an alternative definition of "adverse environmental impact" as follows:

Adverse environmental impact means one or more of the following: entrainment and impingement of significant numbers of a critical aquatic organisms or percentages of aquatic populations; adverse impacts to threatened, endangered or other protected species, or their designated critical habitat; significant losses to populations, including reductions of indigenous species populations, commercial fishery stocks, and recreational fisheries; and stresses to overall communities or ecosystems as evidenced by reductions in diversity or other changes in system structure or function.

## (3) Discussion of UWAG Recommendation for Determining Adverse Environmental Impact

UWAG offers the following definition:

Adverse environmental impact is a reduction in one or more representative indicator species (RIS)<sup>61</sup> that (1) creates an unacceptable risk to a population's ability to sustain itself, to support reasonably anticipated commercial or recreational harvests, or to perform its normal ecological function and (2) is attributable to operation of the cooling water intake structure.

In UWAG's view, defining adverse environmental impact in terms of "unacceptable risk" combines science with the judgments society makes about the value of different resources. UWAG argues that this recommended definition

is scientifically sound and environmentally protective because it focuses on protecting populations or species that are subject to impingement and entrainment by cooling water intake structures and because it requires that the level of population protection be adequate to ensure protection of the integrity of the ecosystem (community structure and function). However, it notes that this definition does not create a "bright line" test based on engineering or science. In addition to use of a valid, previously conducted section 316(b) demonstration, UWAG would allow facilities to use two risk assessment approaches to make a demonstration of "no adverse environmental impact."

The first approach involves demonstrating that the facility meets one or more of a set of conservative decision criteria. Under the second approach, a facility would cooperate with regulators and stakeholders to determine the benchmarks for a risk analysis to determine whether there is an appreciable risk of adverse environmental impact.

### (a) Protective Decision Criteria for Determining Adverse Environmental Impact

UWAG recommends protective decision criteria that it believes are conservative enough to eliminate the risk of adverse environmental impact for all practical purposes. The recommended physical and biological decision criteria are as follows:

#### Physical Criteria

*Locational Criterion:* An existing cooling water intake structure would be considered not to create a risk of adverse environmental impact if it withdraws water from a zone of a water body that does not support aquatic life due to anoxia or other reasons, such as lack of habitat, poor habitat, or water quality conditions.

*Design Criterion:* An existing cooling water intake structure would not be considered to create a risk of adverse environmental impact if it uses wet closed-cycle cooling or technologies that achieve a level of protection reasonably consistent with that achieved by wet closed-cycle cooling. However, wet closed-cycle cooling or reasonably consistent protection would be considered insufficient if permit writers or natural resource agencies identify special local circumstances such as impacts to threatened, endangered, or otherwise protected species or areas designated for special protection.

*Proportion of Flow or Volume Criterion:* On fresh water rivers, lakes (other than the Great Lakes), and

reservoirs, a cooling water intake structure would be considered not to create a risk of adverse environmental impact if it withdraws no more than 5% of either the source water body or the "biological zone of influence." This criterion would apply only to entrainable life stages. Because it might not be appropriate for many RIS to consider the entire source water body in making this decision, determining the appropriate flow or volume would be of critical importance. UWAG recommends how the "biological zone of influence" would be determined for different RIS.

#### Biological Criteria

*Percent Population Loss Criterion:* On freshwater rivers, lakes (other than the Great Lakes), and reservoirs, a facility would be considered not to create a risk of adverse environmental impact if the cooling water intake structure causes the combined loss, from entrainment and impingement, of (1) no more than 1% of the population of any harvested RIS and (2) no more than 5% of the population of any non-harvested RIS, with fractional losses summed over life stages for the entire lake, reservoir, or river reach included in the evaluation. UWAG explains that the 1%/5% population loss criteria are based in part on the recognition that these percentages are small relative to the inter-annual fluctuations typical of fish populations and also small relative to the compensatory responses typical of many species.

*No Significant Downward Trend:* On freshwater rivers, lakes (other than the Great Lakes), and reservoirs, a cooling water intake structure would be considered to create no risk of adverse environmental impact if adequate data collected over a representative period of years, including preoperational data, show no statistically significant downward trend in the population abundance of RIS.

The foregoing criteria would be applied independently. Passing a single criterion could serve as the basis for a successful demonstration of no risk of adverse environmental impact for a facility. If population-based biological criteria are used, they would be applied independently to each RIS species, and each species would need to meet the criteria for the facility to demonstrate no risk of adverse environmental impact.

UWAG states that most of these recommended criteria have limitations on their use, such as being limited to certain water body types or to use with either impingeable or entrainable organisms, but not both. Some facilities, therefore, might use the criteria for only

<sup>61</sup> Drawing on the concept of "critical aquatic organisms" in EPA's 1977 draft guidance, UWAG would define a representative indicator species (RIS) as a species of commercial or recreational importance, a Federal or state threatened or endangered or specially designated species, an important species for ecological community structure or function, or on the basis of species and life stage vulnerability.

some of their RIS and would address the remainder through the structured adverse environmental impact decision making process discussed below.

(b) The Structured Adverse Environmental Impact Decision Making Process Consistent with EPA Ecological Risk Assessment Guidelines

Under this alternative for determining adverse environmental impact, a facility would work with permit writers, resource managers, other appropriate technical experts, and stakeholders to determine what constitutes an "unacceptable" risk of adverse environmental impact in a water body. The process would be based on EPA's 1998 Ecological Risk Assessment Guidelines. The key steps would be as follows:

- Stakeholders would be involved in identifying issues of concern caused by the cooling water intake structure relative to RIS. To focus the effort to identify RIS at risk, previous section 316 studies, the results of demonstrations using the criteria discussed above, information on the design and operation of the facility, water body fisheries management data and plans, and other relevant water body information could be used.

- The permit writer, with input from the facility, would then determine what data collection and assessment studies are necessary to address the RIS of concern. Decisions regarding the scope of the assessment would include identification of RIS; study design, sampling methods, locations, and durations; and analytical methods and/or models to be employed.

- The facility and regulators also would identify explicit measurement endpoints and criteria for assessing adverse environmental impact before any studies are conducted. If the studies demonstrate that predetermined endpoints are not exceeded, the intake structure would be considered not to cause adverse environmental impact. If not, the facility would proceed to identify best technology available alternatives or to identify enhancements that would eliminate adverse environmental impact.

(4) Questions for Comment on the Determination of Adverse Environmental Impact

(a) EPA invites public comment on all aspects of the foregoing approaches to defining adverse environmental impact and for making the preliminary determination on adverse environmental impact, and on which approach should be included if the Agency adopts a site-specific approach for the final rule.

(b) Should the final rule adopt the 1977 Draft Guidance approach to defining adverse environmental impact as any entrainment or impingement damage caused by a cooling water intake structure?

(c) Should the final rule state that any impingement and entrainment is an adverse environmental impact and focus site-specific assessment on whether that impact is minimized by technologies already in place or potential changes in technology? Alternatively, should the final rule define adverse environmental impact in terms of population-level or community-level effects?

(d) Should EPA adopt an approach that makes more explicit use of threshold determinations of whether adverse environmental impact is occurring. If so, should EPA adopt any or all of the conservative decision criteria suggested by UWAG in a final rule?

(e) Should the structured risk assessment decision process that UWAG recommends for determining adverse environmental impact be adopted?

b. Use of Previous Section 316(b) Demonstration Studies

The Sample Site-Specific Rule and the PSEG and UWAG approaches would all give the permittee an opportunity to show that a previously conducted section 316(b) demonstration study was conducted in accordance with accepted methods and guidance, reflects current conditions, and supports decisions regarding the existence of adverse environmental impact and the best technology available for minimizing adverse environmental impact.

(1) Sample Site-Specific Rule Approach for Using Previous Demonstration Studies

Sections 125.94(a)(2) and 125.94(c)(1) of the Sample Rule would permit use of a previously conducted section 316(b) demonstration if the previous study was performed using data collection and analytical methods that conformed to applicable guidance or requirements of the permitting agency or EPA and there have been no significant changes to either the aquatic populations affected by the cooling water intake structure or to the design, construction, or operation of the facility. The burden would be on the owner or operator of the facility to show that these conditions were met.

(2) PSEG Recommendation for Using Previous Demonstration Studies

PSEG would permit use of previous section 316(b) determinations that were based upon analysis deemed to be thorough and based on the appropriate statutory factors and detailed, site-

specific data and information. In PSEG's view, such prior decisions need not be subject to a complete re-evaluation in subsequent permit renewal proceedings absent indications that the current cooling water intake structure is allowing adverse environmental impacts to occur or that there have been material changes in any of the key factors the agency relied upon in reaching the prior determination.

Under PSEG's approach, if a cooling water intake structure at an existing facility has previously been determined to employ best technology available based upon a diligent review of a section 316(b) demonstration that was conducted in conformance with the 1977 EPA Guidance, then the existing intake would continue to be determined to employ best technology available for the next permit cycle. The permit renewal application would have to include information sufficient to allow the permitting agency to determine that: (1) There has been no material change in the operation of the facility that would affect entrainment or impingement; (2) any in-place technologies have been properly operated, maintained, and are not allowing losses to occur in excess of the levels the agency considered in its prior determination; (3) any conservation or mitigation measures included in prior permits are in place and are producing the intended benefits; (4) the economics of applying a different technology have not changed; and (5) data and/or analyses show that fish species of concern are being maintained or that any declines in those species are not attributable to the cooling water intake structure.

In the Fact Sheet accompanying the draft permit, the permitting agency would be required specifically to: (1) Make a finding of fact that the prior section 316(b) determination had been based upon a demonstration conducted in conformance with the Agency's 1977 Guidance; and (2) identify the data and information that the permittee provided in support of the reaffirmance of its prior section 316(b) determination. Interested third parties as well as Federal, state and interstate resource protection agencies (e.g., National Marine Fisheries Service and the United States Fish and Wildlife Service) would have an opportunity to comment on the draft section 316(b) determination and to challenge the final determination if they were aggrieved by the agency's final decision.

## (3) UWAG Recommendation for Using Previous Demonstration Studies

UWAG also would permit use of a previously conducted section 316 demonstration if the past demonstration reflects current biological conditions in the water body and the current location, design, construction, and capacity of the cooling water intake structure. UWAG argues that many States have developed section 316(b) regulatory programs with significant information-gathering requirements and that this information would provide, for many existing facilities, a sufficient basis for determination of compliance with section 316(b). More specifically, UWAG's approach would consider (1) Whether the RIS used in past determinations are still the appropriate ones; (2) whether the data collection and analytical tools used were adequate in light of current circumstances; (3) whether water body biological conditions at the time of the study reflect current conditions; (4) whether the location, design, construction, or capacity of the cooling water intake structure has been altered since the previous section 316(b) demonstration; and (5) other factors that should be considered if there is reason to believe that the previous demonstrations are inadequate.

## (4) Questions for Comment on Using Previous Demonstration Studies

EPA invites public comment on whether a final rule should permit the use of a previous section 316(b) demonstration for determining whether there is adverse environmental impact and the best technology available for minimizing adverse environmental impact. If such a provision is included in the final rule, what criteria or conditions should be included to ensure that the previously conducted demonstration is an adequate basis for section 316(b) decisions?

## c. Process for Determining the Best Technology Available for Minimizing Adverse Environmental Impact and the Role of Costs and Benefits

Once it is determined that there is adverse environmental impact attributable to a cooling water intake structure, the facility and permitting agency must decide on a site-specific basis what changes to the location, design, construction, or capacity of the intake or what alternative voluntary measures, must be installed and implemented to minimize the impact.

## (1) EPA's Draft 1977 Guidance and Development Document

EPA's draft 1977 draft guidance and development document provide guidance on how to select best technology for minimizing adverse environmental impact but are silent on the role of costs and benefits in determining best technology available for minimizing adverse environmental impact. In 1979, the U.S. Court of Appeals for the First Circuit found that cost is an acceptable consideration in section 316(b) determinations. *Seacoast Anti-Pollution League v. Costle*, 597 F.2d 306, 311 (1st Cir. 1979). Over the years, section 316(b) determinations have focused on whether the costs of technologies employed would be wholly disproportionate to the environmental gains to be derived from their use. See e.g., *Seacoast Anti-Pollution League v. Costle*; Decision of the General Counsel No. 63 (July 29, 1977); Decision of the General Counsel No. 41 (June 1, 1976).

## (2) Sample Site-Specific Rule

The Sample Rule would require that the analysis of best technology available for minimizing adverse environmental impact be based on a biological survey of the part of the water body affected by the cooling water intake structure and a Design and Construction Technology Plan submitted by the permittee, together with any voluntary operational measures or restoration measures that would be implemented at the facility. (See Sample Rule §§ 125.94, 125.95 and 125.97.)

Examples of appropriate technologies a facility could propose in the Design and Construction Technology Plan include wedgewire screens, fine mesh screens, fish handling and return systems, barrier nets, aquatic filter barrier systems, an increase in the opening of the cooling water intake structure to reduce velocity and, if warranted by site specific conditions, cooling tower technology. Under the Sample Rule, in-place technologies implemented previously to comply with section 316(b), and information regarding their effectiveness, may be included in the Design and Construction Technology Plan. Operational measures that may be proposed include seasonal shutdowns or reductions in flow and continuous operation of screens.

The Sample Rule also would provide that the Director could exclude any design or construction technology if the costs of such technology would be significantly greater than the estimated benefits of the technology (§ 125.94(f)(2)).

## (3) Processes Structured on Incremental Cost-Benefit Assessment

EPA solicits comment on whether an evaluation of the cost-effectiveness (i.e., the incremental cost to benefit ratio) of cooling water intake structure technologies and any operational and/or restoration measures offered by the owner or operator of a facility is an appropriate component of the analysis that would be undertaken in a site-specific approach to determining best technology available for minimizing adverse environmental impact. The UWAG and PSEG recommendations for selecting technologies and other measures based on an evaluation of costs and benefits are discussed below.

## (A) UWAG Recommendation for a Process

Under the UWAG approach, if the facility is not able to demonstrate that its cooling water intake structure is not causing adverse environmental impact, it would then select and implement the best technology available. As the first step in choosing best technology available, a facility would identify technology alternatives. It would then estimate the costs and benefits of the alternatives. Relevant benefits typically would include preservation of fish and other aquatic life and economic benefits from recreational and commercial fisheries. Relevant costs typically would include the capital cost of constructing a technology, operation and maintenance costs (including energy penalties), and adverse environmental effects such as evaporative loss, salt drift, visible plumes, noise, or land use. For those facilities for which the technologies will lower the generating output of the facility, the cost of replacement power and the environmental effects of increased air pollution and waste generation from generating the replacement power also would be considered.

Facilities then would calculate the net benefits for each technology and rank them by cost-effectiveness. Those with marginal costs greater than marginal benefits would be rejected. The technology with the greatest net benefit would be the "best" technology for the site. UWAG believes use of existing EPA cost-benefit calculation methodologies, such as those used for natural resource damage valuation under CERCLA and under NEPA would be sufficient.

## (B) PSEG Recommendation for a Process

PSEG suggests two options for determining best technology available where prior section 316(b) determinations were not based upon

data and analyses sufficient to allow a permittee to seek renewal.

Under the first option, the permittee would provide the permit writer with an assessment that would address: (1) The alternative technologies or other measures that are available for addressing the cooling water intake structure's effects, and (2) the incremental costs and benefits of alternative technologies or other measures relative to the existing cooling water intake structure's operation. The application would include: an engineering report identifying the suite of technologies potentially applicable to the facility; an analysis describing the bases for the selection of technologies applicable to the facility; an assessment of the issues associated with retrofitting the facility to include each of the applicable technologies and their costs; and an assessment of the reasonably likely reductions in entrainment and impingement losses that would be achieved if the facility were to be retrofitted to operate with the technology. The application also would include a cost-benefit analysis that would address and assess: the effects of the reductions in entrainment and impingement losses on life stages of the species for which an economic value can be determined utilizing readily available information, such as market values of commercial species, and recreational costs based on methods determined to be appropriate by the Director and the appropriate fisheries management agencies. The Director would then select the best alternative technology or other measures, the costs of which are not wholly disproportionate to the benefits, unless the proposed technology or other measures clearly would not result in any substantial improvement to the species of concern.

In evaluating the benefits of alternative technologies, and in determining whether there is likely to be a substantial improvement to the species of concern, permittees and permitting authorities would undertake the level of biological analysis that was appropriate to the situation, supported by the applicable data, and commensurate with the resources available for developing and reviewing the necessary studies.

PSEG's second option would be appropriate where the permittee elects to undertake an in-depth analysis of the potential adverse environmental impact attributable to its cooling water intake structure, followed by a site-specific determination of the appropriate best technology available to minimize that adverse environmental impact. This

path represents the most resource-intensive and scientifically rigorous approach to implementing section 316(b). Under this option, the permittee would provide the permit writer with a detailed assessment that evaluates the effects of the existing cooling water intake structure's operation, and demonstrates the extent to which the operation may be jeopardizing the sustainability of the populations of the species of concern, or assesses other appropriate factors for determining adverse environmental impact. If the permitting agency concurs in an assessment that no adverse environmental impact is being caused by the existing operation, then the existing cooling water intake structure would be deemed to be best technology available. If the assessment demonstrates that the cooling water intake structure is causing adverse environmental impact or the permitting authority rejects the applicant's determination, then the permit applicant would proceed to evaluate alternative technologies or other measures.

#### (4) Questions for Comment on a Process for Determining the Best Technology Available for Minimizing Adverse Environmental Impact and the Role of Costs and Benefits

EPA invites public comment on the standard that would be included in any site-specific final rule for determining best technology available for minimizing adverse environmental impact, including the appropriate role for a consideration of costs and benefits. EPA invites comment on whether the long-standing "wholly disproportionate" cost-to-benefit test is an appropriate measure of costs and benefits in determining best technology available for minimizing adverse environmental impact. EPA also invites comment on the use of the "significantly-greater" cost to benefit test in today's sample site-specific rule. EPA also invites comment on whether a test based on the concept that benefits should justify costs would be more appropriate, as is used in various other legal and regulatory contexts (see, e.g., Safe Drinking Water Act Section 1412(b)(6)(A) and Executive Order 12866, Section 1(b)(6)). EPA also invites public comment on whether variances are appropriate and, if so, what test or tests should be used for granting a variance.

#### d. Use of Voluntary Restoration Measures or Enhancements

The Sample Site-Specific Rule and the UWAG and PSEG approaches would

all permit the owner or operator of an existing facility to voluntarily undertake restoration (or enhancement) measures in combination with, or in lieu of, technologies to minimize adverse environmental impact.

Section 125.95 of the Sample Rule provides that an owner or operator of an existing facility may undertake restoration measures, and the Director would be required to take into account the expected benefits of those measures to fish and shellfish in determining whether the facility has minimized adverse environmental impact. The permittee would include in its section 316(b) plan a list of the measures it proposed to implement and the methods for evaluating the effectiveness of the restoration measures.

UWAG gives the following as examples of potential enhancements: (1) Stocking fish to replace impaired RIS; (2) creating or restoring spawning or nursery habitat for RIS; (3) raising the dissolved oxygen in anoxic areas to expand the carrying capacity of the RIS in a water body; and (4) removing obstructions to migratory species. UWAG would require the objectives of particular enhancements to be established in advance, and appropriate monitoring and/or reporting obligations would be included in the facility's permit to confirm that enhancement objectives have been achieved. UWAG argues that using enhancements might lower compliance costs, might possibly be of more benefit to RIS than technologies, and might provide a longer-term benefit to RIS.

EPA invites public comment on whether a final site-specific rule should permit voluntary restoration or enhancement measures to be taken into account in determining compliance with section 316(b) and, if so, what criteria should be included for evaluating the effectiveness of such measures.

#### e. Consultation With Fish and Wildlife Management Agencies

Because the central focus of any site-specific approach is the effect of the cooling water intake structure on the aquatic populations or ecosystems, it is important that fish and wildlife management agencies with jurisdiction over the affected water body have an opportunity to provide information and views to the Director before section 316(b) determinations are made. The Sample Rule would provide for this in § 125.100(b)(2). The UWAG recommendations also recognize the important role of stakeholders, including fish and wildlife management

agencies, in a structured site-specific alternative (UWAG, pp. 8–9).

EPA invites public comment on the appropriate role of fish and wildlife management agencies if the final rule implements a site-specific approach.

#### 6. Implementation Burden Under Any Site-Specific Approach

Although well-implemented, site-specific approaches for determining best technology available to minimize adverse environmental impact can ensure that technologies are carefully tailored to site-specific environmental needs, EPA also recognizes that site-specific regulatory approaches can lead to difficult implementation challenges for State and Federal permitting agencies. EPA invites comment on the following discussion of the burdens associated with implementing section 316(b) on a site-specific basis, the competing demands on permitting agencies, and resources available to permitting agencies. EPA invites comment on ways to employ a site-specific approach while minimizing implementation burdens on permitting agencies.

The site-specific decision-making process requires each regulated facility to develop, submit, and refine studies that characterize or estimate potential adverse environmental impact. Although some approaches allow facilities to use existing studies in renewal applications, States must still conduct evaluations to ascertain the continued validity of these studies and assess existing conditions in the water body. Such studies can be resource intensive and require the support of a multidisciplinary team. A Director's determinations as to whether the appropriate studies have been performed and whether a given facility has minimized adverse environmental impact have often been subject to challenges that can take significant periods of time to resolve and can impose significant resource demands on permitting agencies, the public, and the permit applicant.

Some examples of the workload that can be required for permitting agencies to implement a site-specific approach follow. Since, 1999, EPA New England has devoted 0.6 full-time employees a year, including a permit writer, a biologist and attorney, to reissuance of a permit for the Pilgrim Nuclear Power Station (PNPS).<sup>62</sup> At the Seabrook Nuclear Power Station, EPA Region I

<sup>62</sup> Information provided by EPA Region I. Region I serves as permitting authority for the non-delegated states of Massachusetts and New Hampshire.

has invested about one full-time employee per year over four years to determine the nature and degree of adverse environmental impacts and the appropriate permit conditions the permit renewal. The State of New York Department of Environmental Conservation's Division of Fish, Wildlife and Marine Resources spent \$169,587 in 1997 and \$167,564 in 1998 to review cooling systems at steam-motivated electricity generating facilities. The Division estimated a total effort expenditure of approximately 2.2 full-time employees in 1997 and 1998 and 4.3 full-time employees for 2001. These figures do not include the level of effort associated with review time spent by the Division of Environmental Permits, the Division of Water, or the Division of Legal Affairs. (See Docket W-00-03.) Because of workload concerns, some States have requested that EPA adopt regulations that set clear requirements specifying standards of performance, monitoring and compliance.<sup>63</sup>

These levels of burden are of particular concern to the Agency and to some State permitting agencies given the heavy permit workloads, pressure on resources available to permitting agencies, and the complexity of finalizing permits required to address 316(b) requirements. Recent data indicate that most States are struggling to meet their major permits issuance targets set for decreasing the permit backlog. For example, these data indicate that for major facilities engaged in the generation, transmission and/or distribution of electric energy for sale (SIC 4911), the permit backlog is 30.3 percent<sup>64</sup>, that is, higher than other categories of major permits (data indicate a backlog of 23.1 percent for major permits in general).<sup>65</sup> In 1998, the EPA Office of Inspector General identified the backlog in issuance of National Pollutant Discharge Elimination System permits as a material weakness pursuant to the Federal Managers' Financial Integrity Act (FMFIA). As part of its Fiscal Year 2001 FMFIA Report, EPA recommended that the permit backlog be identified as a continuing material weakness in its programs. EPA's Office of Water is examining strategies to correct this

<sup>63</sup> See communications from Mr. William McCracken, Chief of the Permits Section, Surface Water Quality Division, Michigan Department of Environmental Quality, January 24, 2002.

<sup>64</sup> Backlog counts for these facilities are based on permits expired as of November 21, 2001 or if the permit expired field in the database is blank.

<sup>65</sup> NPDES Permit Backlog Trend Report: October 31, 2001, issued on November 30, 2001 by EPA's Water Permits Division, US EPA, Washington, DC.

weakness.<sup>66</sup> The evidence does not, however, establish that section 316(b) determinations are a factor in the backlog in issuance of National Pollutant Discharge Elimination System permits.

EPA is also aware that resources available to State permitting agencies are limited. In a recent survey conducted by ECOS (Environmental Council of States)<sup>67</sup> on States environmental agency budget reductions during the current fiscal year and for the upcoming fiscal year, 42 States reported that their agency was asked to cut or reduce their budgets for the current fiscal year.<sup>68</sup> For the following fiscal year, 23 of the responding States expected additional budget cuts. EPA is aware that at least one State, the State of Maryland, has used State law to impose a small surcharge on electric bills in the State to support a State research program, and that funds from that program are used for section 316(b) studies.

EPA seeks additional information and data on the resources necessary and available for the review of section 316(b) determinations in existing facilities' permit renewals.

EPA invites comment on whether the resource requirements of the site-specific approach also have served as a disincentive to a comprehensive revisiting of section 316(b) permit conditions during each renewal (typically every 5 years), despite advances in technologies for reducing impingement mortality and entrainment.

EPA seeks comment on the above discussion of the resource implications of implementing the requirements of section 316(b) on a case-by-case basis. EPA invites comment on how the workload of a site-specific approach could be streamlined so as to provide for the benefits of a site-specific approach (e.g., application of technologies specifically tailored to site-specific conditions) while recognizing the resource constraints faced by so many permitting agencies.

<sup>66</sup> Decision Memorandum from the Deputy Chief Financial Officer of EPA to the Administrator, December 18, 2001.

<sup>67</sup> The Environmental Council Of States is a national non-profit association of state and territorial environmental commissioners. See website: [www.sso.org/ecos/](http://www.sso.org/ecos/). *When the Axe Falls: How State Environmental Agencies Deal with Budget Cuts* by R. Steven Brown, Deputy Executive Director and Chief Operating Officer of ECOS. (See Docket for today's proposed rule.)

<sup>68</sup> This state budget outlook is supported by a report published on October 31, 2001, by the National Conference of State Legislatures (NCSL).

#### *D. Why EPA Is Not Considering Dry Cooling Anywhere?*

EPA conducted a full analysis for the new facility rule (Phase I) and rejected dry cooling as an economically practicable option on a national basis. Dry cooling systems use either a natural or a mechanical air draft to transfer heat from condenser tubes to air. In conventional closed-cycle recirculating wet cooling towers, cooling water that has been used to cool the condensers is pumped to the top of a recirculating cooling tower; as the heated water falls, it cools through an evaporative process and warm, moist air rises out of the tower, often creating a vapor plume. Hybrid wet-dry cooling towers employ both a wet section and dry section and reduce or eliminate the visible plumes associated with wet cooling towers.

For the new facility rule, EPA evaluated zero or nearly zero intake flow regulatory alternatives, based on the use of dry cooling systems. EPA determined that the annual compliance cost to industry for this option would be at least \$490 million. EPA based the costs on 121 facilities having to install dry cooling. The cost for Phase II existing facilities would be significantly higher. EPA estimates that 539 Phase II existing facilities would be subject to this proposal. The cost would be significantly higher because existing facilities have less flexibility, thus incurring higher compliance costs (capital and operating) than new facilities. For example, existing facilities might need to upgrade or modify existing turbines, condensers, and/or cooling water conduit systems, which typically imposes greater costs than use of the same technology at a new facility. In addition, retrofitting a dry cooling tower at an existing facility would require shutdown periods during which the facility would lose both production and revenues, and decrease the thermal efficiency of an electric generating facility.

The disparity in costs and operating efficiency of dry cooling systems compared with wet cooling systems is considerable when viewed on a nationwide or regional basis. For example, under a uniform national requirement based on dry cooling, facilities in the southern regions of the U.S. would be at an unfair competitive disadvantage compared to those in cooler northern climates. Even under a regional subcategorization strategy for facilities in cool climatic regions of the U.S., adoption of a minimum requirement based on dry cooling could impose unfair competitive restrictions for steam electric power generating

facilities. This relates primarily to the elevated capital and operating costs associated with dry cooling. Adoption of requirements based on dry cooling for a subcategory of facilities under a particular capacity would pose similar competitive disadvantages for those facilities.

EPA does not consider dry cooling a reasonable option for a national requirement, nor for subcategorization under this proposal, because the technology of dry cooling carries costs that are sufficient to cause significant closures for Phase II existing facilities. Dry cooling technology would also have a significant detrimental effect on electricity production by reducing energy efficiency of steam turbines. Unlike a new facility that can use direct dry cooling, an existing facility that retrofits for dry cooling would most likely use indirect dry cooling which is much less efficient than direct dry cooling. In contrast to direct dry cooling, indirect dry cooling does not operate as an air-cooled condenser. In other words, the steam is not condensed within the structure of the dry cooling tower, but instead indirectly through an indirect heat exchanger. Therefore, the indirect dry cooling system would need to overcome additional heat resistance in the shell of the condenser compared to the direct dry cooling system. Ultimately, the inefficiency penalties of indirect dry cooling systems will exceed those of direct dry cooling systems in all cases.

Although the dry cooling option is extremely effective at reducing impingement and entrainment and would yield annual benefits of \$138.2 million for impingement reductions and \$1.33 billion for entrainment reductions, it does so at a cost that would be unacceptable. EPA recognizes that dry cooling technology uses extremely low-level or no cooling water intake, thereby reducing impingement and entrainment of organisms to dramatically low levels. However, EPA interprets the use of the word "minimize" in section 316(b) in a manner that allows EPA the discretion to consider technologies that very effectively reduce, but do not completely eliminate, impingement and entrainment and therefore meet the requirements of section 316(b). Although EPA has rejected dry cooling technology as a national minimum requirement, EPA does not intend to restrict the use of dry cooling or to dispute that dry cooling may be the appropriate cooling technology for some facilities. For example, facilities that are repowering and replacing the entire infrastructure of the facility may find

that dry cooling is an acceptable technology in some cases. A State may choose to use its own authorities to require dry cooling in areas where the State finds its fishery resources need additional protection above the levels provided by these technology-based minimum standards.

#### *E. What Is the Role of Restoration and Trading?*

##### 1. Restoration Measures

Restoration measures, as used in the context of section 316(b) determinations, include practices that seek to conserve fish or aquatic organisms, compensate for lost fish or aquatic organisms, or increase or enhance available aquatic habitat used by any life stages of entrained or impinged species. Such measures have been employed in some cases in the past as one of several means of fulfilling the requirements imposed by section 316(b). Examples of restoration measures that have been included as conditions of permits include creating, enhancing, or restoring wetlands; developing or operating fish hatcheries or fish stocking programs; removing impediments to fish migration; and other projects designed to replace fish or restore habitat valuable to aquatic organisms. Restoration measures have been used, however, on an inconsistent and somewhat limited basis in the context of the 316(b) program. Their role under section 316(b) has never been explicitly addressed in EPA regulations or guidance until EPA promulgated the final section 316(b) regulations for new facilities, which is discussed below in more detail. Prior to the section 316(b) new facility regulations, restoration projects were undertaken as part of section 316(b) determinations at Phase II existing facilities and in permitting actions where the cost of the proposed technology was considered to be wholly disproportionate to the demonstrated environmental benefits that could be achieved. Often such cases involved situations where retrofitting with a technology such as cooling towers was under consideration. In addition to the role for restoration outlined as part of the today's proposed rule (see Section VI.A. above), EPA invites comment on the following alternatives for restoration as part of regulations for Phase II existing facilities.

##### a. The Role of Restoration in the Section 316(b) New Facility Regulations

The final rule for new facilities includes restoration measures as part of Track II. EPA did not include restoration in Track I because it was

intended to be expeditious and provide certainty for the regulated community and a streamlined review process for the permitting authority. To do this for new facilities, EPA defined the best technology available for minimizing adverse environmental impact in terms of reduction of impingement and entrainment, a relatively straightforward metric for environmental performance of cooling water intake structures. In contrast, restoration measures in general require complex and lengthy planning, implementation, and evaluation of the effects of the measures on the populations of aquatic organisms or the ecosystem as a whole.

EPA included restoration measures in Track II to the extent that the Director determines that the measures taken will maintain the fish and shellfish in the waterbody in a manner that represents performance comparable to that achieved in Track I. Applicants in Track II need not undertake restoration measures, but they may choose to undertake such measures. Thus, to the extent that such measures achieve performance comparable to that achieved in Track I, it is within EPA's authority to authorize the use of such measures in the place of Track I requirements. This is similar to the compliance alternative approach EPA took in the effluent guidelines program for Pesticide Chemicals: Formulating, Packaging and Repackaging. There EPA established a numeric limitation but also a set of best management practices that would accomplish the same numeric limitations. See 61 FR 57518, 57521 (Nov. 6, 1997). EPA believed that section 316(b) of the Clean Water Act provided EPA with sufficient authority to allow the use of voluntary restoration measures in lieu of the specific requirements of Track I where the performance is substantially similar under the principles of *Chevron USA v. NRDC*, 467 U.S. 837, 844-45 (1984). In section 316(b) of the Clean Water Act, Congress is silent concerning the role of restoration technologies both in the statute and in the legislative history, either by explicitly authorizing or explicitly precluding their use. In the context of the new facility rule EPA also believes that appropriate restoration measures or conservation measures that are undertaken on a voluntary basis by a new facility to meet the requirements of that rule fall within EPA's authority to regulate the "design" of cooling water intake structures. *Bailey v. U.S.*, 516 U.S. 137 (1995) (In determining the meaning of words used in a statute, the court considers not only the bare meaning of the word, but also its

placement and purpose in the statutory scheme.)

In the new facility rule EPA recognized that restoration measures have been used at existing facilities implementing section 316(b) on a case-by-case, best professional judgment basis as an innovative tool or as a tool to conserve fish or aquatic organisms, compensate for the fish or aquatic organisms killed, or enhance the aquatic habitat harmed or destroyed by the operation of cooling water intake structures. Under Track II, that flexibility will continue to be available to new facilities to the extent that they can demonstrate performance comparable to that achieved in Track I. For example, if a new facility that chooses Track II is on an impaired waterbody, that facility may choose to demonstrate that velocity controls in concert with measures to improve the productivity of the waterbody will result in performance comparable to that achieved in Track I. The additional measures may include such things as reclamation of abandoned mine lands to eliminate or reduce acid mine drainage along a stretch of the waterbody, establishment of riparian buffers or other barriers to reduce runoff of solids and nutrients from agricultural or silvicultural lands, removal of barriers to fish migration, or creation of new habitats to serve as spawning or nursery areas. Another example might be a facility that chooses to demonstrate that flow reductions and less protective velocity controls, in concert with a fish hatchery to restock fish being impinged and entrained with fish that perform a similar function in the community structure, will result in performance comparable to that achieved in Track I.

Finally, in the new facility rule, EPA recognized that it may not always be possible to establish quantitatively that the reduction in impact on fish and shellfish is comparable using the types of measures discussed above as would be achieved in Track I, due to data and modeling limitations. Despite such limitations, EPA stated that there may be situations where a qualitative demonstration of comparable performance could reasonably assure substantially similar performance. For that reason, EPA provided, in § 125.86 of the new facility rule, that the Track II Comprehensive Demonstration Study should show that either: (1) The Track II technologies would result in reduction in both impingement mortality and entrainment of all life stages of fish and shellfish of 90 percent or greater of the reduction that would be achieved through Track I (quantitative demonstration) or, (2) if consideration of

impacts other than impingement mortality and entrainment is included, the Track II technologies would maintain fish and shellfish in the waterbody at a substantially similar level to that which would be achieved under Track I (quantitative or qualitative demonstration).

#### b. Restoration Approaches Being Considered for the Existing Facilities Rule

In the existing facilities rule, EPA is proposing to allow restoration as one means of satisfying the compliance requirements for any one of the three alternatives in § 125.94(a). The demonstration a facility would make to show that the restoration measures provide comparable performance to design and construction technologies and/or operational measures would be similar to the demonstration that a facility would make under Track II in the new facility rule. EPA is also inviting comment on other restoration approaches it is considering. These include discretionary and mandatory regulatory approaches involving restoration measures as well as restoration banking, which are discussed below.

##### (1) Discretionary Restoration Approaches

An approach being considered by EPA would provide the Director with the discretion to specify appropriate restoration measures under section 316(b), but would not require that he or she do so. This approach is consistent with several precedents in which the permitting authority allowed the use of restoration measures when the cost to retrofit an existing facility's cooling water intake structures with control technologies was determined to be wholly disproportionate to the benefits the control technology would provide (e.g., John Sevier, Crystal River, Chalk Point, Salem).<sup>69</sup>

##### (2) Mandatory Restoration Approach

Under this approach, the use of restoration measures would be required as an element of a section 316(b) determination in all cases or in some defined set of cases (e.g., for intake structures located on oceans, estuaries,

<sup>69</sup> *In re* Tennessee Valley Authority John Sevier Steam Plant, NPDES Permit No. TN0005436 (1986); *In re* Florida Power Corp. Crystal River Power Plant Units 1, 2, & 3, NPDES Permit FL0000159 (1988); Chalk Point, MDE, State of Maryland, Discharge Permit, Potomac Electric Power Co., State Discharge Permit No. 81-DP-0627B, NPDES Permit No. MD0002658B (1987, modified 1991); Draft NJDEP Permit Renewal Including Section 316(a) Variance Determination and Section 316(b) BTA Decision: NJDEP Permit No. NJ0005622 (1993).

or tidal rivers). Restoration would be required to compensate for organisms that were not protected following facility installation of control technologies. Phase II existing facilities with cooling water intake structures would be required to implement some form of restoration measures in addition to implementing direct control technologies to minimize adverse environmental impact. Under this approach, an existing facility would submit a plan to restore fish and shellfish to the extent necessary for offsetting fish and shellfish entrainment and impingement losses estimated to continue to occur after any required control technology is installed. This restoration plan would be reviewed and approved by the Director and incorporated in the permit. This is similar to the mitigation sequence used under CWA section 404, wherein environmental impacts are avoided and minimized prior to consideration of compensatory mitigation measures although in section 404, not all projects require mitigation. The development of restoration measures applicable to a cooling water intake structure would focus on the unique situation faced by each facility and would allow for review and comment by the permitting agency and the public.

### (3) Restoration Banking

Restoration plans could potentially use a banking mechanism similar to those used in the CWA section 404 program, that would allow the permittee to meet requirements by purchasing restoration credits from an approved bank. For example, should wetlands restoration be an appropriate mechanism for offsetting the adverse impact caused by a cooling water intake structure, the permittee could purchase credits from an existing wetlands mitigation bank established in accordance with the *Federal Guidance for the Establishment, Use and Operation of Mitigation Banks* (50 FR 58605; November 28, 1995). As in the CWA section 404 program, public or private entities could establish and operate the banks providing mitigation for impacts under 316(b). EPA views the use of restoration banking for the purposes of this proposed rule as one way to facilitate compliance and reduce the burden on the permit applicant, while at the same time potentially enhancing the ecological effectiveness of the required restoration activities.

### 2. Entrainment Trading

Under § 125.90(d) of today's proposed rule, States may adopt alternative regulatory requirements that will result

in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment specified in the proposed § 125.94. EPA is considering an approach for implementing section 316(b) that would allow specific Phase II existing facilities to trade entrainment reductions to achieve an overall standard of performance for entrainment reduction in a watershed at a lower cost through a voluntary State or authorized Tribal section 316(b) trading program. EPA believes such an approach might be appropriate in light of section 316(b)'s objective of minimizing adverse environmental impact. The goal of the trading approach is to provide an incentive for some Phase II existing facilities to implement more protective technologies than required by today's proposed rule, resulting in credits that can be traded with other facilities that may not find the most protective technologies economically practicable.

EPA acknowledges that the trading framework that EPA is contemplating under section 316(b) differs from previous trading strategies implemented by EPA because it involves trading living resources rather than pollutant loads. Because this is a novel approach to trading, it raises many questions. For example, how would the program address concerns that some species have greater economic value than others, or the counter-argument that some species may not be economically valuable but nonetheless have high ecological value? What is an appropriate spatial scale under which trading can occur to ensure protection of water quality and aquatic organisms? The following section addresses these questions and others and seeks comment on the appropriate elements of a trading approach under section 316(b) that would conserve and protect water quality and aquatic resources.

#### a. Entrainment Reduction vs. Impingement Reduction as a Basis for Trading

Entrainment and impingement are the main causes of adverse environmental impact from cooling water intake withdrawals. However, impingement reduction technologies are relatively inexpensive compared to entrainment reduction (see Chapter 2 of the Technical Development Document for the New Facility Rule, EPA-821-R-01-036, November 2001). Impingement reduction measures include decreasing intake velocities and installation of traveling screens with fish baskets and fish return systems. The implementation of a section 316(b) trading program for impingement may not justify the cost of

monitoring susceptible species and administering the program. EPA believes that a trading program that focuses on entrainment is more viable. However, EPA requests comment on whether to extend trading to include impingement of aquatic organisms.

In contrast to impingement controls, entrainment reduction technologies can be relatively expensive. Section 316(b) trading would enable smaller facilities that cannot afford to install more costly technologies to reduce their costs by trading with other Phase II existing facilities that face relatively lower costs of entrainment reduction. For the purpose of a section 316(b) trading program, an entrainment reduction performance standard for a watershed would be set by the authorized State or Tribe within the range of 60 to 90 percent for all life stages of entrained fish and shellfish. The performance standard would be set to reflect site-specific facility and ecological characteristics. All facilities located in the watershed would need to reach the performance standard through the installation of technologies to reduce entrainment (or, potentially, restoration measures to compensate for entrainment losses at the facility). A facility that can afford to implement technologies to reduce entrainment above the performance standard would have entrainment reduction credits to sell to other facilities that cannot afford or choose not to meet the performance standard by technology alone. EPA notes that in § 125.94(c) of today's proposed rule, Phase II existing facilities may request a site-specific determination of best technology available if the costs of compliance with the applicable performance standards are significantly greater than the costs EPA considered when establishing the performance standards or significantly greater than site-specific benefits. If a section 316(b) trading program was available, these facilities could potentially have a lower cost option for meeting the applicable performance standard for their respective waterbodies by purchasing credits from another facility that implements more protective technologies. EPA seeks comment on whether a section 316(b) trading program would generally afford greater watershed protection by increasing the number of facilities meeting the performance standard and whether consideration of credit purchases should be mandatory prior to the Director setting alternative requirements.

b. What Should Be the Spatial Scale for Trading?

EPA is considering limiting the zone within which trading may occur among Phase II existing facilities subject to section 316(b). Due to site-specific differences in species and life stages of entrained organisms, the scale of the trading zone would be set to minimize these differences as much as possible. Trading would be most protective if it occurred among Phase II existing facilities that generally entrain the same species and life stages at relatively similar densities per unit flow through the facility. Thus, EPA would prefer that trades be conducted by Phase II existing facilities sited in waterbodies that share similar ecological characteristics, regardless of the relative geographic proximity of the facilities to each other. EPA is also considering limiting trades to specific waterbodies, specific watersheds, or general waterbody types (tidal rivers, estuaries, oceans). Preliminary EPA analyses indicate that some of these options may increase the number of Phase II existing facilities eligible to trade and thus may produce sufficient opportunities to reduce the cost of meeting the performance standard, allowing for a broader range of trades.

(1) Specific Waterbody

If section 316(b) trades for Phase II existing facilities were limited on an individual waterbody basis, EPA estimates that there would be a total of 132 Phase II existing facilities in 40 specific waterbodies eligible to trade. In order to be eligible to trade, each facility involved in the trade would need to be located on the same waterbody and required to meet the performance standard of the waterbody. Further limits would have to be placed on trading in very large waterbodies (e.g., Mississippi River, Pacific Ocean, Atlantic Ocean) to ensure that the facilities are within similar climatic zones, and thus entrain similar species. Allowing trading among Phase II existing facilities and those that may be subject to Phase III regulations for cooling water intake structures could increase opportunities for facilities to trade intake control requirements.

(2) Specific Watershed

By limiting trading on a watershed basis, the problems posed by very large waterbodies are eliminated; however, the zone may include different types of waterbodies that may harbor different species of organisms. Hydrologic Unit Codes (HUC) were developed by the United States Geological Survey (USGS)

to divide the conterminous United States by drainage basins. As the number of digits in the code increases, the drainage basin delineation becomes more refined. Eight-digit codes represent the fourth level of classification in the hierarchy of hydrologic units, where each code represents all or part of a surface drainage basin. There are 2,150 eight-digit HUCs in the conterminous United States. In order to be eligible to trade under this approach, all facilities involved in the trade would be located in the same eight-digit HUC. EPA invites comment on these and other potential trading zones for section 316(b) trading for Phase II existing facilities.

(3) General Waterbody Type

EPA is also considering a site-specific approach that would require facilities to study and provide data on the numbers, life stages, and species of organisms entrained in order to be properly matched for trading with another Phase II existing facility on the same waterbody type (e.g., tidal river, estuary, ocean, Great Lake) which entrains the similar numbers, life stages, and species of organisms. EPA seeks comment on this approach which allows trades to occur among facilities on the same general waterbody type, but not necessarily the same waterbody.

c. What Should Be the Unit (Credit) for Trading?

A trading option requires a definition of the trading commodity and the unit, or credit, that would be traded. In contrast to pollutant-specific trading, which is normally based on the pounds of a single pollutant released into the environment or reduced from a source, trading of entrained species can involve a variety of fish and shellfish species and their life stages, and may be highly variable among facilities. Therefore, it could be difficult to define a trading unit and substantial oversight would be needed under any of these trading units to determine if the trade complied with the underlying performance standards from year to year, or another appropriate period. In developing this proposal, EPA considered a variety of potential trading credits and invites comment on these and other potential trading units. EPA is specifically interested in comments on whether entrainment trading should be species-specific, have weighted values for different species, or simply be net biomass entrainment expressed in mass. EPA is also considering use of restoration measures in conjunction with any of the trading units discussed below. Please see

section VI.E.1 of the preamble to today's proposed rule for additional information and discussion on restoration.

(1) Species Density

Trading based on the density of entrained species life stages (the number of eggs, larvae, juvenile and small fish for all fish and shellfish species entrained per unit of flow through a facility) is EPA's preferred approach because it would account for differences among facilities in the number of organisms entrained per unit flow and would, in a sense, standardize entrainment losses with intake flow withdrawals. Under this approach, trading would be restricted to those Phase II existing facilities sited at waterbodies with similar ecological zones, such as the transitional zone between saline and freshwater portions of an estuary. Because many aquatic species tend to inhabit specific zones within a waterbody during their life histories, restricting trade to individual zones would ensure that similar species at similar densities are traded. In order for a trade to occur, the facilities involved must historically entrain similar species. Under this approach the comparable worth of the unit of flow would be dependent upon the density of the species entrained (see example below). Thus, if a facility entrains twice as many organisms as another facility, its flow would be worth comparably twice as much. This approach would ensure that all species entrained are protected, but may limit the number of trades possible. It is possible that use of this approach may lead to over-protection or under-protection of some species since the average density of all fish and shellfish would be used rather than the density for individual species.

(2) Species Counts

Another option for a trading unit is entrained organism counts by species, life stage, and size. These types of measurements are routinely collected as part of historical facility demonstration studies. This option would be protective of all life stages independently, but would require significant expenditures of time and resources. Entrained organisms would need to be identified to fairly precise taxonomic levels and organized by life stage and size classes. This option would best address the question of different economic values versus ecological values of species since it would allow different monetary values to be set for each species. Although this option would allow for comparable species-by-species trading among Phase II existing facilities, EPA is concerned that it may also result in

complex trading transactions. Also, the number of each species entrained by a facility can vary substantially each year for many reasons, including facility outages and extreme weather events. Substantial oversight might be needed to determine if the trade achieved the underlying technology-based performance standard from year to year, or other appropriate period, for compliance.

### (3) Biomass

Another potential measure that can be used for trading is the biomass of entrained organisms. Biomass is defined as the weight of living material (plant and animal) and can be measured in pounds or kilograms. Measuring the biomass of organisms entrained by facility intakes would be relatively fast and easy to quantify. However, the pound/kilogram as a unit of measurement does not take into account species variations found at different facility locations and within multiple waterbody types. Thus, as a result of adopting this unit of measurement, it would be impossible to distinguish between different species, or even different kingdoms. Because the weights of all entrained organisms are combined into a total mass, biomass measurement may not be equally protective of all species and life stages, and larger, heavier organisms may bias final results. Over time, biomass trading may upset the natural equilibrium of certain species and/or impact the functionality of the entire ecosystem should some species be entrained more frequently than others. However, EPA invites comment on whether biomass trading might be limited to certain zones of certain waterbodies or waterbody types, in a manner similar to that described above for species-density trading to address some of these concerns.

### d. Example of Section 316(b) Trading Under EPA's Preferred Alternative (Species Density)

Facility A is an existing 750 MGD facility located in an estuary. Facility B is an existing 350 MGD facility located at the mouth of the same estuary. The performance standard for this estuary has been set by the authorized State or Tribe at a 75 percent reduction of entrainment for all facilities. Facility A determines that it can install a cooling tower at relatively low cost. The installation of the cooling tower reduces the facility's flow by 95 percent. Using the standard assumption that entrained organisms behave like passive water molecules, this flow reduction will, on a long-term average basis, reduce entrainment by 95 percent at Facility A.

In effect, Facility A has reduced its entrainment by 20 percent more than it needs to in order to provide its share toward meeting the performance standard of 75 percent for the estuary. Because of its small size, Facility B determines that it is not cost effective to reduce entrainment by 75 percent. Instead, Facility B chooses to install fine mesh wedgewire screens, which reduce its entrainment by 60 percent. Facility B could possibly make up for the remaining 15 percent of its share to meet the estuary's performance standard by trading.

Based on historical monitoring data, Facility A entrains alewife, Atlantic croaker, Atlantic menhaden, bay anchovy, blueback herring, silversides, spot, striped bass, weakfish and white perch. The average number, across many years of data, of all life stages of all species entrained is 417,210 fish per day. Per gallon of water used, it entrains 0.000556 fish (417,210/750,000,000).

Facility B also entrains alewife, Atlantic croaker, Atlantic menhaden, bay anchovy, blueback herring, silversides, spot, striped bass, weakfish, and white perch as determined by historical monitoring data. Facility B historically entrains the same species of fish as Facility A as they withdraw water from the same waterbody. The average number, across many years of data, of all life stages of all species entrained is 322,620 fish per day. Per gallon of water used, it entrains 0.000922 fish (322,620/350,000,000). Based on density, Facility B entrains 1.658 times as many fish as Facility A per unit flow (0.000922/0.000556). This is the average density ratio of organisms entrained.

Facility B needs to make up for 15 percent of its share toward the estuary's performance standard for entrainment reduction. Again, using the standard assumption that entrained organisms behave like passive water molecules, the simplified 1:1 relationship between flow and entrainment from Facility A is also used for Facility B in this example. Therefore, Facility B needs to compensate for the environmental effects caused by 15 percent of its flow, or 52,500,000 gallons of resource use (0.15 \* 350,000,000). Since Facility A has reduced entrainment 20 percent more than required, it has 150,000,000 gallons of resource use available for trading (0.20 \* 750,000,000). A trade could be made between these two facilities because they are located on the same waterbody, they both must install entrainment controls, and the same species are present in their respective entrainment numbers. The average density ratio of organisms entrained

multiplied by the gallons of resource use needed by Facility B would equal the gallons of resource use that Facility B would need to buy from Facility A in order to make up for the difference in the density of the species the two facilities entrain. Based on the discrepancy in the average density of organisms entrained as calculated above, in order to trade with Facility A, Facility B must purchase entrainment credits for 1.658 times as many gallons as it needs. Thus, Facility B needs to purchase 87,045,000 gallons of resource use from Facility A (1.658 \* 52,500,000).

### e. Trading Option for New Facilities

EPA is considering extending a section 316(b) trading program beyond the Phase II rule for existing electric generation facilities. Those facilities that are covered by the Phase I rule (new facilities) might be allowed to participate in a section 316(b) trading program. New facilities could implement technological controls beyond what is required under the Phase I rule. In general, if more facilities were allowed to trade, there would be an increased degree of competitiveness in trading and it would become easier to meet the performance standard because entrainment reductions would be shared by multiple facilities. EPA invites comment on the option of extending a section 316(b) trading program to new facilities.

### f. Voluntary Adoption of Trading by Authorized States and Tribes

Under EPA's preferred alternative for section 316(b) trading, authorized States or Tribes would decide whether to voluntarily adopt a section 316(b) trading program. EPA notes that authorized States and Tribes would first need to adopt the appropriate legal authority to conduct a section 316(b) trading program. In general, EPA believes that States and Tribes have a better understanding of the dynamics, value, and overall quality of their local waterbodies based on assigned designated uses, 305(b) monitoring reports, and other relevant information and studies compiled over time. Thus, authorized States or Tribes may be in a better position to judge whether or not to develop and implement a section 316(b) trading program. Although EPA acknowledges that a nationally-run section 316(b) trading program may enhance uniformity, EPA is concerned that a national program may not be feasible because of differences in species; habitats; waterbody characteristics; and the variety, nature, and magnitude of environmental impacts from cooling water intake

structures found across the United States. EPA seeks comment on whether a national registry of trades and associated national trading guidance would be appropriate.

A voluntary program would be administered by the authorized State or Tribe. Authorized States and Tribes that participate could allow trading among facilities to meet the entrainment reduction performance standard. Key environmental and natural resource agencies, industry and its trade associations, and local environmental groups involved in the protection of the watershed would participate in the authorized State or Tribal section 316(b) trading program through the public comment process. The program would also include consultation with from relevant Federal, State and authorized Tribal resource agencies and neighboring authorized States and Tribes where interstate waters are affected (similar to stakeholder involvement under the NPDES permitting program).

**g. When Would the Permits Be Reissued to Trading Partners?**

If trades under section 316(b) are done on a watershed basis, and permits are synchronized, then permits would be reissued to trading partners at the same time according to the permitting authority's standard permit renewal cycle (e.g., every 5 years). With permitting authorities that have moved toward a watershed permitting strategy, synchronizing the permit renewal process for all trading partners in a geographic area reduces some administrative cost and burden on the permitting authorities.

Alternatively, a trading arrangement may not be specified in the permit. Instead, the permit would include the performance standard and a requirement to meet that standard. Under this approach, trades could occur between permitting cycles. Another option would allow trading of entrainment units between Phase II existing facilities within permit cycles at the discretion of each authorized State or Tribal permitting authority. A disadvantage to this approach is the additional administrative burden borne by the permitting authorities. EPA seeks comment on how to harmonize the reissuance of permits with trading among Phase II existing facilities under section 316(b).

**h. Implementation and Enforcement Issues for Section 316(b) Trading**

The concept of a section 316(b) trading program for Phase II existing facilities presents many challenges for

the permitting program at the Federal, State, or authorized Tribe level. These challenges include development of implementation guidance, incorporation of a section 316(b) trade tracking system within EPA's Permit Compliance System or through some other tracking mechanism, self-reporting on compliance with trade agreements (similar to the self-reporting conducted through use of Discharge Monitoring Reports), determination of the administrative cost and burden of such a trading program and EPA oversight of whether regulatory requirements for impingement and entrainment reduction are met. EPA invites comment on these unique challenges and any others regarding implementation, compliance assessment, and enforcement of a section 316(b) trading program.

**VII. Implementation**

As in the new facility rule, section 316(b) requirements for Phase II existing facilities would be implemented through the NPDES permit program. Today's proposal would establish application requirements in § 125.95, monitoring requirements in § 125.96, and recordkeeping and reporting requirements in § 125.97 for Phase II existing facilities that have a design intake flow of 50 MGD or more. The proposed regulations also require the Director to review application materials submitted by each regulated facility and include monitoring and recordkeeping requirements in the permit (§ 125.98). EPA will develop a model permit and permitting guidance to assist Directors in implementing these requirements after they are finalized. In addition, the Agency will develop implementation guidance for owners and operators that will address how to comply with the application requirements, the sampling and monitoring requirements, and the recordkeeping and reporting requirements in these proposed regulations.

**A. When Does the Proposed Rule Become Effective?**

Phase II existing facilities subject to today's proposed rule would need to comply with the Subpart J requirements when an NPDES permit containing requirements consistent with Subpart J is issued to the facility. See proposed § 125.92. Under existing NPDES program regulations, this would occur when an existing NPDES permit is reissued or, when an existing permit is modified or revoked and reissued.

**B. What Information Must I Submit to the Director When I Apply for My Reissued NPDES Permit?**

The NPDES regulations that establish the application process at 40 CFR 122.21(d)(2) generally require that facilities currently holding a permit submit information and data 180 days prior to the end of the permit term, which is five years. If you are the owner or operator of a facility that is subject to this proposed rule, you would be required to submit the information that is required under 40 CFR 122.21(r)(2), (3), and (5) and § 125.95 of today's proposed rule with your application for permit reissuance. This section provides a general discussion of the proposed application requirements for Phase II existing facilities at the outset and then goes into more detail in subsequent subsections. The Director would review the information you provide in your application including the information submitted in compliance with 40 CFR 122.21(r) and § 125.95 and would confirm whether your facility should be regulated as an existing facility under these proposed regulations or as a new facility under regulations that were published on December 19, 2001 (66 FR 65256) and establish the appropriate requirements to be applied to the cooling water intake structure(s).

Today's proposed rule would modify regulations at 40 CFR 122.21(r) to require existing facilities to prepare and submit some of the same information required for new facilities. The proposed application requirements would require owners or operators of Phase II existing facilities to submit two general categories of information when they apply for a reissued NPDES permit. The general categories of information would include (1) Physical data to characterize the source waterbody in the vicinity where the cooling water intake structures are located (40 CFR 122.21(r)(2)) and (2) data to characterize the design and operation of the cooling water intake structures (40 CFR 122.21(r)(3)). Unlike the new facilities, however, Phase II existing facilities would not be required to submit the Source Water Baseline Biological Characterization Data required under 40 CFR 122.21(r)(4)). Today's proposed rule would add a new requirement at 40 CFR 122.21(r)(5) to require a facility to submit information describing the design and operating characteristics of its cooling water systems and how they relate to the cooling water intake structures at the facility.

In addition, today's proposed rule would require all Phase II existing facilities to submit the information

required under § 125.95. In general, the proposed application requirements in § 125.95 require all Phase II existing facility applicants, except those that already use a closed-cycle, recirculating cooling system, to submit a Comprehensive Demonstration Study (§ 125.95(b)). This study includes a proposal for information collection; source waterbody information; a characterization of impingement mortality and entrainment; a proposal for technologies, operational measures, restoration measures and estimated efficacies; and a plan to conduct monitoring to demonstrate that the proposed technologies and measures achieve the performance levels that were estimated. The following describes the proposed application requirements in more detail.

1. Source Water Physical Data (40 CFR 122.21(r)(1)(ii))

Under the proposed requirements at 40 CFR 122.21(r)(1)(ii), Phase II existing facilities subject to this proposed rule would be required to provide the source water physical data specified at 40 CFR 122.21(r)(2) in their application for a reissued permit. These data are needed to characterize the facility and evaluate the type of waterbody and species potentially affected by the cooling water intake structure. The Director would use this information to evaluate the appropriateness of the design and construction technologies proposed by the applicant.

The applicant would be required to submit the following specific data: (1) A narrative description and scale drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation; (2) an identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the intake's zone of influence and the results of such studies; and (3) locational maps.

2. Cooling Water Intake Structure Data (40 CFR 122.21(r)(1)(ii))

Under the proposed requirements at 40 CFR 122.21(r)(1)(ii), Phase II existing facilities would be required to submit the cooling water intake structure data specified at 40 CFR 122.21(r)(3) to characterize the cooling water intake structure and evaluate the potential for impingement and entrainment of aquatic organisms. Information on the design of the intake structure and its location in the water column would

allow the permit writer to evaluate which species or life stages would potentially be subject to impingement and entrainment. A diagram of the facility's water balance would be used to identify the proportion of intake water used for cooling, make-up, and process water. The water balance diagram also provides a picture of the total flow in and out of the facility, allowing the permit writer to evaluate compliance with the performance standards.

The applicant would be required to submit the following specific data: (1) A narrative description of the configuration of each of its cooling water intake structures and where they are located in the waterbody and in the water column; (2) latitude and longitude in degrees, minutes, and seconds for each of its cooling water intake structures; (3) a narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal operation schedules, if applicable; (4) a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and (5) engineering drawings of the cooling water intake structure.

3. Phase II Existing Facility Cooling Water System Description (40 CFR 122.21(r)(1)(ii))

Under the proposed requirements at 40 CFR 122.22(r)(1)(ii), Phase II existing facilities would be required to submit the cooling water system data specified at 40 CFR 122.21(r)(5) to characterize the operation of cooling water systems and their relationship to the cooling water intake structures at the facility. Also proposed to be required is a description of the design intake flow that is attributed to each system and the number of days of the year in operation and any seasonal operation schedules, if applicable. This information would be used by the applicant and the Director in determining the appropriate standards that can be applied to the Phase II facility. Facilities that have closed-cycle, recirculating cooling water systems will be determined to have met the performance standards in § 125.94 if all of their systems are closed-cycle, recirculating cooling systems. These facilities are not required to submit a Comprehensive Demonstration Study. Additionally, if only a portion of the total design intake flow is water withdrawn for a closed-cycle, recirculating cooling system, such facilities may use the reduction in

impingement mortality and entrainment that is attributed to the reduction in flow in complying with the performance standards in § 125.94(b).

4. Comprehensive Demonstration Study (§ 125.95(b))

Proposed application requirements at § 125.95(b) would require all existing facilities except those deemed to have met the performance standard in § 125.94(b)(1) (reduced intake capacity to a level commensurate with the use of a closed-cycle, recirculating cooling water system) to perform and submit to the Director the results of a Comprehensive Demonstration Study, including data and detailed analyses to demonstrate that you will meet applicable requirements in § 125.94.

The proposed Comprehensive Demonstration Study has seven components.

- Proposal for Information Collection;
- Source Waterbody Flow Information;
- Impingement Mortality and Entrainment Characterization Study;
- Design and Construction Technology Plan;
- Information to Support Proposed Restoration Measures;
- Information to Support Site-specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact; and
- Verification Monitoring Plan.

The information required under each of these components of the Comprehensive Demonstration Study may not be required to be submitted by all Phase II existing facilities. Required submittals for your facility would depend on the compliance option you have chosen. All Phase II existing facilities, except those deemed to have met the performance standard in § 125.94(b)(1), would be required to submit a Proposal for Information Collection; a Source Waterbody Flow Information; an Impingement Mortality and Entrainment Characterization Study; a Design and Construction Technology Plan; and a Verification Monitoring Plan. Only those Phase II existing facilities that propose to use restoration measures in whole or in part to meet the performance standards in § 125.94 would be required to submit the Information to Support Proposed Restoration Measures. Only those facilities who choose to demonstrate that a site-specific standard is appropriate for their site would be required to submit Information to Support Site-specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact.

a. Proposal for Information Collection

Before performing the study you would be required to submit to the Director for review and approval, a proposal stating what information would be collected to support the study (see § 125.96(b)(1)). This proposal would provide: (1) A description of the proposed and/or implemented technology(ies) and/or supplemental restoration measures to be evaluated; (2) a list and description of any historical studies characterizing impingement and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to this proposed study. If you propose to use existing data, you must demonstrate the extent to which the data are representative of current conditions and that the data were collected using appropriate quality assurance/quality control procedures; (3) a summary of any past, ongoing, or voluntary consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to this study and a copy of written comments received as a result of such consultation; and (4) a sampling plan for any new field studies you propose to conduct in order to ensure that you have sufficient data to develop a scientifically valid estimate of impingement and entrainment at your site. The sampling plan would document all methods and quality assurance/quality control procedures for sampling and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and must take into account the methods used in other studies performed in the source waterbody. The sampling plan would include a description of the study area (including the area of influence of the cooling water intake structure), and provide taxonomic identifications of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish).

The proposed rule does not specify particular timing requirements for your information collection proposal, but does require review and approval of the proposal by the Director. In general, EPA expects that it would be submitted well in advance of the other permit application materials, so that if the Director determined that additional information was needed to support the application, the facility would have time to collect this information, including additional monitoring as appropriate. In some cases, however, where the facility intends to rely on existing data and there has been no

change in conditions at the site since the last permit renewal, a long lead time might not be necessary. This would most likely be the case for subsequent permit renewals following the first renewal after the Phase II requirements go into effect. EPA requests comment on whether it should specify a particular time frame for submitting the information collection proposal, or alternatively, whether it should remove the requirement for approval by the Director.

b. Source Waterbody Flow Information

Under the proposed requirements at § 125.95(b)(2)(i), Phase II existing facilities, except those deemed to meet the performance standard in § 125.94(b)(1), with cooling water intake structures that withdraw cooling water from freshwater rivers or streams would be required to provide the mean annual flow of the waterbody and any supporting documentation and engineering calculations that allow a determination of whether they are withdrawing less than or greater than five (5) percent of the annual mean flow. This would provide information needed to determine which requirements (§ 125.94(b)(2) or (3)) would apply to the facility. The documentation might include either publicly available flow data from a nearby U.S. Geological Survey (USGS) gauging station or actual instream flow monitoring data collected by the facility. The waterbody flow should be compared with the total design flow of all cooling water intake structures at the regulated facility.

Under the proposed requirements at § 125.95(b)(2)(ii), Phase II existing facilities subject to the proposed rule with cooling water intake structures that withdraw cooling water from a lake or reservoir and that propose to increase the facility's design intake flow would be required to submit a narrative description of the waterbody thermal stratification and any supporting documentation and engineering calculations to show that the increased flow meets the requirement not to disrupt the natural thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies) (§ 125.94(b)(4)(ii)). Typically, this natural thermal stratification would be defined by the thermocline, which may be affected to a certain extent by the withdrawal of cooler water and the discharge of heated water into the system. This information demonstrates to the permit writer that any increase in

design intake flow is maintaining the thermal stratification or turnover pattern (where present) of the source water except in cases where the disruption is determined to be beneficial to the management of fisheries for fish and shellfish by any fishery management agency(ies).

c. Impingement Mortality and Entrainment Characterization Study (§ 125.95(b)(3))

The proposed regulations would require that you submit the results of an Impingement Mortality and Entrainment Characterization Study in accordance with § 125.96(b)(3). This characterization would include: (1) Taxonomic identifications of those species of fish and shellfish and their life stages that are in the vicinity of the cooling water intake structure and are most susceptible to impingement and entrainment; (2) a characterization of these species of fish and shellfish and life stages, including a description of the abundance and temporal/spatial characteristics in the vicinity of the cooling water intake structure, based on the collection of a sufficient number of years of data to characterize annual, seasonal, and diel variations in impingement mortality and entrainment (e.g., related to climate/weather differences, spawning, feeding and water column migration); and (3) documentation of the current impingement mortality and entrainment of all life stages of fish and shellfish at the facility and an estimate of impingement mortality and entrainment under the calculation baseline. This documentation may include historical data that are representative of the current operation of the facility and of biological conditions at the site. Impingement mortality and entrainment samples to support the calculations required in § 125.95(b)(4)(iii) and (b)(5)(ii) must be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples must be documented. In addition, this study must include an identification of species that are protected under Federal, State, or Tribal law (including threatened or endangered species) that might be susceptible to impingement and entrainment by the cooling water intake structure(s). The Director might coordinate a review of your list of threatened, endangered, or other protected species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or other relevant agencies to ensure that potential

impacts to these species have been addressed.

d. Design and Construction Technology Plan (§ 125.96(b)(4))

If you choose to use existing and/or proposed design and construction technologies or operational measures in whole or in part to meet the requirements of § 125.94, proposed § 125.95(b)(4) would require that you develop and submit a Design and Construction Technology Plan with your application that demonstrates that your facility has selected and would implement the design and construction technologies necessary to reduce impingement mortality and/or entrainment to the levels required. The Agency recognizes that selection of the specific technology or group of technologies for your site would depend on individual facility and waterbody conditions.

Phase II existing facilities seeking to avoid entrainment reduction requirements because their capacity utilization rate is less than 15 percent, would also be required to calculate and submit the capacity utilization rate and supporting data and calculations. The data being requested include (1) the average annual net generation of the facility in (Mwh) measured over a five year period (if available) and representative of operating conditions and (2) the net capacity of the facility (in MW). These data are needed to determine whether the facility has less than a 15 percent utilization rate and would only be required to reduce impingement mortality in accordance with § 125.94(b)(1).

In its application, a Phase II existing facility choosing to use design and construction technologies or operational measures to meet the requirements of § 125.94 would be required to describe the technology(ies) or operational measures they would implement at the facility to reduce impingement mortality and entrainment based on information that demonstrates the efficacy of the technologies for those species most susceptible. Examples of appropriate technologies would include, but are not limited to, wedgewire screens, fine mesh screens, fish handling and return systems, barrier nets, aquatic filter barrier systems, enlargement of the cooling water intake structure to reduce velocity. Examples of operational measures include, but are not limited to, seasonal shutdowns or reductions in flow, and continuous operations of screens, etc.

Phase II existing facilities that are required to meet the proposed ranges to reduce impingement mortality by 80 to

95 percent and entrainment by 60 to 90 percent would be required to provide calculations estimating the reduction in impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved through the use of existing and/or proposed technologies or operational measures. In determining compliance with any requirements to reduce impingement mortality or entrainment, you must first determine the calculation baseline against which to assess the total reduction in impingement mortality and entrainment. The calculation baseline is defined § 125.93 as an estimate of impingement mortality and entrainment that would occur at your site assuming you had a shoreline cooling water intake structure with an intake capacity commensurate with a once-through cooling water system and with no impingement and/or entrainment reduction controls. Reductions in impingement mortality and entrainment from this calculation baseline as a result of any design and construction technologies already implemented at your facility would be added to the reductions expected to be achieved by any additional design and construction technologies that would be implemented in order to determine compliance with the performance standards. Facilities that recirculate a portion of their flow may take into account the reduction in impingement mortality and entrainment associated with the reduction in flow when determining the net reduction associated with existing technology and operational measures. This estimate must include a site-specific evaluation of the suitability of the technology(ies) based on the species that are found at the site, and/or operational measures and may be determined based on representative studies (i.e., studies that have been conducted at cooling water intake structures located in the same waterbody type with similar biological characteristics) and/or site-specific technology prototype studies.

If your facility already has some existing impingement mortality and entrainment controls, you would need to estimate the calculation baseline. This calculation baseline could be estimated by evaluating existing data from a facility nearby without impingement and/or entrainment control technology (if relevant) or by evaluating the abundance of organisms in the source waterbody in the vicinity of the intake structure that may be susceptible to impingement and/or entrainment. The proposed rule would specifically require that the following

information be submitted in the Design and Construction Technology Plan: (1) A narrative description of the design and operation of all design and construction technologies existing or proposed to reduce impingement mortality; (2) a narrative description of the design and operation of all design and construction technologies existing or proposed to reduce entrainment; (3) calculations of the reduction in impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved by the technologies and operational measures you have selected based on the Impingement Mortality and Entrainment Characterization Study in § 125.95(b)(3); (4) documentation which demonstrates that you have selected the location, design, construction, and capacity of the cooling water intake structure that reflects the best technology available for meeting the applicable requirements in § 125.94; and (5) design calculations, drawings, and estimates to support the narrative descriptions required by steps (1) and (2) above.

Today's proposed rule allows for the Director to evaluate, with information submitted in your application, the performance of any technologies you may have implemented in previous permit terms. Additional or different design and construction technologies may be required if the Director determines that the initial technologies you selected and implemented would not meet the requirements of § 125.94.

e. Information To Support Proposed Restoration Measures (§ 125.94(b)(5))

Under proposed § 125.94(d), Phase II existing facilities subject to the proposed rule may propose to implement restoration measures in lieu of or in combination with design and construction or operational measures to meet the performance standards in § 125.94(b) or site-specific requirements imposed under § 125.94(c). Facilities proposing to use restoration measures would be required to submit the following information to the Director for review as proposed in § 125.95(b)(5). The Director must approve any use of restoration measures.

First, the Phase II existing facility must submit a list and narrative description of the restoration measures the facility has selected and proposes to implement. This list and description should identify the species and other aquatic resources targeted under any restoration measures. The facility also must submit a summary of any past, ongoing, or voluntary consultation with appropriate Federal, State, and Tribal fish and wildlife agencies regarding the

proposed restoration measures that is relevant to the Comprehensive Demonstration Study and a copy of any written comments received as a result of such consultation.

Second, the facility must submit a quantification of the combined benefits from implementing design and construction technologies, operational measures and/or restoration measures and the proportion of the benefits that can be attributed to each. This quantification must include: (1) The percent reduction in impingement mortality and entrainment that would be achieved through the use of any design and construction technologies or operational measures that the facility has selected (i.e., the benefits that would be achieved through impingement and entrainment reduction); (2) a demonstration of the benefits that could be attributed to the restoration measures selected; and (3) a demonstration that the combined benefits of the design and construction technology(ies), operational measures, and/or restoration measures would maintain fish and shellfish at a level comparable to that which you would achieve were you to implement the requirements of § 125.94. They also must establish that biotic community structure and function would be maintained to a level comparable or substantially similar to that which would be achieved through § 125.94 (b) or (c).

If it is not possible to demonstrate quantitatively that restoration measures such as creation of new habitats to serve as spawning or nursery areas or establishment of riparian buffers would achieve comparable performance, a facility may make a qualitative demonstration that such measures would maintain fish and shellfish in the waterbody at a level substantially similar to that which would be achieved under § 125.94. Any qualitative demonstration must be sufficiently substantive to support a demonstration under § 125.94(d).

Third, the facility must submit a plan for implementing and maintaining the efficacy of the restoration measures it has selected as well as supporting documentation to show that the restoration measures, or the restoration measures in combination with design and construction technology(ies) and operational measures, would maintain the fish and shellfish in the waterbody, including the community structure and function, to a level comparable or substantially similar to that which would be achieved through § 125.94(b) and (c). This plan should be sufficient to ensure that any beneficial effects

would continue for at least the term of the permit.

Finally, the facility must provide design and engineering calculations, drawings, and maps documenting that the proposed restoration measures would meet the restoration performance standard at § 125.94(d).

The proposed regulations at § 125.98(b)(1)(ii) would require that this information be reviewed by the Director to determine whether the documentation demonstrates that the proposed restoration measures, in conjunction with design and construction technologies and operational measures would maintain the fish and shellfish in the waterbody to a level substantially similar to that which would be achieved under § 125.94.

#### f. Information To Support Site-Specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact

Under the third compliance option, the owner or operator of a Phase II existing facility may demonstrate to the Director that a site-specific determination of best technology available is appropriate for the cooling water intake structures at that facility if the owner or operator can meet one of the two cost tests specified under § 125.94(c)(1). To be eligible to pursue this approach, the Phase II existing facility must first demonstrate to the Director either (1) that its cost of compliance with the applicable performance standards specified in § 125.94(b) would be significantly greater than the costs considered by the Administrator in establishing such performance standards, or (2) that the existing facility's costs would be significantly greater than benefits of complying with the performance standards at the facility's site. A discussion of applying this cost test is provided in Section VI.A of this proposed rule. Where a Phase II existing facility demonstrates that it meets either of these cost tests, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact. This determination would be based on less costly design and construction technologies, operational measures, and/or restoration measures proposed by the facility and approved by the Director. The Director can approve less costly technologies to the extent justified by the significantly greater cost, and could determine that technologies and measures in addition to those already in place are not

justified because of the significantly greater cost.

A Phase II existing facility that meets one of the two cost tests described above must select less costly design and construction technologies, operational measures, and/or restoration measures that would minimize adverse environmental impact to the extent justified by the significantly greater cost. In order to do this, Phase II existing facilities that pursue this option would have to assess the nature and degree of adverse environmental impact associated with their cooling water intake structures, and then identify the best technology available to minimize such impact. Phase II existing facilities would assess adverse environmental impact associated with their cooling water intake structures in the Comprehensive Demonstration Study that would be required to be submitted to the Director under § 125.95(b). This study would include source waterbody flow information, and a characterization of impingement mortality and entrainment, as described in this section of this preamble.

Such facilities also must submit to the Director for approval a Site-Specific Technology Plan. This plan would be based on the Comprehensive Cost Evaluation Study and, for those facilities seeking a site-specific determination of best technology available based on costs significantly greater than benefits, a valuation of monetized benefits (see Section VI.A). It would describe the design and operation of all design and construction technologies, operational measures, and restoration measures selected, and provide information that demonstrates the effectiveness of the selected technologies or measures for reducing the impacts on the species of concern. Existing facilities would be required to submit design calculations, drawings, and estimates to support these descriptions. This plan also would need to include engineering estimates of the effectiveness of the technologies or measures for reducing impingement mortality and entrainment of all life stages of fish and shellfish. It also would need to include a site-specific evaluation of the suitability of the technologies or measures for reducing impingement mortality and entrainment based on representative studies and/or site-specific technology prototype studies. Again, design calculations, drawings and estimates would be required to support such estimates. If a Phase II existing facility intends to use restoration measures in its site-specific approach, it also must submit the information required under

§ 125.95(b)(5). See preamble Section VII.B.4.e. Finally, the Site-Specific Technology Plan would have to include documentation that the technologies, operational measures or restoration measures selected would reduce impingement mortality and entrainment to the extent necessary to satisfy the requirements of § 125.94 (i.e., the level of performance would be reduced only to the extent justified by the significantly greater cost).

#### g. Verification Monitoring Plan

Finally, proposed § 125.95(b)(7) would require all Phase II existing facilities, except those deemed to meet the performance standard in § 125.94(b)(1), to submit a Verification Monitoring Plan to measure the efficacy of the implemented design and construction technologies, operational measures, and restoration measures. The plan would include a monitoring study lasting at least two years to verify the full-scale performance of the proposed or already implemented technologies and of any additional operational and restoration measures. The plan would be required to describe the frequency of monitoring and the parameters to be monitored and the bases for determining these. The Director would use the verification monitoring to confirm that the facility is meeting the level of impingement mortality and entrainment reduction expected and that fish and shellfish are being maintained at the level expected (as required in § 125.94(b)). Verification monitoring would be required to begin once the technologies, operational measures, or supplemental restoration measures are implemented and continue for a sufficient period of time (but at least two years) to demonstrate that the facility is reducing impingement mortality and entrainment to the level of reduction required at § 125.94(b) or (c).

#### C. How Would the Director Determine the Appropriate Cooling Water Intake Structure Requirements?

The Director's first step would be to determine whether the facility is covered by this rule. If the answer to all the following questions is yes, the facility would be required to comply with the requirements of this proposed rule.

(1) Does the facility both generate and transmit electric power or generate electric power but sell it to another entity for transmission?

(2) Is the facility an "existing facility" as defined in § 125.93?

(3) Does the facility withdraw cooling water from waters of the U.S.; or does the facility obtain cooling water by any

sort of contract or arrangement with an independent (supplier or multiple suppliers) of cooling water if the supplier(s) withdraw(s) water from waters of the U.S. and is not a public water system?

(4) Is at least 25 percent of the water withdrawn by the facility used for cooling purposes?

(5) Does the facility have a design intake flow of 50 million gallons or more per day (MGD)?<sup>70</sup>

(6) Does the facility discharge pollutants to waters of the U.S., including storm water-only discharges, such that the facility has or is required to have an NPDES permit?

The Director's second step would be to determine whether the facility proposes to comply by demonstrating that its existing design and construction technologies, operational measures, or restoration measures meet the proposed performance standards (Option 1); by implementing design and construction technologies, operational measures, or restoration measures that, in combination with existing technologies and operational measures, meet the proposed performance standards (Option 2); or by seeking a site-specific determination of best technology available to minimize adverse environmental impact (Option 3) (see, § 125.98(1)). The Director also would need to determine whether the facility's utilization rate is less than 15 percent, since such facilities are only subject to impingement mortality performance requirements.

Where a Phase II existing facility selects Option 1 and chooses to demonstrate that its existing design and construction technologies, operational measures, or restoration measures meet the proposed performance standards, the Director would verify either that the existing facility satisfies the reduced intake capacity requirement, or that the facility meets the impingement and entrainment reduction and other requirements. Facilities that have closed-cycle, recirculating cooling water systems would meet the reduced intake capacity requirement, and would not be subject to further performance standards. Other methods of reducing intake capacity also could be used but would need to be commensurate with the level that can be attained by a closed-cycle, recirculating cooling water system.

Under Option 1, to verify that existing controls meet the impingement and

<sup>70</sup> If the answer is no to these flow parameters and yes to all the other questions, the Director would use best professional judgment on a case-by-case basis to establish permit conditions that ensure compliance with section 316(b).

entrainment reduction requirements in the proposed rule, the Director would need to (1) verify the facility's baseline calculation; (2) confirm the location of the facility's cooling water intake structure(s); (3) verify the withdrawal percentage of mean annual flow; (4) review impingement and/or entrainment rates or estimates; and (5) consider any use of restoration. These same steps also would be part of determining requirements under Options 2 and 3, as discussed below.

The Director would initially review and verify the calculation baseline estimate submitted by the facility under § 125.95(b)(iii). This estimate must be consistent with the proposed definition of the term "calculation baseline" and must be representative of current biological conditions at the facility. The Director would then review the information that the facility provides to validate the source waterbody type in which the cooling water intake structure is located (freshwater river or stream; lake or reservoir; or estuary, tidal river, ocean, or Great Lake). The Director would review the supporting material the applicant provided in the permit application to document the physical placement of the cooling water intake structure. For existing facilities with one or more cooling water intake structures located in a freshwater river or stream, the Director would need to determine whether the facility withdraws more or less than five percent of the mean annual flow, which determines whether impingement, or impingement and entrainment controls would apply. For facilities with cooling water intake structures located on lakes or reservoirs other than a Great Lake for which the facility seeks to increase the design flow, the Director would need to determine whether the increased intake flow would disrupt the natural thermal stratification or turnover pattern of the source waterbody. In making this determination the Director would need to consider anthropogenic factors that can influence the occurrence and location of a thermocline, and would need to coordinate with appropriate Federal, State, or Tribal fish and wildlife agencies to determine if the disruption is beneficial to the management of the fisheries. Both of these determinations would be based on the source waterbody flow information required under proposed § 125.95(b)(2).

For Phase II existing facilities that use or propose to implement restoration measures to meet the requirements of § 125.94(b), the Director would review the evaluation of any current or proposed restoration measures submitted under proposed

§ 125.95(b)(5). The Director could gather additional information and solicit input for the review from appropriate fishery management agencies as necessary. The Director would need to determine whether the current or proposed measures would maintain the fish and shellfish in the waterbody at comparable levels to those that would be achieved under § 125.94, as well as review and approve the proposed Verification and Monitoring Plan to ensure the restoration measures meet § 125.94(d) and 125.95(b)(3).

Finally, the Director would review impingement and/or entrainment data or estimates to determine whether in-place or identified controls achieve the performance standards proposed for the different categories of source waterbodies. This step would involve comparing the calculation baseline with the impingement and/or entrainment data or estimates provided as part of the Comprehensive Demonstration Study required under § 125.95(b) and the Impingement Mortality and Entrainment Characterization Study required under § 125.95(b)(3). It may also entail considering whether, how, and to what extent restoration would allow the facility to meet applicable performance standards.

If the Director determines that the Comprehensive Demonstration Study submitted does not demonstrate that the technologies, operational measures, and supplemental restoration measures employed would achieve compliance with the applicable performance standards, the Director may issue a permit requiring such compliance. If such studies are approved and a permit is issued but the Director later determines, based on the results of subsequent monitoring, that the technologies, operational measures, and supplemental restoration measures did not meet the rule standards, the Director could require the existing facility to implement additional technologies and operational measures as necessary to meet the rule requirements. In general, this would occur at the next renewal of the permit. The Director would also review the facility's Technology Verification Plan for post-operational monitoring to demonstrate that the technologies are performing as predicted.

Under compliance Option 2, the same general steps would be followed as described above for assessing compliance of existing controls with applicable performance standards except that under this option the Phase II existing facility would be demonstrating that the technologies and measures identified would meet (rather

than currently meet) the applicable performance standards. This review would also be based on data submitted in the Comprehensive Demonstration Study required under § 125.95(b).

These same basic steps also apply to facilities seeking to comply under Option 3, however, the Director must make two additional determinations under this option, including whether the facility meets one of the applicable cost tests and whether any alternative requirements are justified by significantly greater costs. Under Option 3, a Director must first determine whether a Phase II existing facility satisfies either of the cost tests proposed at § 125.94(c). Phase II existing facilities seeking to comply under this option are required to submit a Comprehensive Cost Evaluation Study under § 125.95(b)(6), which includes data that document the cost of implementing design and construction technologies or operational measures to meet the requirements of § 125.94, as well as the costs of alternative technologies or operational measures proposed. The Director would need to review these data, including detailed engineering cost estimates, and compare these with the costs the Agency considered in establishing these requirements. Where the Director finds that the facility's cost of implementation are significantly greater than those considered during rule development, he or she must approve site-specific requirements and could approve alternative technologies or operational measures. Such alternative technologies or operational measures could be those proposed by the facility in the Site-Specific Technology Plan, but less protective requirements would have to be justified by the significantly greater costs.

Where a Phase II existing facility seeks site-specific requirements based on facility costs that are significantly greater than the environmental benefits of compliance, the facility must submit a Valuation of Monetized Benefits of Reducing Impingement and Entrainment. The Director must review this valuation to determine whether it fully values the impacts of the cooling water intake structures at issue, as required in § 125.95(b)(6)(ii), and whether the facility's cost of implementation are significantly greater than the environmental benefits of complying with the requirements of § 125.94. If the Director determines that the implementation costs are significantly greater than the environmental benefits, the Director must approve site-specific requirements and could approve alternative technologies or operational measures.

Such alternative technologies or operational measures could be those proposed by the facility in the Site-Specific Technology Plan, but less protective requirements would have to be justified by the significantly greater costs. EPA is interested in ways to decrease application review time and make this process both efficient and effective.

#### *D. What Would I Be Required To Monitor?*

Proposed § 125.96 provides that Phase II existing facilities would have to perform monitoring to demonstrate compliance with the requirements of § 125.94 as prescribed by the Director. In establishing such monitoring requirements, the Director should consider the need for biological monitoring data, including impingement and entrainment sampling data sufficient to assess the presence, abundance, life stages, and mortality (including eggs, larvae, juveniles, and adults) of aquatic organisms (fish and shellfish) impinged or entrained during operation of the cooling water intake structure. These data could be used by the Director in developing permit conditions to determine whether requirements, or additional requirements, for design and construction technologies or operational measures should be included in the permit. The Director should ensure, where appropriate, that any required sampling would allow for the detection of any annual, seasonal, and diel variations in the species and numbers of individuals that are impinged or entrained. The Director should also consider if a reduced frequency in biological monitoring may be justified over time if the supporting data show that the technologies are consistently performing as projected under all operating and environmental conditions and less frequent monitoring would still allow for the detection of any future performance fluctuations. The Director should further consider whether weekly visual or remote or similar inspections should be required to ensure that any technologies that have been implemented to reduce impingement mortality or entrainment are being maintained and operated in a manner that ensures that they function as designed. Monitoring requirements could be imposed on Phase II existing facilities that have been deemed to meet the performance standard in § 125.94(b)(1) to the extent consistent with the provisions of the NPDES program.

### *E. How Would Compliance Be Determined?*

This proposed rule would be implemented by the Director placing conditions consistent with this proposed rule in NPDES permits. To demonstrate compliance, the proposed rule would require that the following information be submitted to the Director:

- Data submitted with the NPDES permit application to show that the facility is in compliance with location, design, construction, and capacity requirements;
- Compliance monitoring data and records as prescribed by the Director. Proposed § 125.97 would require existing facilities to keep records and report compliance monitoring data in a yearly status report. In addition, Directors may perform their own compliance inspections as deemed appropriate (see CFR 122.41).

### *F. What Are the Respective Federal, State, and Tribal Roles?*

Section 316(b) requirements are implemented through NPDES permits. Today's proposed regulations would amend 40 CFR 123.25(a)(36) to add a requirement that authorized State and Tribal programs have sufficient legal authority to implement today's requirements (40 CFR part 125, subpart J). Therefore, today's proposed rule would affect authorized State and Tribal NPDES permit programs. Under 40 CFR 123.62(e), any existing approved section 402 permitting program must be revised to be consistent with new program requirements within one year from the date of promulgation, unless the NPDES-authorized State or Tribe must amend or enact a statute to make the required revisions. If a State or Tribe must amend or enact a statute to conform with today's proposed rule, the revision must be made within two years of promulgation. States and Tribes seeking new EPA authorization to implement the NPDES program must comply with the requirements when authorization is requested.

EPA recognizes that some States have invested considerable effort in developing section 316(b) regulations and implementing programs. EPA is proposing regulations that would allow States to continue to use these programs by including in this national rule a provision that allows States to use their existing program if the State establishes that such programs would achieve comparable environmental performance. Specifically, the proposed rule would allow any State to demonstrate to the Administrator that it has adopted

alternative regulatory requirements that would result in environmental performance within each relevant watershed that is comparable to the reductions in impingement mortality and entrainment that would be achieved under § 125.94. EPA invites comment on such "functionally equivalent" programs. In particular, EPA invites comment on the proposed alternative and on decision criteria EPA should consider in determining whether a State program is functionally equivalent. If EPA adopts such an approach, the Agency would also need to specify the process through which an existing State program is evaluated and whether such process can occur under the existing State program regulations or whether additional regulations to provide the evaluation criteria are needed.

Finally, EPA invites comment on the role of restoration and habitat enhancement projects as part of any "functionally equivalent" State programs.

In addition to updating their programs to be consistent with today's proposed rule, States and Tribes authorized to implement the NPDES program would be required to implement the cooling water intake structure requirements following promulgation of the proposed regulations. The requirements would have to be implemented upon the issuance or reissuance of permits containing the requirements of proposed subpart J. Duties of an authorized State or Tribe under this regulation may include

- Review and verification of permit application materials, including a permit applicant's determination of source waterbody classification and the flow or volume of certain waterbodies at the point of the intake;
- Determination of the standards in § 125.94 that apply to the facility;
- Verification of a permit applicant's determination of whether it meets or exceeds the applicable performance standards;
- Verification that a permit applicant's Design and Construction Technology Plan demonstrates that the proposed alternative technologies would reduce the impacts to fish and shellfish to levels required;
- Verification that a permit applicant meets the cost test and that permit conditions developed on a site-specific basis are justified based on documented costs, and, if applicable, benefits;
- Verification that a permit applicant's proposed restoration measures would meet regulatory standards;
- Development of draft and final NPDES permit conditions for the

applicant implementing applicable section 316(b) requirements pursuant to this rule; and

- Ensuring compliance with permit conditions based on section 316(b) requirements.

EPA would implement these requirements where States or Tribes are not authorized to implement the NPDES program. EPA also would implement these requirements where States or Tribes are authorized to implement the NPDES program but do not have sufficient authority to implement these requirements.

### *G. Are Permits for Existing Facilities Subject to Requirements Under Other Federal Statutes?*

EPA's NPDES permitting regulations at 40 CFR 122.49 contain a list of Federal laws that might apply to federally issued NPDES permits. These include the Wild and Scenic Rivers Act, 16 U.S.C. 1273 *et seq.*; the National Historic Preservation Act of 1966, 16 U.S.C. 470 *et seq.*; the Endangered Species Act, 16 U.S.C. 1531 *et seq.*; the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.*; and the National Environmental Policy Act, 42 U.S.C. 4321 *et seq.* See 40 CFR 122.49 for a brief description of each of these laws. In addition, the provisions of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.*, relating to essential fish habitat might be relevant. Nothing in this proposed rulemaking would authorize activities that are not in compliance with these or other applicable Federal laws.

### *H. Alternative Site-Specific Requirements*

Today's proposed rule would establish national requirements for Phase II existing facilities. EPA has taken into account all the information that it was able to collect, develop, and solicit regarding the location, design, construction, and capacity of cooling water intake structures at these existing facilities. EPA concludes that these proposed requirements would reflect the best technology available for minimizing adverse environmental impact on a national level. In some cases, however, data that could affect the economic practicability of requirements might not have been available to be considered by EPA during the development of today's proposed rule. Therefore, where a facility's cost would be significantly greater than the cost considered by EPA in establishing the applicable performance standards, proposed § 125.94(c)(2) would require the Director

to make a site-specific determination of the best technology available based on less costly design and construction technologies, operational measures, and/or restoration measures. Less costly technologies or measures would be allowable to the extent justified by the significantly greater cost. Similarly, § 125.94(c)(3) provides that where an existing facility's cost would be significantly greater than the benefits of complying with the applicable performance standards, the Director must make a site-specific determination of the best technology available based on less costly technologies or measures. These provisions would allow the Director, in the permit development process, to set alternative best technology available requirements that are less stringent than the nationally applicable requirements.

Under proposed § 125.94(c), alternative requirements would not be granted based on a particular facility's ability to pay for technologies that would result in compliance with the requirements of proposed § 125.94. Thus, so long as the costs of compliance are not significantly greater than the costs EPA considered and determined to be economically practicable, and are not significantly greater than the benefits of compliance with the proposed performance standards, the ability of an individual facility to pay in order to attain compliance with the rule would not support the imposition of alternative requirements. Conversely, if the costs of compliance for a particular facility are significantly higher than those considered by EPA in establishing the presumptive performance standards, then regardless of the facility's ability to afford the significantly higher costs, the Director should make a site-specific determination of best technology available based on less costly technologies and measures to the extent justified by the significantly higher costs.

The burden is on the person requesting the site-specific alternative requirement to demonstrate that alternative requirements should be imposed and that the appropriate requirements of proposed § 125.94 have been met. The person requesting the site-specific alternative requirements should refer to all relevant information, including the support documents for this proposed rulemaking, all associated data collected for use in developing each requirement, and other relevant information that is kept on public file by EPA.

## VIII. Economic Analysis

EPA used an electricity market model, the Integrated Planning Model 2000 (IPM 2000), to identify potential economic and operational impacts of various regulatory options considered for proposal. Analyzed characteristics include changes in capacity, generation, revenue, cost of generation, and electricity prices. These changes are identified by comparing two scenarios: (1) The base case scenario (in the absence of Section 316(b) regulation); and (2) the post compliance scenario (after the implementation of Section 316(b) regulation). The results of these comparisons were used to assess the impacts of the proposed rule and two of the five alternative regulatory options considered by EPA. The following sections present EPA's economic analyses of the proposed rule and the alternative options.

### A. Proposed Rule

Today's proposed rule would provide three compliance options for Phase II existing facilities. Such facilities could: (1) Demonstrate that their existing cooling water intake structure design and construction technologies, operational measures, and/or restoration measures meet the proposed performance standards; (2) implement design and construction technologies, operational measures, and/or restoration measures that meet the proposed performance standards; or (3) where the facility can demonstrate that its costs of complying with the proposed performance standards are significantly greater than either the costs EPA considered in establishing these requirements or the benefits of meeting the performance standards, seek a site-specific determination of best technology available to minimize adverse environmental impact. The applicable performance standards are described in Section VI.A., above.

Section VIII.A.1 below presents the analysis of national costs associated with the proposed section 316(b) Phase II Rule. Section VIII.A.2 presents a discussion of the impact analysis of the proposed rule at the market level and for facilities subject to this rule.

#### 1. Costs

EPA estimates that facilities subject to this proposed rule will incur annualized post-tax compliance costs of approximately \$178 million. These costs include one-time technology costs of complying with the rule, annual operating and maintenance costs, and permitting costs (including initial permit costs, annual monitoring costs,

and repermitting costs). This cost estimate does not include the costs of administering the rule by permitting authorities and the federal government. Also excluded are compliance costs for 11 facilities that are projected to be baseline closures (see discussion below). Including compliance costs for projected baseline closure facilities would result in a total annualized compliance cost of approximately \$182 million.

#### 2. Economic Impacts

EPA used an electricity market model to account for the dynamic nature of the electricity market when analyzing the potential economic impacts of Section 316(b) regulation. The IPM 2000 is a long-term general equilibrium model of the domestic electric power market which simulates the least-cost dispatch solution for all generation assets in the market given a suite of user-specified constraints.<sup>71</sup> The impacts of compliance with a given regulatory option are defined as the difference between the model output for the base case scenario and the model output for the post-compliance scenario.<sup>72</sup>

Due to the lead time required in running an integrated electricity market model, EPA first completed an electricity market model analysis of two options with costs higher than those in today's proposed option: the "Closed-Cycle, Recirculating Wet Cooling based on Waterbody type and Intake Capacity" Option (waterbody/capacity-based option) and the "Closed-Cycle, Recirculating Wet Cooling Everywhere" Option (all cooling towers option). Both of the analyzed options are more stringent in aggregate than the proposed rule and provide a ceiling on its potential economic impacts. Because of limited time after final definition of the rule as proposed herein, EPA was unable to rerun the IPM model with an analytic option that completely matches the proposed rule's specifications. As a result, EPA adopted a two-step approach for the aggregate impact analysis. First, EPA identified that for certain regional electricity markets that

<sup>71</sup> For a more detailed description of IPM 2000 see the EBA document.

<sup>72</sup> The IPM model simulates electricity market function for a period of 25 years. Model output is provided for five user specified model run years. EPA selected three run years to provide output across the ten year compliance period for the rule. Analyses of regulatory options are based on output for model run years which reflect a scenario in which all facilities are operating in their post-compliance condition. Options requiring the installation of cooling towers are analyzed using output from model run year 2013. All other options are analyzed using output from model run years 2008. See the EBA document for a detailed discussion of IPM 2000 model run years.

do not have any facilities costed with a closed-cycle recirculating cooling water system, the waterbody/capacity-based option, as analyzed, matches the technology compliance requirements of the proposed rule.<sup>73</sup> These are the North American Electric Reliability Council (NERC) regions that do not border oceans and estuaries: ECAR, MAIN, MAPP, SPP.<sup>74</sup> Accordingly, EPA was able to interpret the results of the IPM analysis for the waterbody/capacity-based option for these four NERC regions as representative of the proposed rule in these regions. As shown below, EPA found very small or no impacts in these NERC regions. Second, EPA identified and compared data relevant to determination of rule impacts for these four NERC regions and the remaining NERC regions for which the IPM analysis would not be indicative of the proposed rule. Finding no material differences in these underlying characteristics between the two groups of NERC regions, EPA concluded that the finding of no significant impacts from the IPM-based analysis of the four NERC regions identified above, could also be extended to the remaining six NERC regions.

Therefore, EPA believes that the proposed option, which would apply the same requirements (e.g., based on technologies such as fine mesh screens, filter fabric barrier nets, or fish return systems) to facilities in all NERC regions, would, in total, have very small or no impacts. The remainder of this section presents an assessment of the impacts of the proposed rule using the market and Phase II existing facility-level results from the IPM 2000 analysis of the alternative waterbody/capacity-based option for these four NERC regions. A more detailed analysis of all NERC regions under the alternative waterbody/capacity-based option is presented in Section VIII.B.2 below.

i. Market Level Impacts

This section presents the results of the IPM 2000 analysis for the four NERC regions with no cooling tower requirements under the alternative waterbody/capacity-based option: ECAR, MAIN, MAPP, and SPP.<sup>75</sup> As indicated above, the compliance requirements of this analyzed option are identical to those of the proposed rule for these four regions. Given the similarity in compliance requirements and the limited electricity exchanges

between NERC regions modeled in IPM 2000, EPA concludes that the impacts modeled for the alternative waterbody/capacity-based option would be representative of potential impacts associated with the proposed rule for each of these regions.

Five measures developed from the IPM 2000 output are used to assess market level impacts associated with Section 316(b) regulation: (1) Total capacity, defined as the total available capacity of all facilities not identified as either baseline closures or economic closures resulting from the regulatory option; (2) new capacity, defined as total capacity additions from new facilities; (3) total generation, calculated as the sum of generation from all facilities not identified as baseline closures or economic closures resulting from the regulatory option; (4) production costs per MWh of generation, calculated as the sum of total fuel and variable O&M costs divided by total generation; and (5) energy prices, defined as the prices received by facilities for the sale of electricity. Exhibit 6 presents the base case and post compliance results for each of these economic measures.

EXHIBIT 6.—MARKET-LEVEL IMPACTS OF THE PROPOSED RULE  
[Four Nerc Regions; 2008]

NERC region	Base case	Option 1	Difference	% Change
<b>(ECAR)</b>				
Total Capacity (MW) .....	118,390	118,570	180	0.2
New Capacity (MW) .....	8,310	8,490	180	2.2
Total Generation (GWh) .....	649,140	649,140	0	0.0
Production Costs (\$2001/MWh) .....	\$12.53	\$12.53	\$0.00	0.0
Energy Prices (\$2001/MWh) .....	\$22.58	\$22.56	(\$0.02)	-0.1
<b>(MAIN)</b>				
Total Capacity (MW) .....	60,230	60,210	-20	0.0
New Capacity (MW) .....	6,540	6,530	-10	-0.2
Total Generation (GWh) .....	284,920	284,860	-60	0.0
Production Costs (\$2001/MWh) .....	\$12.29	\$12.29	\$0.00	0.0
Energy Prices (\$2001/MWh) .....	\$22.54	\$22.55	\$0.01	0.0
<b>(MAPP)</b>				
Total Capacity (MW) .....	35,470	35,470	0	0.0
New Capacity (MW) .....	2,760	2,760	0	0.0
Total Generation (GWh) .....	179,110	179,170	60	0.0
Production Costs (\$2001/MWh) .....	\$11.67	\$11.68	\$0.01	0.0
Energy Prices (\$2001/MWh) .....	\$22.25	\$22.20	(\$0.05)	-0.2
<b>(SPP)</b>				
Total Capacity (MW) .....	49,110	49,110	0	0.0
New Capacity (MW) .....	160	160	0	0.0

<sup>73</sup> While the compliance requirements are identical under the proposed rule and the alternative waterbody/capacity-based option, permitting costs associated with the proposed rule are higher than those for the alternative option analyzed using the IPM 2000. The cost differential averages approximately 30 percent of total compliance costs associated with the alternative option. Despite the higher permitting costs, EPA concludes that the results of the alternative analysis

are representative of impacts that could be expected under the proposed rule.

<sup>74</sup> ECAR (East Central Area Reliability Coordination Agreement) includes the states of Kentucky, Ohio, and West Virginia, and portions of Michigan, Maryland, Virginia, and Pennsylvania. MAIN (Mid-America Interconnected Network, Inc.) includes the state of Illinois and portions of Missouri, Wisconsin, Iowa, Minnesota and Michigan. MAPP (Mid-Continent Area Power Pool)

includes the states of Nebraska and North Dakota, and portions of Iowa, South Dakota, Wisconsin, Montana and Minnesota. SPP (Southwest Power Pool) includes the states of Kansas and Oklahoma, and portions of Arkansas, Louisiana, Texas, and New Mexico.

<sup>75</sup> The market level results include results for all units located in each of the four NERC regions including facilities both in scope and out of scope of the alternative waterbody/capacity-based option.

## EXHIBIT 6.—MARKET-LEVEL IMPACTS OF THE PROPOSED RULE—Continued

[Four Nerc Regions; 2008]

NERC region	Base case	Option 1	Difference	% Change
Total Generation (GWh) .....	217,670	217,750	80	0.0
Production Costs (\$2001/MWh) .....	\$14.43	\$14.43	\$0.00	0.0
Energy Prices (\$2001/MWh) .....	\$25.00	\$24.99	(\$0.01)	0.0%

The results presented in Exhibit 6 reveal no significant changes in any of the economic measures used to assess the impacts of the alternative waterbody/capacity-based option in any of the four NERC regions.<sup>76</sup> One region, SPP, experienced no change of any consequence to any of the five impact measures as a result of the alternative option. Post compliance changes in total capacity and new capacity were experienced in both ECAR and MAIN. Each of these measures decreased by insignificant amounts in MAIN while ECAR experienced a slight increase of 0.2 percent in total capacity and a slightly larger increase of 2.2 percent in new capacity additions. While the slight increases in total and new capacity seen in ECAR did not result in changes in either generation or production costs, energy prices did decrease slightly.

Energy prices also decreased slightly in MAPP despite no appreciable difference in any other measure for that region. Based on these results, EPA concludes that there are no significant impacts associated with the proposed section 316(b) Phase II Rule in these regions.

While the waterbody/capacity-based option, as analyzed in IPM, matches the technology specifications of the proposed rule for the four regions discussed above, this is not the case for the other six NERC regions: ERCOT, FRCC, MAAC, NPCC, SERC, and WSCC.<sup>77</sup> Under the waterbody/capacity-based option, as analyzed, some facilities in these regions were analyzed with more stringent and costly compliance requirements, including recirculating wet cooling towers, than would required by the proposed rule. As a result, the IPM waterbody/capacity-based option overstates the expected

rule impacts in these remaining six regions. To provide an alternative approach to estimating the rule's impacts in these regions, EPA compared characteristics relevant to the determination of rule impacts for the four NERC regions explicitly analyzed in the IPM analysis and the six NERC regions for which the IPM analysis otherwise overstates impacts. EPA found no material differences between the two groups of regions in (1) the percentage of total base case capacity subject to the proposed rule, (2) the ratio of the annualized compliance costs of the proposed rule to total base case generation, and (3) the compliance requirements of the proposed rule (see Exhibit 7 below). EPA therefore concludes that the results for the four regions would be representative of the other NERC regions as well.<sup>78</sup>

## EXHIBIT 7.—COMPARISON OF COMPLIANCE REQUIREMENTS BY NERC REGION—2008

NERC region	Percent of total capacity subject to the rule	Total annualized compliance cost per MWh generation (\$2001)	Percentage of facilities subject to each compliance requirement—proposed rule				
			Total facilities	Both impingement and entrainment controls	Entrainment controls only (percent)	Impingement controls only (percent)	None (percent)
ECAR .....	66.5	0.05	99	32.4	7.1	23.9	36.6
MAIN .....	60.9	0.04	49	30.6	6.1	22.7	40.7
MAPP .....	42.1	0.04	42	9.5	7.1	28.5	54.8
SPP .....	40.7	0.03	32	12.6	0.0	46.9	40.5
Average .....	57.1	0.04	.....	24.8	5.8	27.8	41.5
ERCOT .....	57.8	0.04	51	2.0	11.8	60.8	25.5
FRCC .....	49.8	0.07	30	40.0	13.3	16.7	30.0
MAAC .....	50.7	0.06	43	26.2	19.1	28.8	25.9
NPCC .....	49.6	0.08	54	22.1	34.2	16.5	27.1
SERC .....	53.8	0.03	95	16.8	7.4	31.6	44.2
WSCC .....	18.3	0.02	33	52.9	3.0	16.6	27.5
Average .....	43.6	0.04	.....	22.8	14.6	30.3	32.3
Average of All NERC Regions .....	47.7	0.04	.....	23.6	10.9	29.3	36.2

<sup>76</sup> In addition to the five impact measures presented in Exhibit 6, EPA utilized IPM 2000 to identify changes in other economic and operational characteristics, including revenues, average fuel costs, changes in repowering, and the number and capacity of facilities identified as economic closures. The IPM results showed no economic closures and no changes in repowering associated with compliance with the alternative waterbody/capacity-based option in any of the four NERC regions presented in Exhibit 6. For a detailed discussion of the results of the IPM 2000 analysis

of the alternative waterbody/capacity based option see section VIII.B.2 and the EBA document.

<sup>77</sup> The six other NERC regions are: Electric Reliability Council of Texas (ERCOT), Florida Reliability Coordinating Council (FRCC), Mid Atlantic Area Council (MAAC), Northeast Power Coordination Council (NPCC), Southeastern Electricity Reliability Council (SERC), and Western Systems Coordinating Council (WSCC).

<sup>78</sup> The comparison presented in Exhibit 7 includes information for facilities modeled in IPM 2000 only. Of the 539 existing facilities subject to

the section 316(b) Phase II rule, nine are not modeled in the IPM 2000: Three facilities are in Hawaii, and one is in Alaska. Neither state is represented in the IPM 2000. One facility is identified as an "Unspecified Resource" and does not report on any EIA forms. Four facilities are on-site facilities that do not provide electricity to the grid. The 530 existing facilities were weighted to account for facilities not sampled and facilities that did not respond to the EAP's industry survey and thus represent a total of 540 facilities industry-wide.

Exhibit 7 indicates that, on average, the percentage of total capacity is slightly higher and the percentage of facilities subject to the proposed rule is slightly lower in the four analyzed NERC regions compared to the other six regions. In addition, the average annualized compliance costs per MWh of generation is very similar in all NERC regions. Based on this comparison and the limited amount electricity exchanges between regions modeled in IPM 2000, EPA concluded that the analysis of impacts under the proposed rule for the four NERC regions is representative of likely impacts in the other NERC regions. As the analysis of the impacts of the alternative waterbody/capacity-based option revealed no significant impacts at the market level, EPA concluded that there would be no significant impacts on any

NERC region associated with the proposed rule.

ii. Impacts on Facilities Subject to the Proposed Rule

This section presents the results of the facility impact analysis for the proposed rule, again using the IPM 2000 analysis of the alternative waterbody/capacity-based option for the four NERC regions where the compliance requirements of the proposed rule and the analyzed option are identical.<sup>79</sup> EPA used the IPM 2000 results to analyze two potential facility level impacts of the proposed section 316(b) Phase II Rule: (1) potential changes in the economic and operational characteristics of the group of Phase II existing facilities and (2) potential changes to individual facilities within the group of Phase II existing facilities.

EPA used output from model run year 2008 to develop four measures used to identify changes in the economic and operational characteristics of the group of Phase II existing facilities. These measures include: (1) Total capacity, defined as the total available capacity of all facilities not identified as either baseline closures or economic closures resulting from the regulatory option; (2) total generation, calculated as the sum of generation from all facilities not identified as baseline closures or economic closures resulting from the regulatory option; (3) revenues, calculated as the sum of energy and capacity revenues; and (4) production costs per MWh of generation, calculated as the sum of total fuel and variable O&M costs divided by total generation. Exhibit 8 presents the base case and post compliance results for each of these economic measures.

EXHIBIT 8.—IMPACTS ON PHASE II EXISTING FACILITIES OF THE PROPOSED RULE  
[Four NERC Regions; 2008]

	Base case	Proposed rule	Difference	% Change
<b>(ECAR)</b>				
Total Capacity (MW) .....	78,710	78,710	0.00	0.0
Total Generation (GWh) .....	515,020	515,030	10.00	0.0
Revenues (Million \$2001) .....	\$17,650	\$17,650	0.00	0.0
Production Costs (\$2001/MWh) .....	\$12.34	\$12.34	0.00	0.0
<b>(MAIN)</b>				
Total Capacity (MW) .....	36,700	36,700	0.00	0.0
Total Generation (GWh) .....	226,360	226,350	-10.00	0.0
Revenues (Million \$2001) .....	\$7,890	\$7,890	0.00	0.0
Production Costs (\$2001/MWh) .....	\$11.74	\$11.74	0.00	0.0
<b>(MAPP)</b>				
Total Capacity (MW) .....	14,920	14,920	0.00	0.0
Total Generation (GWh) .....	103,430	103,470	40.00	0.0
Revenues (Million \$2001) .....	\$3,420	\$3,420	0.00	0.0
Production Costs (\$2001/MWh) .....	\$11.78	\$11.78	0.00	0.0
<b>(SPP)</b>				
Total Capacity (MW) .....	19,990	19,990	0.00	0.0
Total Generation (GWh) .....	112,250	112,350	100.00	0.1
Revenues (Million \$2001) .....	\$3,930	\$3,930	0.00	0.0
Production Costs (\$2001/MWh) .....	\$13.32	\$13.34	0.01	0.1

**Note:** Total capacity, total generation, and revenues have been rounded to the closest 10.

The results for the four NERC regions presented in Exhibit 8 reveal no significant changes in any of the economic measures used to assess the impacts of the alternative waterbody/capacity-based option to the group of Phase II existing facilities. None of the four NERC regions analyzed experienced any post compliance change in either capacity or revenues. Further, while there were some variations in total generation derived from Phase II existing facilities in these regions, no region experienced an

increase or decrease in generation of more than one tenth of one percent. Similarly, there was no significant change to the production costs of Phase II existing facilities in any of the analyzed regions. Given EPA's earlier noted finding of no material differences between these four NERC regions and the remaining six NERC regions in important characteristics relevant to rule impacts, EPA again concluded that the finding of no significant impact for these four regions could be extended to the remaining six regions. As a result,

EPA concludes that the proposed rule will not pose significant impacts in any NERC region.

While the group of Phase II existing facilities as a whole is not expected to experience impacts under the proposed rule, it is possible that there would be shifts in economic performance among individual facilities subject to this rule. To examine the range of possible impacts to individual Phase II existing facilities, EPA analyzed facility-specific changes in generation, production costs, capacity utilization, revenue, and

<sup>79</sup> These results only pertain to the steam electric component of the Phase II existing facilities and

thus do not provide complete measures for facilities

with both steam electric and non-steam electric generation.

operating income. Exhibit 9 presents the number of Phase II existing facilities located in the four analyzed NERC regions by category of change for each economic measure.

EXHIBIT 9.—OPERATIONAL CHANGES AT PHASE II EXISTING FACILITIES FROM THE PROPOSED RULE  
[Four NERC Regions; 2008]

Economic measures	Reduction		Increase		No change
	0–1%	1%	0–1%	1%	
Change in Generation .....	2	0	1	2	218
Change in Production Costs .....	0	0	27	0	178
Change in Capacity Utilization .....	2	0	2	1	218
Change in Revenue .....	56	0	44	2	121
Change in-Operating Income .....	66	0	58	1	98

**Note:** IPM 2000 output for run year 2008 provides data for 223 Phase II existing facilities located in the four NERC regions with identical compliance requirements under the alternative option and proposed rule. Eighteen facilities had zero generation in either the base case or post compliance scenario. As such it was not possible to calculate production costs in dollars per MWh of generation for these facilities. For all measures, the percentages used to assign facilities to impact categories have been rounded to the nearest 10th of a percent.

Exhibit 9 shows that there is almost no shift in economic activity between facilities subject to this rule in the four analyzed NERC regions. No facility experiences a decrease in generation, capacity utilization, revenues, or operating income, or an increase in production costs of more than one percent. These findings, together with the findings from the comparison of compliance costs and requirements across all regions above, further confirm EPA’s conclusion that the proposed rule would not result in economic impacts to Phase II existing facilities located in the four analyzed NERC regions.

*B. Alternative Regulatory Options*

EPA is considering four alternative options that would establish substantive requirements for best technology available for minimizing adverse environmental impact by specific rule rather than by site-specific analysis. These include: (1) Requiring existing facilities located on estuaries and tidal rivers to reduce intake capacity commensurate with the use of a closed-cycle recirculating cooling system; (2) requiring all Phase II existing facilities to reduce intake capacity commensurate with the use of closed-cycle, recirculating cooling systems; (3) requiring all Phase II existing facilities to reduce impingement and entrainment to levels established based on the use of design and construction (e.g., fine mesh screens, fish return systems) or operational measures; and (4) requiring all existing facilities to reduce their intake capacity to a level commensurate with the use of a dry cooling system.

EPA conducted an electricity market model analysis of alternative options one and two as defined above. Section VIII.B.1 below presents the national costs of these two alternative regulatory options considered by EPA. Section

VIII.B.2 discusses the impacts associated with these two alternative regulatory options.

1. Costs

EPA estimated total national annualized post-tax cost of compliance for two alternative options: (1) The “Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System based on Waterbody Type/Capacity” Option (waterbody/capacity-based option) and (2) the “Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System for All Facilities” Option (all closed-cycle option). The estimated total annualized post-tax cost of compliance for the waterbody/capacity-based option is approximately \$585 million. EPA further estimates that the total annualized post-tax cost of compliance for the all cooling tower option is approximately \$2.26 billion. Not included in either estimate are 9 facilities that are projected to be baseline closures. Including compliance costs for these 9 facilities would increase the total cost of compliance with the waterbody/capacity-based option to approximately \$595 million, and to roughly \$2.32 billion for the all cooling tower option.

2. Economic Impacts

As stated in Section VIII.A.2 above, EPA used the IPM 2000 electricity market model to assess impacts associated with the proposed rule and regulatory options. These impacts are assessed by comparing model output for the base case and post compliance scenarios for each regulatory option. In support of this rule, EPA completed an electricity market model analysis of two post compliance scenarios: (1) The “Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling

System based on Waterbody Type/Capacity” Option (waterbody/capacity-based option) and (2) the “Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System for All Facilities” Option (all closed-cycle option). This section presents the results of the IPM 2000 analysis of these two post-compliance scenarios.

a. Intake Capacity Commensurate With Closed-Cycle, Recirculating Cooling System Based on Waterbody Type/Capacity

This section presents the market level and Phase II existing facility level impacts of the alternative waterbody/capacity-based option. This option would require facilities that withdraw water from an estuary, tidal river, or ocean and that meet certain intake flow requirements, to reduce their intake capacity to a level that can be attained by a closed-cycle, recirculating cooling system. This requirement would be met within five to ten years of promulgation of the final rule (2004 to 2012) depending on when a permittee’s first NPDES permit after promulgation expires. The impacts of compliance with this option are calculated using base case and post compliance results for model run year 2013. This run year reflects the long-term operational changes of the regulatory option with all in-scope facilities operating in their post compliance condition.

(1) Market Level Impacts

EPA used five measures to identify changes to economic and operational characteristics of existing facilities and assess market level impacts due to compliance with the alternative waterbody/capacity-based option: (1) Capacity retirements, calculated as the total capacity of facilities identified as economic closures due to the alternative

option; (2) capacity retirements as a percentage of baseline capacity; (3) post compliance changes in total production costs per MWh, where production costs are calculated as the sum of total fuel and variable O&M costs divided by total

generation; (4) post compliance changes in energy price, where energy prices are defined as the prices received by facilities for the sale of electric generation; and (5) post compliance changes in capacity price, where

capacity prices are defined as the price paid to facilities for making unloaded capacity available as reserves to ensure system reliability. Exhibit 10 presents the market level summary of these impact measures by NERC region.

EXHIBIT 10.—MARKET-LEVEL IMPACTS OF THE ALTERNATIVE WATERBODY/CAPACITY-BASED OPTION (2013)

NERC region	Baseline capacity (MW)	Capacity closures (MW)	Closures as % of baseline capacity	Change in production cost (\$/MWh) (percent)	Change in energy price (\$/MWh) (percent)	Change in capacity price (\$/MWh) (percent)
ECAR .....	122,080	0	0.0	0.0	0.0	-0.2
ERCOT .....	80,230	0	0.0	0.0	0.0	-0.2
FRCC .....	52,850	0	0.0	0.4	0.5	-2.0
MAAC .....	65,270	0	0.0	0.7	0.6	-1.5
MAIN .....	61,380	0	0.0	0.2	0.1	-0.1
MAPP .....	36,660	0	0.0	0.0	0.0	-0.1
NPCC .....	74,080	840	1.1	0.5	-0.3	13.2
SERC .....	205,210	0	0.0	0.1	0.0	0.0
SPP .....	51,380	0	0.0	0.0	0.0	0.0
WSCC .....	173,600	2,170	1.3	1.9	-0.1	2.0
Total .....	922,740	3,010	0.3	0.5	n/a	n/a

Note: Baseline Capacity and Closure Capacity have been rounded to the nearest 10 MW.

Exhibit 10 shows that with the exception of an increase in the capacity price paid in NPCC, no significant change in market-level operation would result from the alternative waterbody/capacity-based option. Two of the ten NERC regions modeled, NPCC and WSCC, would experience economic closures of existing facilities as a result of the alternative option. However, these closures represent an insignificant percentage of total baseline capacity in these regions (1.1 percent and 1.3 percent respectively). Of the capacity retirements in NPCC, 400 MW would be nuclear capacity and 440 MW would be oil/gas-fired capacity. The vast majority of the closures in WSCC, 2,150 MW, represents nuclear capacity. Six NERC

regions would experience slight increases in production costs per MWh. Production cost per MWh in WSCC would increase the most, by almost 2 percent. In addition, three NERC regions would experience a slight increase in energy price while NPCC and WSCC both would see a slight decrease in post compliance energy prices due to the economic closure of existing capacity. Further, NPCC and WSCC are the only regions that would experience an increase in capacity price. The increase in capacity prices would be the highest in NPCC with 13.2 percent.

(2) Phase II Existing Facility Level Impacts

The IPM 2000 results from model run year 2013 were used to analyze two potential facility level impacts associated with the alternative waterbody/capacity-based option: (1) Potential changes in the economic and operational characteristics of the group of Phase II existing facilities and (2) potential changes to individual facilities within the group of Phase II existing facilities. EPA analyzed economic closures and changes in production costs to assess impacts to all Phase II existing facilities resulting from the alternative option. Exhibit 11 below presents the results from this analysis, by NERC region.

EXHIBIT 11.—IMPACTS ON PHASE II EXISTING FACILITIES OF THE ALTERNATIVE WATERBODY/CAPACITY-BASED OPTION (2013)

NERC region	Baseline capacity (MW)	Closure Analysis			Change in production cost (\$/MWh) (percent)
		# Facilities	Capacity (MW)	Percent of baseline capacity	
ECAR .....	78,680	0	0	0.0	-0.1
ERCOT .....	42,330	0	0	0.0	0.0
FRCC .....	24,460	0	0	0.0	0.7
MAAC .....	30,310	0	0	0.0	0.0
MAIN .....	33,650	0	0	0.0	0.0
MAPP .....	14,900	0	0	0.0	0.0
NPCC .....	36,360	(1)	650	1.8	-0.2
SERC .....	100,780	0	0	0.0	0.0
SPP .....	19,990	0	0	0.0	0.0
WSCC .....	30,110	2	2,170	7.2	3.9
Total .....	411,570	1	2,820	0.7	-0.3

Note: Baseline Capacity and Closure Capacity have been rounded to the nearest 10 MW.

Exhibit 11 shows that impacts under the waterbody/capacity-based option would be small. Similar to the market level, WSCC and NPCC are the only regions that would experience capacity retirements at Phase II existing facilities under this regulatory option. It should be noted that retirements presented in these exhibits are net retirements, accounting for both a potential increase and decrease in the number of retirements, post compliance. For example, NPCC is projected to experience a capacity loss of 650 MW under this option. However, one facility

fewer than under the base case is projected to retire: Two facilities that would have retired in the baseline remain operational under the analyzed option, because their compliance costs are low compared to that of other facilities in the same region and they would therefore become relatively more profitable. WSCC is the other region with projected Phase II retirements under this option. The combined capacity retirements of both regions would be 2,820 MW, or 0.7 percent of all Phase II capacity.

While the group of Phase II existing facilities as a whole is not expected to experience impacts under the waterbody/capacity-based option, it is possible that there would be shifts in economic performance among individual facilities subject to this rule. To assess potential distributional effects, EPA analyzed facility-specific changes in generation, production costs, capacity utilization, revenue, and operating income. Exhibit 12 presents the total number of Phase II existing facilities with different degrees of change in each of these measures.<sup>80</sup>

EXHIBIT 12.—OPERATIONAL CHANGES AT PHASE II EXISTING FACILITIES FROM THE WATERBODY/CAPACITY-BASED OPTION (2013)

Economic measures	Reduction			Increase			No change
	0–1%	1–3%	>3%	0–1%	1–3%	>3%	
Change in Generation .....	7	17	21	4	4	9	444
Change in Production Costs .....	6	5	1	13	16	3	380
Change in Capacity Utilization .....	10	7	12	7	3	5	462
Change in Revenue .....	57	43	17	48	15	20	306
Change in Operating Income .....	75	42	10	46	15	22	296

**Note:** IPM 2000 output for model run year 2013 provides output for 506 Phase II existing facilities. Eighty-two facilities had zero generation in either the base case or post compliance scenario. As such it was not possible to calculate production costs in dollars per MWh of generation for these facilities. For all measures percentages used to assign facilities to impact categories have been rounded to the nearest 10th of a percent.

Exhibit 12 indicates that the majority of Phase II existing facilities would not experience changes in generation, production costs, or capacity utilization due to compliance with the alternative option. Of those facilities with changes in post compliance generation and capacity utilization, most would experience decreases in these measures. In addition, while approximately 40 percent of Phase II existing facilities would experience an increase or decrease in revenues and/or operating income, the magnitude of such changes would be small.

Under the alternative waterbody/capacity-based option, facilities withdrawing water from an estuary, tidal river, or ocean are required to meet standards for reducing impingement mortality and entrainment based on the performance of wet cooling towers. These facilities would have the choice to comply with Track I or Track II requirements. Facilities that choose to comply with Track I would be required to reduce their intake flow to a level commensurate with that which can be attained by a closed-cycle, recirculating system. Facilities that choose to comply with Track II would have to demonstrate that alternative technologies would reduce

impingement and entrainment to comparable levels that would be achieved with a closed-cycle recirculating system. EPA's estimation of impacts associated with the alternative waterbody/capacity-based option is based on an electricity market model analysis that assumes all facilities withdrawing water from an estuary, tidal river, or ocean choose to comply with the requirements of Track I. While these impacts represent the worst case scenario under this option, it is reasonable to assume that a number of facilities would choose to comply with the requirements of Track II. EPA therefore also considered an additional scenario in which 33 of the 54 existing facilities costed with a cooling tower, or 61 percent, would choose to comply with the requirements of Track II. While this scenario was not explicitly analyzed, the absence of significant impacts under the more expensive scenario, where all 54 facilities are costed with cooling towers, suggests the alternative scenario would have similar or lower impacts.

**b. Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System for All Facilities**

This section presents the market level and Phase II existing facility level impacts of the closed-cycle, recirculating wet cooling everywhere option. This option requires that existing facilities with a design intake flow 50 MGD or more reduce their total design intake flow to a level that can be attained by a closed-cycle recirculating cooling water system. In addition, facilities in specified circumstances would have to install design and construction technologies to minimize impingement mortality and entrainment. Existing facilities would be required to comply within five to ten years of promulgation of the final rule (2004 to 2012) depending on when a permittee's first NPDES permit after promulgation expires. The impacts of compliance with this option are calculated using base case and post compliance results for model run year 2013 in order to reflect the long-term operational changes of the rule with all in-scope facilities operating in their post compliance condition.

<sup>80</sup> Note that the facility-level exhibit excludes in-scope facilities with significant status changes (including baseline closures, avoided closures, and

facilities that repower) to allow for a better comparison of operational changes as a result of the analyzed option. Status changes are discussed

separately in this section and the supporting Economic and Benefits Analysis Document.

(1) Market Level Impacts

EPA used IPM output to examine changes to economic and operational characteristics of existing facilities and to assess market level impacts due to

compliance with the all cooling towers option. The measures used to assess market level responses to this option include capacity retirements, capacity retirements as a percentage of baseline

capacity, and post compliance changes in total production costs per MWh, energy price, and capacity price. Exhibit 13 presents the market level summary of these impact measures by NERC region.

EXHIBIT 13.—MARKET-LEVEL IMPACTS OF THE ALTERNATIVE ALL COOLING TOWERS OPTION (2013)

NERC region	Baseline capacity (MW)	Capacity closures (MW)	Closures as % of baseline capacity percent	Change in production cost (\$/MWh) percent	Change in energy price (\$/MWh) percent	Change in capacity price (\$/MWh) percent
ECAR .....	122,080	2,190	1.8	2.4	1.9	0.7
ERCOT .....	80,230	510	0.6	0.3	0.4	-0.1
FRCC .....	52,850	90	0.2	0.7	1.1	-3.8
MAAC .....	65,270	0	0.0	1.8	0.6	-0.2
MAIN .....	61,380	490	0.8	2.3	0.9	0.3
MAPP .....	36,660	0	0.0	1.0	0.1	3.0
NPCC .....	74,080	890	1.2	1.0	0.1	16.6
SERC .....	205,210	0	0.0	1.2	0.4	0.0
SPP .....	51,380	20	0.0	0.5	0.3	-0.7
WSCC .....	173,600	2,370	1.4	1.9	0.1	1.0
Total .....	922,740	6,560	0.7	1.4		

Note: Baseline Capacity and Closure Capacity have been rounded to the nearest 10 MW.

Exhibit 13 indicates that, of the ten NERC regions modeled, only MAAC, MAPP, and SERC would not experience economic closures of existing capacity as a result of the all cooling towers option. ECAR and WSCC would experience the highest closures with 2,370 MW and 2,190 MW, respectively. Of the 6,560 MW of capacity projected to retire as a result of this option, 5,150 MW, or 79 percent, would be nuclear capacity. The remainder would be oil/gas steam capacity. In addition, every NERC region would experience an increase in both production costs per

MWh and energy prices. The increases in production costs would range from a 0.3 percent increase in ERCOT to an increase of more than 2 percent in ECAR. The most substantial changes would occur in the prices paid for capacity reserves. The highest capacity price increase would occur in NPCC with 16.6 percent.

(2) Phase II Existing Facility Level Impacts:

As with the alternative waterbody/capacity-based option analysis, the IPM 2000 results from model run year 2013

were used to analyze two potential facility level impacts associated with the alternative all cooling towers option: (1) Potential changes in the economic and operational characteristics of the Phase II existing facilities and (2) potential changes to individual facilities within the group of Phase II existing facilities. EPA analyzed economic closures and changes in production costs to assess impacts to all Phase II existing facilities resulting from the alternative option. Exhibit 14 below presents the results from this analysis, by NERC region.

EXHIBIT 14.—IMPACTS ON PHASE II EXISTING FACILITIES OF THE ALTERNATIVE ALL COOLING TOWERS OPTION (2013)

NERC region	Baseline capacity	Closure analysis			Change in production Cost (\$/MWh) (percent)
		# Facilities	Capacity (MW)	Percent of baseline capacity	
ECAR .....	78,680	1	2,060	2.6	1.4
ERCOT .....	42,330	1	420	1.0	-0.5
FRCC .....	24,460	0	0	0.0	0.8
MAAC .....	30,310	0	0	0.0	-1.0
MAIN .....	33,650	0	490	1.5	1.4
MAPP .....	14,900	0	0	0.0	1.3
NPCC .....	36,360	0	720	2.0	-0.3
SERC .....	100,780	0	0	0.0	1.0
SPP .....	19,990	1	20	0.1	0.1
WSCC .....	30,110	2	2,170	7.2	2.6
Total .....	411,570	5	5,880	1.4	-0.2

Note: Baseline Capacity and Closure Capacity have been rounded to the nearest 10 MW.

Exhibit 14 shows that economic impacts under the all cooling tower option would be higher than under the proposed rule and the alternative waterbody/capacity-based option. Overall, seven Phase II existing facilities would retire under this option. An

additional two facilities that retire in the base case would find it profitable to remain operating under this option. The net retirements are therefore five facilities and 5,880 MW of capacity. ECAR would experience the highest impact with capacity closures of over

2,000 MW while WSCC would experience the highest percentage retirement, with 7.2 percent of its total Phase II capacity. While the group of Phase II existing facilities as a whole is not expected to experience impacts under the all

cooling towers option, it is possible that this option would lead to shifts in economic performance among individual facilities subject to this rule.

To identify these shifts, EPA analyzed facility-specific changes in generation, production costs, capacity utilization, revenue, and operating income. Exhibit

15 presents the total number of Phase II existing facilities with different degrees of change in each of these measures.

EXHIBIT 15.—OPERATIONAL CHANGES AT PHASE II EXISTING FACILITIES FROM THE ALL COOLING TOWERS OPTION (2013)

Economic Measures	Reduction			Increase			No Change
	0–1%	1–3%	> 3%	0–1%	1–3%	> 3%	
Change in Generation .....	18	251	53	3	4	22	151
Change in Production Costs .....	16	12	4	64	257	17	51
Change in Capacity Utilization .....	15	25	25	8	12	15	402
Change in Revenue .....	154	121	55	88	39	35	10
Change in-Operating Income .....	118	160	50	83	47	29	15

**Note:** IPM 2000 output for model run year 2013 provides output for 502 Phase II existing facilities. Eighty-one facilities had zero generation in either the base case or post compliance scenario. As such it was not possible to calculate production costs in dollars per MWh of generation for these facilities. For all measures percentages used to assign facilities to impact categories have been rounded to the nearest 10th of a percent.

Exhibit 15 indicates that under the all cooling tower option, more facilities would experience changes in their operations and economic performance than under the other two analyzed options. For example, 322 out of 502 facilities, or 64 percent, would experience a reduction in generation.<sup>81</sup> In addition, 328 facilities would experience a reduction in operating income while 338 facilities would see their production cost per MWh increase. However, some facilities subject to today’s rule would also benefit from regulation under this option: 162 facilities would experience an increase in revenues and 159 would experience an increase in operating income.

**IX. Benefit Analysis**

*A. Overview of Benefits Discussion*

This section presents EPA’s estimates of the national environmental benefits of the proposed section 316(b) regulations for Phase II existing facilities. The benefits occur due to the reduction in impingement and entrainment at cooling water intake structures affected by this rulemaking. Impingement and entrainment kills or injures large numbers of aquatic organisms. By reducing the levels of impingement and entrainment, today’s proposed rule would increase the number of fish, shellfish, and other aquatic life in local aquatic ecosystems. This, in turn, will directly and indirectly improve direct use benefits such as those associated with recreational and commercial fisheries. Other types of benefits, including ecological and nonuse values, would also be enhanced. The text below provides an overview of types and

sources of benefits anticipated, how these benefits were estimated, what level of benefits have been estimated for the proposed rule, and how benefits compare to costs. Additional detail and EPA’s complete benefits assessment can be found in the EBA for the proposed rule.

*B. The Physical Impacts of Impingement and Entrainment*

Impingement and entrainment can have adverse impacts on many kinds of aquatic organisms, including fish, shrimp, crabs, birds, sea turtles, and marine mammals. Adult fish and larger organisms are trapped against intake screens, where they often die from the immediate impact of impingement, residual injuries, or from exhaustion and starvation. Entrained organisms that are carried through the facility’s intakes die from physical damage, thermal shock, or chemical toxicity induced by antifouling agents.

The extent of harm to aquatic organisms depends on species characteristics, the environmental setting in which the facilities are located, and facility location, design, and capacity. Species that spawn in nearshore areas, have planktonic eggs and larvae, and are small as adults experience the greatest impacts, since both new recruits and reproducing adults are affected (e.g., bay anchovy in estuaries and oceans). In general, higher impingement and entrainment are observed in estuaries and near coastal waters because of the presence of spawning and nursery areas. By contrast the young of freshwater species are epibenthic and/or hatchel from attached egg masses rather than existing as free-floating individuals, and therefore freshwater species may be less susceptible to entrainment.

The likelihood of impingement and entrainment also depends on facility

characteristics. If the quantity of water withdrawn is large relative to the flow of the source waterbody, a larger number of organisms will be affected. Intakes located in nearshore areas tend to have greater ecological impacts than intakes located offshore, since nearshore areas are usually more biologically productive and have higher concentrations of aquatic organisms.

In general, the extent and value of reducing impingement and entrainment at existing cooling water intake structure locations depends on intake and species characteristics that influence the intensity, time, and spatial extent of interactions of aquatic organisms with a facility’s cooling water intake structure and the physical, chemical, and biological characteristics of the source waterbody. A once-through cooling system withdraws water from a source waterbody, circulates it through the condenser system, and then discharges the water back to the waterbody without recirculation. By contrast, closed-cycle cooling systems (which are one part of the basis for best technology available in some circumstances) withdraw water from the source waterbody, circulate the water through the condensers, and then sends it to a cooling tower or cooling pond before recirculating it back through the condensers. Because cooling water is recirculated, closed-cycle systems generally reduce the water flow from 72 percent to 98 percent, thereby using only 2 percent to 28 percent of the water used by once-through systems. It is generally assumed that this would result in a comparable reduction in impingement and entrainment.

<sup>81</sup> As explained earlier, facilities with significant status changes (including baseline closures, avoided closures, and facilities that repower) are excluded from this comparison.

### *C. Impingement and Entrainment Impacts and Regulatory Benefits are Site-Specific*

Site-specific information is critical in predicting benefits, because studies at existing facilities demonstrate that benefits are highly variable across facilities and locations. Even similar facilities on the same waterbody can have very different impacts depending on the aquatic ecosystem in the vicinity of the facility and intake-specific characteristics such as location, design, construction, and capacity.

Some of the important factors that make benefits highly site-specific include important differences across the regulated facilities themselves. Many of these facility-specific characteristics that affect benefits add additional stressors to the aquatic systems in which they operate. Benefits occur through the reduction of the stressors through the application of impingement and entrainment reduction technologies. Stressor-related factors that make benefits site-specific include:

- Cooling water intake structure size and scale of operation (e.g., flow volume and velocity)
- Cooling water intake structure technologies and/or operational practices in place (if any) for impingement and entrainment reduction at baseline (i.e., absent any new regulations)
- Cooling water intake structure intake location in relation to local zones of ecological activity and significance (e.g., depth and orientation of the intake point, and its distance from shore)
- Cooling water intake structure flow volumes in relation to the size of the impacted waterbody

Many of the key factors that make impingement and entrainment impacts site-specific reflect the receptors exposed to the stressor-related impacts. Receptors include the types of waterbodies impacted, the aquatic species that are affected in those waterbodies, and the people who use and/or value the status of the water resources and aquatic ecosystems affected. Receptor-oriented factors that make impingement and entrainment impacts highly site-specific include:

- The aquatic species present near a facility
- The ages and life stages of the aquatic species present near the intakes
- The timing and duration of species' exposure to the intakes
- The ecological value of the impacted species in the context of the aquatic ecosystem
- Whether any of the impacted species are threatened, endangered, or

otherwise of special concern and status (e.g., depleted commercial stocks)

- Local ambient water quality issues that may also affect the fisheries and their uses

All of these factors, as well as several others, have important impacts on the level and significance of impingement and entrainment. These factors determine baseline impacts, and the size and value of regulation-related reductions in those impacts.

The regulatory framework proposed by EPA recognizes the site-specific nature of impingement and entrainment impacts and is designed to accommodate these factors to the greatest degree practicable in a national rulemaking. For example, EPA's proposed regulatory approach accounts for the types of waterbodies that a cooling water intake structure impacts, the proportion of the source water flow supplied to the cooling water intake structure, and technological design parameters related to the impingement and entrainment from the intake. The Agency's benefits analysis attempts to accommodate and reflect these site-specific parameters.

### *D. Data and Methods Used to Estimate Benefits*

To estimate the economic benefits of reducing impingement and entrainment at existing cooling water intake structures, all the beneficial outcomes need to be identified and, where possible, quantified and assigned appropriate monetary values. Estimating economic benefits can be challenging because of the many steps that need to be analyzed to link a reduction in impingement and entrainment to changes in impacted fisheries and other aspects of relevant aquatic ecosystems, and then to link these ecosystem changes to the resulting changes in quantities and values for the associated environmental goods and services that ultimately are linked to human welfare.

The benefit estimates for this rule are derived from a series of case studies from a range of waterbody types at a number of locations around the country including:

- The Delaware Estuary (Mid-Atlantic Estuaries)
- The Ohio River (Large Freshwater Rivers)
- Tampa Bay (Gulf Coast Estuaries)
- New England Coast (Oceans)
- Mount Hope Bay, New England (North Atlantic Estuaries)
- San Francisco Bay/Delta (Pacific Coast Estuaries)
- The Great Lakes

The following sections describe the methods used by EPA used to evaluate impingement and entrainment impacts at section 316(b) case study Phase II existing facilities and to derive an economic value associated with any such losses.

#### 1. Estimating Losses of Aquatic Organisms

The first set of steps in estimating the benefits of the proposed rule involves estimating the magnitude of impingement and entrainment. EPA's analysis involved compiling facility-reported empirical impingement and entrainment counts and life history information for affected species. Life history data typically included species-specific growth rates, the fractional component of each life stage vulnerable to harvest, fishing mortality rates, and natural (nonfishing) mortality rates.

It is important to note that impingement and entrainment monitoring data are often limited to a subset of species, and monitoring is often of very limited duration (e.g., confined to a single year). This implies that the magnitude of impingement and entrainment is often underestimated. In addition, in many cases data are over two decades old (e.g., from 1979). Therefore the data may not always reflect current fishery conditions, including changes in fisheries due to water quality improvements since the monitoring period. The limited temporal extent of the data also omits the high variability often seen in aquatic populations. If data are collected only in a year of low abundance, impingement and entrainment rates will also be low, and may not reflect the long term average. The data also may not represent potential cumulative long-term impacts of impingement and entrainment.

In EPA's analysis of impingement and entrainment impacts, these facility-derived impingement and entrainment counts were modeled with relevant life history data to derive estimates of age 1 equivalent losses (the number of individuals that would have survived to age 1 if they had not been impinged and entrained by facility intakes), foregone fishery yield (the amount in pounds of commercial and recreational fish and shellfish that is not harvested due to impingement and entrainment losses) and foregone production (losses of impinged and entrained forage species that are not commercial or recreational fishery targets but serve as valuable components of aquatic food webs, particularly as an important food supply to other aquatic species including commercial and recreational species).

## 2. Estimating Baseline Losses and the Economic Benefits of the Proposed Rule

Given the projected physical impact on aquatic organisms (losses of age 1 equivalents resulting from impingement and entrainment), the second set of steps in the benefits analysis entails assigning monetary values to the estimated losses. These economic loss estimates are subsequently converted into estimated benefits for the proposed rule by examining the extent to which impingement and entrainment is reduced by adoption of the best technology available in accordance with the options defined in this proposed rule.

Economic benefits can be broadly defined according to several categories of goods and services furnished by the impacted species, including those that pertain to the direct use or indirect use of the impacted resources. There also are benefits that are independent of any current or anticipated use (direct or indirect) of the resource; these are known as nonuse or passive use values. The benefits can be further categorized according to whether or not affected goods and services are traded in the market. "Direct use" benefits include both "market" commodities (e.g., commercial fisheries) and "nonmarket" goods (e.g., recreational angling). Indirect use benefits also can be linked to either market or nonmarket goods and services "for example, the manner in which reduced impingement and entrainment-related losses of forage species leads through the aquatic ecosystem food web to enhance the biomass of species targeted for commercial (market) and recreational (nonmarket) uses. "Nonuse" benefits include only "nonmarketed" goods and services, reflecting human values associated with existence and bequest motives.

The economic value of benefits is estimated using a range of traditional methods, with the specific approach being dependent on the type of benefit category, data availability, and other suitable factors. Accordingly, some benefits are valued using market data (e.g., for commercial fisheries), and others are valued using secondary nonmarket valuation data (e.g., benefits transfer of nonmarket valuation studies of the value of recreational angling). Some benefits are described only qualitatively, because it was not feasible to derive reliable quantitative estimates of the degree of impact and/or the monetary worth of reducing those impacts. In addition, some nonmarket benefits are estimated using primary research methods. Specifically,

recreational values are estimated for some of the case studies (those that are examined on a watershed-scale) using a Random Utility Model (RUM). Also, some benefits estimates are developed using habitat restoration costing or similar approaches that use replacement costs as a proxy for beneficial values. Variations of these general methodologies have been applied to better reflect site-specific circumstances or data availability.

In the case of forage species, benefits valuation is challenging because these species are not targeted directly by commercial or recreational anglers and have no direct use values that can be observed in markets or inferred from revealed actions of anglers. Therefore, two general approaches were used to translate estimated impingement and entrainment losses to forage species into monetary values. The first approach examines replacement costs as a proxy for the value of estimated forage species losses (expressed as the total number of age 1 equivalents) and was valued based on hatchery costs. This approach does not take into consideration ecological problems associated with introducing hatchery fish into wild populations. The second approach used two distinct estimates of trophic transfer efficiency to relate foregone forage production to foregone commercial and recreational fishery yields. A portion of total forage production has relatively high trophic transfer efficiency because it is consumed directly by harvested species. The remaining portion of total forage production has low trophic transfer efficiency because it reaches harvested species indirectly following multiple interactions at different parts of the food web. Ultimately, the production foregone approach assigns a value to reduced forage species losses based on their indirect contribution to higher commercial and recreational fishery values.

Benefits analyses for rulemakings under the Clean Water Act have been limited in the range of benefits addressed, which has hindered EPA's ability to compare the benefits and costs of rules comprehensively. The Agency is working to improve its benefits analyses, including applying methodologies that have now become well established in the natural resources valuation field, but have not been used previously in the rulemaking process. EPA was particularly interested in expanding its benefits analysis for this rule to include more primary research along with the use of secondary (e.g., benefits transfer) methods to estimate recreation benefits. EPA has therefore expanded upon its traditional

methodologies in the benefits analysis for this proposed rule by applying an original travel cost study using data from the National Marine Fishery Service in the Delaware and Tampa Estuaries and data from the National Recreational Demand Survey (NDS) in Ohio in a Random Utility Model (RUM) of recreational behavior, to estimate the changes in consumer valuation of water resources that would result from reductions in impingement and entrainment-related fish losses. These studies are presented in detail in the Case Study Document.

The Agency also improved its analyses by performing several Habitat-Based Replacement Cost analyses. A complete Habitat-Based Replacement Cost analysis develops values for impingement and entrainment losses based on the combined costs for implementing habitat restoration actions, administering the programs, and monitoring the increased production after the restoration actions. These costs are developed by identifying the preferred habitat restoration alternative for each species with impingement and entrainment, and then scaling the level of habitat restoration until the losses across all species have been offset fully by expected increases in the production of those species. The total value of the impingement and entrainment losses is then calculated as the sum of the costs across the categories of preferred habitat restoration alternatives. An in-depth discussion of the Habitat-Based Replacement Cost methodology is in Chapter A11 of the Case Study Document. Examples of estimating benefits using the Habitat-Based Replacement Cost methodology can be found in the case studies for the Pilgrim Nuclear facility (Part G) and the Brayton Point facility (Part F). A stream-lined version of the methodology can be found in the J.R. Whiting case study (Part H) and the Monroe case study (Part I) of the Case Study Document.

The primary strength of the Habitat-Based Replacement Cost method is the explicit recognition that impingement and entrainment losses have impacts on all components of the aquatic ecosystem, and the public's use and enjoyment of that ecosystem, beyond that estimated by reduced commercial and recreational fish catches. Results depend on the quality of the impingement and entrainment data collected, the availability of data on the habitat requirements of impinged or entrained species, and the program for defining expected production increases for species following implementation of restoration activities.

### 3. EPA's Estimates of Impingement and Entrainment Losses and Benefits Probably are Underestimates

EPA's estimates of fish losses due to impingement and entrainment, and of the benefits of the proposed regulations, are subject to considerable uncertainties. As a result, the Agency's benefits estimates could be either over- or under-estimated. However, because of the many factors omitted from the analysis (typically because of data limitations) and the manner in which several key uncertainties were addressed, EPA believes that its analysis is likely to lead to a potentially significant underestimate of baseline losses and, therefore lead to understated estimates of regulatory benefits.

Several of the key factors that are likely to lead EPA's analysis to underestimate benefits include:

#### *Data Limitations*

- EPA's analysis is based on facility-provided biological monitoring data. These facility-furnished data typically focus on a subset of the fish species impacted by impingement and entrainment, resulting in an underestimate of the total magnitude of losses.

- Industry biological studies often lack a consistent methodology for monitoring impingement and entrainment. Thus, there are often substantial uncertainties and potential biases in the impingement and entrainment estimates. Comparison of results between studies is therefore very difficult and sometimes impossible, even among facilities that impinge and entrain the same species.

- The facility-derived biological monitoring data often pertain to conditions existing many years ago (e.g., the available biological monitoring often was conducted by the facilities 20 or more years ago, before activities under the Clean Water Act had improved aquatic conditions). In those locations where water quality was relatively degraded at the time of monitoring relative to current conditions, the numbers and diversity of fish are likely to have been depressed during the monitoring period, resulting in low impingement and entrainment. In most of the nation's waters, current water quality and fishery levels have improved, so that current impingement and entrainment losses are likely to be greater than available estimates for depressed populations.

#### *Estimated Technology Effectiveness*

- The only technology effectiveness that is certain is reductions in

impingement and entrainment with cooling towers.

- Potential latent mortality rates are unknown for most technologies.
- Installed technologies may not operate at the maximum efficiency assumed by EPA in its estimates of technology effectiveness.

#### *Potential Cumulative Impacts*

- Impingement and entrainment impacts often have cumulative impacts that are usually not considered. Cumulative impacts refer to the temporal and spatial accumulation of changes in ecosystems that can be additive or interactive. Cumulative impacts can result from the effects of multiple facilities located within the same waterbody and from individually minor but collectively significant impingement and entrainment impacts taking place over a period or time.

- Relatively low estimates of impingement and entrainment impacts may reflect a situation where cumulative impingement and entrainment impacts (and other stresses) have appreciably reduced fishery populations so that there are fewer organisms present in intake flows.

- In many locations (especially estuary and coastal waters), many fish species migrate long distances. As such, these species are often subject to impingement and entrainment risks from a large number cooling water intake structures. EPA's analyses reflect the impacts of a limited set of facilities on any given fishery, whereas many of these fish are subjected to impingement and entrainment at a greater number of cooling water intake structures than are included in the boundaries of the Agency's case studies.

#### *Recreational Benefits*

- The proportion of impingement and entrainment losses of fishery species that were valued as lost recreational catch was determined from stock-specific fishing mortality rates, which indicate the fraction of a stock that is harvested. Because fishing mortality rates are typically less than 20%, a large proportion of the losses of fishery species were not valued in the benefits transfer and RUM analyses.

- Only selected species were evaluated because impingement and entrainment or valuation data were limited.

- In applying benefits transfer to value the benefits of improved recreational angling, the Agency only assigned a monetary benefit to the increases in consumer surplus for the baseline number of fishing days. Changes in participation (except where

the RUM is estimated) are not considered. Thus, benefits will be understated if participation increases in response to increased availability of fishery species as a result of reduced impingement and entrainment. This approach omits the portion of recreational fishing benefits that arise when improved conditions lead to higher levels of participation. Empirical evidence suggests that the omission of increased angling days can lead to an underestimate of total recreational fishing benefits. Where EPA has been able to apply its RUM analyses, the recreational angling benefits are more indicative of the full range of beneficial angling outcomes.

#### *Secondary (Indirect) Economic Impacts*

Secondary impacts, are not calculated (effects on marinas, bait sales, property values, and so forth are not included, even though they may be significant and applicable on a regional scale).

#### *Commercial Benefits*

- The proportion of impingement and entrainment losses of fishery species that were valued as lost commercial catch was determined from stock-specific fishing mortality rates, which indicate the fraction of a stock that is harvested. Because fishing mortality rates are typically less than 20%, a large proportion of the losses of fishery species were not valued in the benefits transfer analyses.

- In most cases, invertebrate species (e.g. lobsters, mussels, crabs, shrimp) were not included because of a lack of impingement and entrainment data and/or life history information.

- Impingement and entrainment impacts and associated reductions in fishery yields are probably understated even for those species EPA could evaluate because of a lack of monitoring data to capture population variability and cumulative impingement and entrainment impacts over time.

- Current fishing mortality rates (and resulting estimates of yield) often reflect depleted fisheries, not what the fisheries should or could be if not adversely impacted by impingement and entrainment and other stressors. As such, yield estimates may be artificially low because of significantly curtailed recreational and/or commercial catch of key species impinged and entrained (e.g., winter flounder in Mount Hope Bay).

#### *Forage Species*

- Forage species often make up the predominant share of losses due to impingement and entrainment. However, impingement and entrainment

losses of forage species are usually not known because many facility studies focus on commercial and recreational fishery species only.

- Even when forage species are included in loss estimates, the monetary value assigned to forage species is likely to be understated because the full ecological value of the species as part of the food web is not considered.

- Forage losses are often valued at only a fraction of their potential full value because of partial “replacement” cost (even if feasible to replace).

- Low production foregone assumptions (no inherent value, only added biomass to landed recreational and commercial species is considered).

- In one valuation approach EPA applied to forage species, only the small share of these losses are valued—namely the contribution of the forage species to the increased biomass of landed recreational and commercial species.

- This does not apply to benefits derived by the Habitat-Based Replacement Cost approach, which provides a more comprehensive indication of the benefits of reducing impingement and entrainment on all species, including forage fish. EPA has applied this approach to a limited number of settings, and in those settings the findings suggest benefits appreciably greater than derived from the more traditional, partial benefits approaches applied by the Agency.

*Nonuse Benefits*

- Nonuse benefits are most likely understated using the 50 percent rule because the recreational values used are likely to be understated.

- The 50 percent rule itself is conservative (e.g., only reflects nonuse component of total value to recreational users. It does not reflect any nonuse benefits to recreational nonusers).

- Impacts on threatened and endangered species are not fully captured.

*Incidental Benefits*

- EPA has not accounted for thermal impact reductions, which will be incidental benefits in places where once-through facilities are replaced with recirculating water regimes.

*E. Summary of Benefits Findings: Case Studies*

As noted above, EPA developed benefits estimates for various case studies, and key results are described below.

1. The Delaware Estuary (Mid-Atlantic Estuaries)

The results of EPA’s evaluation of impingement and entrainment rates at cooling water intake structures in the Delaware Estuary transition zone indicate that cumulative impacts can be substantial. EPA’s analysis shows that even when losses at individual facilities appear insignificant, the total of all impingement and entrainment impacts on the same fish populations can be sizable. For example, nearly 44,000 age 1 equivalents of weakfish are lost as a result of entrainment at Hope Creek, which operates with closed-cycle cooling and therefore has relatively low entrainment rates. However, the number of total weakfish age 1 equivalents lost as a result of entrainment at all transition zone cooling water intake structures is over 2.2 million individuals. Cumulative impacts of all species at Delaware Estuary transition zones facilities is 14.3 million age 1 equivalent fish impinged per year and entrainment is 616 million age 1 equivalent fish entrained per year.

EPA has conservatively estimated cumulative impacts on Delaware Estuary species by considering the impingement and entrainment impacts of only transition zone cooling water intake structures. In fact, many of the species affected by cooling water intake structures within the transition zone move in and out of this area, and therefore may be exposed to many more cooling water intake structures than considered here. Regardless of the geographic extent of an evaluation of cumulative impacts, it is important to consider how impingement and entrainment rates relate to the relative abundance of species in the source waterbody. Thus, low impingement and entrainment does not necessarily imply low impact, since it may reflect low population abundance, which can result from numerous natural and anthropogenic factors, including long-term impingement and entrainment impacts of multiple cooling water intake

structures. On the other hand, high population abundance in the source waterbody and associated high impingement and entrainment may reflect waterbody improvements that are independent of impacts from or improvements in cooling water intake structure technologies. High levels of impingement and entrainment impacts on a species may also indicate a high susceptibility of that given species to cooling water intake structure effects.

In addition to estimating the physical impact of impingement and entrainment in terms of numbers of fish lost because of the operation of all in scope and out-of-scope cooling water intake structures in the Delaware Estuary transition zone, EPA also examined the estimated economic value of the losses from impingement and entrainment. The estimated cumulative impact of impingement and entrainment at the 12 cooling water intake structures located in the Delaware case study area was based on data available for the Salem facility and then extrapolated to the other facilities on the basis of flow. Average losses at all transition zone cooling water intake structures from impingement are valued (using benefits transfer) at between roughly \$0.5 million and \$1.1 million per year, and between approximately \$23.9 million and \$49.5 million per year for entrainment (all in 2001\$). Average losses at the four in scope facilities (using benefits transfer combined with RUM recreation estimates) range from \$0.5 million to \$0.8 million per year for impingement and from \$26.0 to \$46.2 million per year for entrainment (all in 2001\$) (see Exhibit 13).

In this estuarine setting, benefits attributed to reducing losses due to both impingement and entrainment may be quite large in terms of numbers of fish and in terms of the portion of benefits that could be monetized. Entrainment losses are over 40 times greater than impingement losses. This reflects the typical richness of estuary waters as important nursery locations for early life stages of many important aquatic species, coupled with the significant adverse impact that entrainment can have on such life stages. This result indicates the relative importance of entrainment controls in estuary areas.

EXHIBIT 13.—BASELINE IMPACTS (ANNUAL AVERAGE) AT FOUR IN SCOPE FACILITIES IN THE TRANSITION ZONE OF THE DELAWARE ESTUARY

	Impingement	Entrainment
<b>Four In Scope Facilities</b>		
a. age 1 equivalent fish lost .....	>14.3 mil/yr .....	>616 mil/yr.

EXHIBIT 13.—BASELINE IMPACTS (ANNUAL AVERAGE) AT FOUR IN SCOPE FACILITIES IN THE TRANSITION ZONE OF THE DELAWARE ESTUARY—Continued

	Impingement	Entrainment
b. # lbs lost to landed fishery .....	>438,000 lbs/yr .....	>16 mil lbs/yr.
c. \$ value of loss (2001\$) .....	\$0.5 mil—\$0.8 mil .....	\$26.0 mil—\$46.2 mil.

In part, EPA’s recreational benefits estimates for the Delaware Estuary is based on a RUM analysis of recreational fishing benefits from reduced impingement and entrainment. The RUM application in the Delaware Estuary focuses on weakfish and striped bass fishing valuation. Several recreational fishing studies have valued weakfish and striped bass, but values specific to these studies are not available. The study area includes recreational fishing sites at the Delaware River Estuary and the Atlantic coasts of Delaware and New Jersey.

EPA uses data for this case study from the Marine Recreational Fishery Statistics Survey (MRFSS), combined with the 1994 Add-on MRFSS Economic Survey (AMES). The study uses MFRSS information on angler characteristics and angler preferences, such as where they go fishing and what species they catch, to infer their values for changes in recreational fishing quality. EPA estimated angler behavior using a RUM for single-day trips. The study used standard assumptions and specifications of the RUM model that are readily available from the recreation demand literature. Among these assumptions are that anglers choose fishing mode and then the site in which to fish; and that anglers’ choice of target species is exogenous to the model. EPA modeled an angler’s decision to visit a site as a function of site-specific cost, fishing trip quality, presence of boat launching facilities, and water quality.

The quality of a recreational fishing trip is expressed in terms of the number of fish caught per hour of fishing. Catch rate is the most important attribute of a fishing site from the angler’s perspective. This attribute is also a policy variable of concern because catch rate is a function of fish abundance, which may be affected by fish mortality caused by impingement and entrainment.

The Agency combined the estimated model coefficients with the estimated changes in impingement and entrainment associated with various cooling water intake structure technologies to estimate per trip welfare losses from impingement and entrainment at the cooling water intake structures located in the Delaware

Estuary transition zone. The estimated economic values of recreational losses from impingement and entrainment at the 12 cooling water intake structures located in the case study area are \$0.75, \$2.04, and \$9.97 per trip for anglers not targeting any particular species and anglers targeting weakfish and striped bass, respectively (all in 2001\$). EPA then estimated benefits of reducing impingement and entrainment of two species —weakfish and striped bass—at the four in scope cooling water intake structures in the case study area. The estimated values of an increase in the quality of fishing sites from reducing impingement and entrainment at the in scope cooling water intake structures are \$0.52, \$1.40 and \$6.90 per trip for no target anglers and anglers targeting weakfish and striped bass, respectively (all in 2001\$).

EPA also examined the effects of changes in fishing circumstances on fishing participation during the recreational season. First, the Agency used the negative binomial form of the Poisson model to model an angler’s decision concerning the number of fishing trips per recreation season. The number of fishing trips is modeled as function of the individual’s socioeconomic characteristics and estimates of individual utility derived from the site choice model. The Agency then used the estimated model coefficients to estimate percentage changes in the total number of recreational fishing trips due to improvements in recreational site quality. EPA combined fishing participation data for Delaware and New Jersey obtained from MFRSS with the estimated percentage change in the number of trips under various policy scenarios to estimate changes in total participation stemming from changes in the fishing site quality in the study area. The MRFSS fishing participation data include information on both single-day and multiple-day trips. The Agency assumed that per day welfare gain from improved fishing site quality is independent of trip length. EPA therefore calculated total fishing participation for this analysis as the sum of the number of single day trips and the number of fishing days corresponding to multiple day trips. Analysis results

indicate that improvements in fishing site quality from reducing impingement and entrainment at all in scope facilities will increase the total number of fishing days in Delaware and New Jersey by 9,464.

EPA combined fishing participation estimates with the estimated per trip welfare gain under various policy scenarios to estimate the value to recreational anglers of changes in catch rates resulting from changes in impingement and entrainment in the Delaware Estuary transition zone. EPA calculated low and high estimates of economic values of recreational losses from impingement and entrainment by multiplying the estimated per trip welfare gain by the baseline and policy scenario number of trips, respectively. The estimated recreational losses (2001\$) to Delaware and New Jersey anglers from impingement and entrainment of 2 species at all Phase II existing facilities in the transitional estuary, and all facilities in the transitional estuary range from \$0.2 to \$0.3 and from \$7.2 to \$13.2 million, respectively. Using similar calculations, the Agency estimated that reducing impingement and entrainment of weakfish and striped bass at the four in scope cooling water intake structures in the transition zone will generate \$5.2 to \$9.3 million (2001\$) annually, in recreational fishing benefits alone, to Delaware and New Jersey anglers.

In interpreting the results of the case study analysis, it is important to consider several critical caveats and limitations of the analysis. For example, in the economic valuation component of the analysis, valuation of impingement and entrainment losses is often complicated by the lack of market value for forage species, which may comprise a large proportion of total losses. EPA estimates that more than 500 million age 1 equivalents of bay anchovy may be lost to entrainment at transition zone cooling water intake structure each year (over 85 percent of the total of over 616 million estimated lost age 1 individuals for all species combined). Bay anchovy has no direct market value, but it is nonetheless a critical component of estuarine food webs. EPA included forage species impacts in the economic benefits calculations, but the final

estimates may well underestimate the full value of the losses imposed by impingement and entrainment. Thus, on the whole, EPA believes the estimates developed here probably underestimate the economic benefits of reducing impingement and entrainment in the Delaware transition zone.

2. Ohio River (Large Rivers)

EPA evaluated the impacts of impingement and entrainment using facility-generated data at 9 cooling water intake structures along a 500 mile stretch of the Ohio River, spanning from the western portion of Pennsylvania, along the southern border of Ohio, and into eastern Indiana. The results were then extrapolated to the 20 other in scope facilities along this stretch of the river (a total of 29 facilities are expected to be in scope for this rulemaking, and another 19 facilities are out-of-scope).

To estimate impingement and entrainment impacts for the Ohio, EPA evaluated the available impingement and entrainment monitoring data at 9 case study facilities (W.C. Beckjord, Cardinal, Clifty Creek, Kammer, Kyger Creek, Miami Fort, Philip Sporn, Tanners Creek, and WH Sammis). The results from these 9 facilities with impingement and entrainment data were then extrapolated to the remaining in scope facilities to derive an impingement and entrainment baseline for all facilities subject to the proposed rule (additional extrapolations were also made to out-of-scope facilities so that total impingement and entrainment could be estimated as well). The extrapolations were made on the basis of relative operating size (operating MGD) and by river pool (Hannibal, Markland, McAlpine, New Cumberland, Pike Island, and Robert C. Byrd pools).

The results indicate that impingement at all facilities (in scope and out-of-scope) causes the mortality of

approximately 11.6 million fish (age 1 equivalents) per year. This translates into over 1.11 million pounds of fishery production foregone per year, and over 15,000 pounds of lost fishery yield annually.

For in scope facilities only, the results indicate that impingement causes the mortality of approximately 11.3 million fish (age 1 equivalents) per year (97.8 percent of all impingement). This translates into nearly 1.09 million pounds of fishery production foregone per year, and nearly 15,000 pounds of lost fishery yield annually (98.1 percent and 97.1 percent of the total, respectively).

For entrainment, the results indicate that all facilities combined (in scope and out-of-scope) cause the mortality of approximately 24.4 million fish (age 1 equivalents) per year. This translates into over 10.08 million pounds of fishery production foregone per year, and over 39,900 pounds of lost fishery yield annually.

For in scope facilities only, the results indicate that entrainment causes the mortality of approximately 23.0 million fish (age 1 equivalents) per year (94.2 percent of all entrainment). This translates into nearly 9.89 million pounds of fishery production foregone per year, and over 39,000 pounds of lost fishery yield annually (98.1 percent and 97.7 percent of the total, respectively).

In addition to estimating the physical impact of impingement and entrainment in terms of numbers of fish lost because of the operation of all in scope and out-of-scope cooling water intake structures in the Ohio River case study area, EPA also estimated the baseline economic value of the losses from impingement and entrainment. The economic value of these losses is based on benefits transfer-based values applied to losses to the recreational fishery, nonuse values, and the partial value of forage

species impacts (measured as partial as replacement costs or production foregone). This provides an indication of the estimated cumulative impact of impingement and entrainment at the all in scope and out-of-scope cooling water intake structures in the case study area, based on data available for the 9 case study facilities with usable impingement and entrainment data, and then extrapolated to the other facilities on the basis of flow and river pool.

Average historical losses from all in scope facilities in the case study area for impingement are valued using benefits transfer at between roughly \$0.1 million and \$1.4 million per year (in 2001\$). Average historical losses from entrainment are valued using benefits transfer at between approximately \$0.8 million and \$2.4 million per year (all in 2001\$) for in scope facilities.

EPA also estimated a random utility model (RUM) to provide primary estimates of the recreational fishery losses associated with impingement and entrainment in the Ohio River case study area. This primary research results supplement the benefits transfer estimates derived by EPA. The average annual recreation-related fishery losses at all facilities in the case study amount to approximately \$8.4 million (in 2001\$) per year (impingement and entrainment impacts combined). For the in scope facilities covered by the proposed Phase II rule, the losses due to impingement and entrainment were estimated via the RUM to amount to approximately \$8.3 million per year (in 2001\$). Results for the RUM analysis were merged with the benefits transfer-based estimates in a manner that avoids double counting, and indicate that baseline losses at in scope facilities amount to between \$3.5 million and \$4.7 million per year for impingement and between \$9.3 and \$9.9 million per year for entrainment (in 2001\$) (see Exhibit 14).

EXHIBIT 14.—BASELINE IMPACTS (ANNUAL AVERAGE) IN THE OHIO RIVER AT IN SCOPE FACILITIES

	Impingement	Entrainment
<b>29 In Scope Facilities</b>		
a. age 1 equivalent fish lost .....	> 11.3 mil/yr .....	> 23.0 mil/yr
b. # lbs lost to landed fishery .....	> 1.1 mil lbs/yr .....	> 9.9 mil lbs/yr
c. \$ value of loss (2001\$) .....	\$3.5 mil—\$4.7 mil/yr .....	\$9.3 mil—\$9.9 mil/yr

In interpreting the results of the case study analysis, it is important to consider several critical caveats and limitations of the analysis. In the economic valuation component of the analysis, valuation of impingement and entrainment losses is often complicated

by the lack of market value for forage species, which may comprise a large proportion of total losses. Forage species have no direct market value, but are nonetheless a critical component of aquatic food webs. EPA included forage species impacts in the economic

benefits calculations, but because techniques for valuing such losses are limited, the final estimates may well underestimate the full ecological and economic value of these losses.

In addition, the Ohio River case study is intended to reflect the level of impingement and entrainment, and

hence the benefits associated with reducing impingement and entrainment impacts, for cooling water impact structures along major rivers of the U.S. However, there are several factors that suggest that the Ohio River case study findings may be a low-end scenario in terms of estimating the benefits of the proposed regulation at facilities along major inland rivers of the U.S. These factors include the following:

- The impingement and entrainment data developed by the facilities were limited to one year only, and are from 1977 (nearly 25 years ago) and pertain to a period of time when water quality in the case study area was worse than it is currently. This suggests that the numbers of impinged and entrained fish today (the regulatory baseline) would be appreciably higher than observed in the data collection period. In addition, the reliance on a monitoring period of one year or less implies that the naturally high variability in fishery populations is not captured in the analysis, and the results may reflect a year of above or below average impingement and entrainment.

- The Ohio River is heavily impacted by numerous significant anthropogenic stressors in addition to impingement and entrainment. The river's hydrology has been extensively modified by a series of 20 dams and pools, and the river also has been extensively impacted by municipal and industrial wastewater discharges along this heavily populated and industrialized corridor. To the degree to which these multiple stressors were atypically extensive along the Ohio River (in 1977) relative to those along other cooling water intake structure-impacted rivers in the U.S. (in

2002), the case study will yield smaller than typical impingement and entrainment impact estimates.

- The Ohio River is very heavily impacted by cumulative effects of impingement and entrainment over time and across a large number of cooling water intake structures. The case study segment of the river has 29 facilities that are in scope for the Phase II rulemaking, plus an additional 19 facilities that are out of scope. Steam electric power generation accounted for 5,873 MGD of water withdrawal from the river basin, more than 90 percent of the total surface water withdrawals, according to 1995 data from USGS.

In conclusion, several issues and limitations in the impingement and entrainment data for the Ohio case study (e.g., the reliance on data for one year, nearly 25 years ago), and the many stressors that affect the river (especially in the 1977 time frame), suggest that the results obtained by EPA underestimate the benefits of the rule relative to current Ohio River conditions. The results are also likely to underestimate the benefits value of impingement and entrainment reductions at other inland river facilities.

3. San Francisco Bay/Delta (Pacific Coast Estuaries)

The results of EPA's evaluation of impingement and entrainment of striped bass, and threatened and endangered and other special status fish species at the Pittsburg and Contra Costa facilities in the San Francisco Bay/Delta demonstrate the significant economic benefits that can be achieved if losses of highly valued species are reduced by the proposed section 316(b) rule. The

benefits were estimated by reference to other programs already in place to protect and restore the declining striped bass population and threatened and endangered fish species of the San Francisco Bay/Delta region. The special status species that were evaluated included delta smelt, threatened and endangered runs of chinook salmon and steelhead, sacramento splittail, and longfin smelt.

Based on limited facility data, EPA estimates that the striped bass recreational catch is reduced by about 165,429 fish per year due to impingement at the two facilities and 185,073 fish per year due to entrainment. Estimated impingement losses of striped bass are valued at between \$379,000 and \$589,000 per year, and estimated entrainment losses are valued at between \$2.58 million to \$4.01 million per year (all in 2001\$).

EPA estimates that the total loss of special status fish species at the two facilities is 145,003 age 1 equivalents per year resulting from impingement and 269,334 age 1 equivalents per year due to entrainment. Estimated impingement losses of these species are valued at between \$12.38 million and \$42.65 million per year, and estimated entrainment losses are valued at between \$23.1 million and \$79.2 million per year (all in 2001\$).

The estimated value of the recreational losses and the special status species losses combined range from \$12.8 million to \$43.2 million per year for impingement and from \$25.6 million to \$83.2 million per year for entrainment (all in 2001\$) (see Exhibit 15).

EXHIBIT 15.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR SPECIAL STATUS FISH SPECIES AT 2 FACILITIES IN THE SAN FRANCISCO BAY/DELTA

	Impingement	Entrainment
<b>Two In Scope Facilities</b>		
a. age 1 equivalent fish lost .....	> 145,000/yr .....	> 269,000/yr
b. number of striped bass lost to recreational catch .....	165,429 .....	185,073
c. \$ value of combined loss (2001\$) .....	\$12.8 mil—\$43.2 mil/yr .....	\$25.6 mil—\$83.2 mil/yr

In interpreting these results, it is important to consider several critical caveats and limitations of the analysis. No commercial fisheries losses or non-special status forage species losses are included in the analysis. Recreational losses are analyzed only for striped bass. There are also uncertainties about the effectiveness of restoration programs in terms of meeting special status fishery outcome targets.

It is also important to note that under the Endangered Species Act, losses of all life stages of endangered fish are of concern, not simply losses of adults. However, because methods are unavailable for valuing losses of fish eggs and larvae, EPA valued the losses of threatened and endangered species based on the estimated number of age 1 equivalents that are lost. Because the number of age 1 equivalents can be substantially less than the original

number of eggs and larvae lost to impingement and entrainment, and because the life history data required to calculate age 1 equivalent are uncertain for these rare species, this method of quantifying impingement and entrainment losses may result in an underestimate of the true benefits to society of the proposed section 316(b) regulation.

4. The Great Lakes

EPA examined the estimated economic value of impingement and entrainment at J.R. Whiting before installation of a deterrent net to reduce impingement to estimate the historical losses of the facility and potential impingement and entrainment damages at other Great Lakes facilities that do not employ technologies to reduce impingement or entrainment. Average impingement without the net is valued at between \$0.4 million and \$1.2 million per year, and average entrainment is valued at between \$42,000 and \$1.7 million per year (all in 2001\$) (see Exhibit 16).

The midpoints of the pre-net results from the benefits transfer approach were used as the lower ends of the valuations losses. The upper ends of the valuation of losses reflect results of the Habitat-based Replacement Cost (HRC) method for valuing impingement and entrainment losses. HRC-based estimates of the economic value of impingement and entrainment losses at J.R. Whiting were included with the transfer-based estimates to provide a better estimate of loss values,

particularly for forage species for which valuation techniques are limited. The HRC technique is designed to provide a more comprehensive, ecological-based valuation of impingement and entrainment losses than valuation by traditional commercial and recreational impacts methods. Losses are valued on the basis of the combined costs for implementing habitat restoration actions, administering the programs, and monitoring the increased production after the restoration actions. In a complete HRC, these costs are developed by identifying the preferred habitat restoration alternative for each species with impingement and entrainment losses and then scaling the level of habitat restoration until the losses across all the species in that category have been offset by expected increases in production of each species. The total value of impingement and entrainment losses at the facility is then calculated as the sum of the costs across the categories of preferred habitat restoration alternatives.

The HRC method is thus a supply-side approach for valuing impingement and entrainment losses in contrast to the more typically used demand-side

valuation approaches (e.g., commercial and recreational fishing impacts valuations). An advantage of the HRC method is that the HRC values can easily address losses for species lacking a recreational or commercial fishery value (e.g., forage species that typically are a large proportion of impingement and entrainment impacts, but that are not readily valued in a traditional benefits analysis). Further, the HRC explicitly recognizes and captures the fundamental ecological relationships between impinged and entrained organisms and their surrounding environment by valuing losses through the cost of the actions required to provide an offsetting increase in the existing populations of those species in their natural environment.

Impingement losses at J.R. Whiting with an aquatic barrier net are estimated to be reduced by 92 percent, while entrainment losses are not significantly affected. Thus, losses with a net are valued at between \$29,000 and \$99,000 for impingement and between \$42,000 and \$1.7 million per year for entrainment (all in 2001\$) (see Exhibit 17).

EXHIBIT 16.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR J.R. WHITING WITHOUT NET

	Impingement	Entrainment
<b>One Great Lakes Facility</b>		
a. age 1 equivalent fish lost .....	>1.8 mil/yr .....	>290,000/yr.
b. # lbs lost to landed fishery .....	>21.4 mil lbs/yr .....	> 404,000 lbs/yr.
c. \$ value of loss (2001\$) .....	\$0.4 mil–\$1.2 mil/yr .....	\$42,000–\$1.7 mil/yr.

EXHIBIT 17.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR J.R. WHITING WITHOUT NET

	Impingement	Entrainment
<b>One Great Lakes Facility</b>		
a. age 1 equivalent fish lost .....	>0.1 mil/yr .....	>290,000/yr.
b. # lbs lost to landed fishery .....	>1.7 mil lbs/yr .....	>404,000 lbs/yr.
c. \$ value of loss (2001\$) .....	\$29,000–\$99,000/yr .....	\$42,000–\$1.7 mil/yr.

5. Tampa Bay

To evaluate potential impingement and entrainment impacts of cooling water intake structures in estuaries of the Gulf Coast and Southeast Atlantic, EPA evaluated impingement and entrainment rates at the Big Bend facility in Tampa Bay. EPA estimated that the impingement impact of Big Bend is 420,000 age 1 equivalent fish and over 11,000 pounds of lost fishery yield per year. The entrainment impact is 7.71 billion age 1 equivalent fish and over nearly 23 million pounds of lost fishery yield per year. Extrapolation of these losses to other Tampa Bay

facilities indicated a cumulative impingement impact of 1 million age 1 fish (27,000 pounds of lost fishery yield) and a cumulative entrainment impact of 19 billion age 1 equivalent fish (56 million pounds of lost fishery yield) each year.

The results of EPA’s evaluation of the dollar value of impingement and entrainment losses at Big Bend, as calculated using benefits transfer, indicate that baseline economic losses range from \$61,000 to \$67,000 per year for impingement and from \$7.1 million to \$7.4 million per year for entrainment (all in 2001\$). Baseline economic losses

using benefits transfer for all in scope facilities in Tampa Bay (Big Bend, PL Bartow, FJ Gannon, and Hookers Point) range from \$150,000 to \$165,000 for impingement and from \$17.5 million to \$18.5 million per year for entrainment (all in 2001\$).

EPA also developed a random utility model (RUM) approach to estimate the effects of improved fishing opportunities due to reduced impingement and entrainment in the Tampa Bay Region. Cooling water intake structures withdrawing water from Tampa Bay impinge and entrain many of the species sought by recreational

anglers. These species include spotted seatrout, black drum, sheepshead, pinfish, and silver perch. The study area includes Tampa Bay itself and coastal sites to the north and south of Tampa Bay.

The study's main assumption is that anglers will get greater satisfaction, and thus greater economic value, from sites where the catch rate is higher, all else being equal. This benefit may occur in two ways: first, an angler may get greater enjoyment from a given fishing trip when catch rates are higher, and thus get a greater value per trip; second, anglers may take more fishing trips when catch rates are higher, resulting in greater overall value for fishing in the region.

EPA's analysis of improvements in recreational fishing opportunities in the Tampa Bay Region relies on a subset of the 1997 Marine Recreational Fishery Statistics Survey (MRFSS) combined with the 1997 Add-on MRFSS Economic Survey (AMES) and the follow-up telephone survey for the Southeastern United States. The Agency evaluated five species and species groups in the model: drums (including red and black drum), spotted seatrout, gamefish, snapper-grouper, and all other species. Impingement and entrainment was found to affect black drum, spotted seatrout, and sheepshead which is included in the snapper-grouper species category.

EPA estimated both a random utility site choice model and a negative binomial trip participation model. The random utility model assumes that anglers choose the site that provides them with the greatest satisfaction, based on the characteristics of different sites and the travel costs associated with visiting different sites. The trip participation model assumes that the total number of trips taken in a year are a function of the value of each site to the angler and characteristics of the angler.

To estimate changes in the quality of fishing sites under different policy scenarios, EPA relied on the recreational fishery landings data by State and the estimates of recreational losses from impingement and entrainment on the relevant species at the Tampa Bay cooling water intake structures. The Agency estimated changes in the quality of recreational fishing sites under different policy scenarios in terms of the percentage change in the historic catch rate. EPA divided losses to the recreational fishery from impingement and entrainment by the total recreational landings for the Tampa Bay area to calculate the percent change in historic catch rate from baseline losses (i.e., eliminating impingement and entrainment completely).

The results show that anglers targeting black drum have the largest per trip welfare gain (\$7.18 in 2001\$) from eliminating impingement and entrainment in the Tampa region. Anglers targeting spotted seatrout and sheepshead have smaller per-trip gains (\$1.80 and \$1.77 respectively, in 2001\$). The large gains for black drum are due to the large predicted increase in catch rates. In general, based on a hypothetical one fish per trip increase in catch rate, gamefish and snapper-grouper are the most highly valued fish in the study area, followed by drums and spotted seatrout.

EPA calculated total economic values by combining the estimated per trip welfare gain with the total number of trips to sites in the Tampa Bay region. EPA used the estimated trip participation model to estimate the percentage change in the number of fishing trips with the elimination of impingement and entrainment. These estimated percentage increases are 0.93 percent for anglers who target sheepshead, 0.94 percent for anglers who target spotted seatrout, and 3.82

percent for anglers who target black drum.

If impingement and entrainment is eliminated in the Tampa region, total benefits are estimated to be \$2,428,000 per year at the baseline number of trips, and \$2,458,000 per year at the predicted increased number of trips (all in 2001\$). At the baseline number of trips, the impingement and entrainment benefits to black drum anglers are \$270,000 per year; benefits to spotted seatrout anglers are \$2,016,000 per year; and benefits to sheepshead anglers are \$143,000 per year (all in 2001\$).

Results for the RUM analysis were merged with the benefits transfer-based estimates to create an estimate of recreational fishery losses from impingement and entrainment in a manner that avoids double counting of the recreation impacts. Baseline economic losses combining both approaches for all in scope facilities in Tampa Bay (Big Bend, PL Bartow, FJ Gannon, and Hookers Point) range from \$0.80 million to \$0.82 million for impingement and from \$20.0 million to \$20.9 million per year for entrainment (all in 2001\$) (see Exhibit 18).

For a variety of reasons, EPA believes that the estimates developed here underestimate the value of impingement and entrainment losses at Tampa Bay facilities. EPA assumed that the effects of impingement and entrainment on fish populations are constant over time (i.e., that fish kills do not have cumulatively greater impacts on diminished fish populations). EPA also did not analyze whether the number of fish affected by impingement and entrainment would increase as populations increase in response to improved water quality or other improvements in environmental conditions. In the economic analyses, EPA also assumed that fishing is the only recreational activity affected.

EXHIBIT 18.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR TAMPA BAY

	Impingement	Entrainment
<b>Four In Scope Facilities</b>		
a. age 1 equivalent fish lost .....	>1 mil/yr .....	>19 billion/yr.
b. # lbs lost to landed fishery .....	>27,000 lbs/yr .....	>56 million lbs/yr.
c. \$ value of loss (2001\$) .....	\$0.80 mil-\$0.82 mil/yr .....	\$20.0 mil-\$20.9 mil/yr.

6. Brayton Point

EPA evaluated cumulative impingement and entrainment impacts at the Brayton Point Station facility in Mount Hope Bay in Somerset, Massachusetts. EPA estimates that the cumulative impingement impact is

69,300 age 1 equivalents and 5,100 pounds of lost fishery yield per year. The cumulative entrainment impact amounts to 3.8 million age 1 equivalents and 70,400 pounds of lost fishery yield each year.

The results of EPA's evaluation of the dollar value of impingement and entrainment losses at Brayton Point (as calculated using benefits transfer) indicate that baseline economic losses range from \$7,000 to \$12,000 per year for impingement and from \$166,000 to

\$303,000 per year for entrainment (all in 2001\$).

EPA also developed an Habitat-based Replacement Cost (HRC) analysis to examine the costs of restoring impingement and entrainment losses at Brayton Point. These HRC estimates were merged with the benefits transfer results to develop a more comprehensive range of loss estimates. The HRC results were used as an upper bound and the midpoint of the benefits transfer method was used as a lower bound (HRC annualized at 7 percent

over 20 years). Combining both approaches, the value of impingement and entrainment losses at Brayton Point range from approximately \$9,000 to \$890,00 per year for impingement, and from \$0.2 million to \$28.3 million per year for entrainment (all in 2001\$) (see Exhibit 19).

For a variety of reasons, EPA believes that the estimates developed here underestimate the total economic benefits of reducing impingement and entrainment at Brayton Point. EPA assumed that the effects of impingement

and entrainment on fish populations are constant over time (i.e., that fish kills do not have cumulatively greater impacts on diminished fish populations). EPA also did not analyze whether the number of fish affected by impingement and entrainment would increase as populations increase in response to improved water quality or other improvements in environmental conditions. In the economic analyses, EPA also assumed that fishing is the only recreational activity affected.

EXHIBIT 19.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR BRAYTON POINT

	Impingement	Entrainment
<b>One In Scope Facility</b>		
a. age 1 equivalent fish lost .....	>69,300/yr .....	>3.8 mil/yr.
b. # lbs lost to landed fishery .....	>5,100 lbs/yr .....	>70,400 lbs/yr.
c. \$ value of loss (2001\$) .....	\$9,000–\$890,000/yr .....	\$0.2 mil–\$28.3 mil/yr.

7. Seabrook Pilgrim

The results of EPA's evaluation of impingement and entrainment rates at Seabrook and Pilgrim indicate that impingement and entrainment at Seabrook's offshore intake is substantially less than impingement and entrainment at Pilgrim's nearshore intake. Impingement per MGD averages 68 percent less and entrainment averages 58 percent less at Seabrook. The species most commonly impinged at both facilities are primarily winter flounder, Atlantic herring, Atlantic menhaden, and red hake. These are species of commercial and recreational interest. However, the species most commonly entrained at the facilities are predominately forage species. Because it is difficult to assign an economic value to such losses, and because entrainment losses are much greater than impingement losses, the benefits of an offshore intake or other technologies that may reduce impingement and entrainment at these facilities are likely

to be underestimated. There also are several important factors in addition to the intake location (nearshore versus offshore) that complicate the comparison of impingement and entrainment at the Seabrook facility to impingement and entrainment at Pilgrim (e.g., entrainment data are based on different flow regimes, different years of data collection, and protocols for reporting monitoring results).

Average impingement losses at Seabrook are valued at between \$3,500 and \$5,200 per year, and average entrainment losses are valued at between \$142,000 and \$315,000 per year (all in 2001\$) (see Exhibit 20). Average impingement losses at Pilgrim are valued at between \$3,300 and \$5,000 per year, and average entrainment losses are valued at between \$523,500 and \$759,300 per year (all in 2001\$). These values reflect estimates derived using benefits transfer.

EPA also developed an HRC analysis to examine the costs of restoring

impingement and entrainment losses at Pilgrim. Using the HRC approach, the value of impingement and entrainment losses at Pilgrim are approximately \$507,000 for impingement, and over \$9.3 million per year for entrainment (HRC annualized at 7 percent over 20 years) (all in 2001\$). These HRC estimates were merged with the benefits transfer results to develop a more comprehensive range of loss estimates.

These HRC estimates were merged with the benefits transfer results to develop a more comprehensive range of loss estimates. The HRC results were used as an upper bound and the midpoint of the benefits transfer method was used as a lower bound (HRC annualized at 7 percent over 20 years). Combining both approaches, the value of impingement and entrainment losses at Pilgrim range from approximately \$4,000 to \$507,00 per year for impingement, and from \$0.6 million to \$9.3 million per year for entrainment (all in 2001\$) (see Exhibit 21).

EXHIBIT 20.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR SEABROOK

	Impingement	Entrainment
<b>One In Scope Facility: Seabrook</b>		
a. age 1 equivalent fish lost .....	> 1.8 mil/yr .....	> 290,000/yr
b. # lbs lost to landed fishery .....	> 21.4 mil lbs/yr .....	> 404,000 lbs/yr
c. \$ value of loss (2001\$) .....	\$3,000–\$5,000 .....	\$142,000–\$315,000

EXHIBIT 21.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR PILGRIM

	Impingement	Entrainment
<b>One In Scope Facility: Pilgrim Losses Using Benefits Transfer</b>		
a. age 1 equivalent fish lost .....	> 1.8 mil/yr .....	> 290,000/yr

EXHIBIT 21.—BASELINE IMPACTS (ANNUAL AVERAGE) FOR PILGRIM—Continued

	Impingement	Entrainment
b. # lbs lost to landed fishery .....	> 21.4 mil lbs/yr .....	> 404,000 lbs/yr
c. \$ value of loss (2001\$) .....	\$3,000–\$5,000/yr .....	\$0.5 mil–\$0.7 mil/yr
<b>Pilgrim Losses Using HRC as Upper Bounds and Benefits Transfer Midpoints as Lower</b>		
a. age 1 equivalent fish lost .....	> 1.8 mil/yr .....	> 290,000/yr
b. # lbs lost to landed fishery .....	> 21.4 mil lbs/yr .....	> 404,000 lbs/yr
c. \$ value of loss (2001\$) .....	\$4,000–\$507,000/yr .....	\$0.6 mil–\$9.3 mil/yr

8. Monroe

EPA estimates that the baseline impingement losses at the Monroe facility are 35.8 million age 1 equivalents and 1.4 million pounds of lost fishery yield per year. Baseline entrainment impacts amount to 11.6 million age 1 equivalents and 608,300 pounds of lost fishery yield each year.

The results of EPA’s evaluation of the dollar value of baseline impingement and entrainment losses at Monroe (as calculated using benefits transfer) indicate that baseline economic losses range from \$502,200 to \$981,750 per year for impingement and from \$314,600 to \$2,298,500 per year for entrainment (all in 2001\$).

EPA also developed an HRC analysis to examine the costs of restoring

impingement and entrainment losses at Pilgrim. These HRC estimates were merged with the benefits transfer results to develop a more comprehensive range of loss estimates. These HRC estimates were merged with the benefits transfer results to develop a more comprehensive range of loss estimates. The HRC results were used as an upper bound and the midpoint of the benefits transfer method was used as a lower bound (HRC annualized at 7 percent over 20 years). Combining both approaches, the value of impingement and entrainment losses at Monroe range from approximately \$0.7 million to \$5.6 million per year for impingement, and from \$1.3 million to \$13.9 million per year for entrainment (all in 2001\$) (see Exhibit 22).

For a variety of reasons, EPA believes that the estimates developed here underestimate the total economic benefits of reducing impingement and entrainment at the Monroe facility. EPA assumed that the effects of impingement and entrainment on fish populations are constant over time (i.e., that fish kills do not have cumulatively greater impacts on diminished fish populations). EPA also did not analyze whether the number of fish affected by impingement and entrainment would increase as populations increase in response to improved water quality or other improvements in environmental conditions. In the economic analyses, EPA also assumed that fishing is the only recreational activity affected.

EXHIBIT 22.—BASELINE LOSSES AT (ANNUAL AVERAGE) MONROE (USING HRC VALUES AS UPPER BOUNDS)

	Impingement	Entrainment
<b>One In Scope Facility</b>		
a. age 1 equivalent fish lost .....	> 1.8 mil/yr .....	> 290,000/yr
b. # lbs lost to landed fishery .....	> 21.4 mil lbs/yr .....	> 404,000 lbs/yr
c. \$ value of loss (2001\$) .....	\$0.7 mil–\$5.6 mil .....	\$1.3 mil–\$13.9 mil

F. Estimates of National Benefits

1. Methodology

In order to compare benefits to costs for a national rulemaking such as the section 316(b) proposed rule for Phase II existing facilities, there is a need to generate national estimates of both costs and benefits. This section describes the methodology EPA has developed to provide national estimates of benefits.

Because benefits are very site-specific, there are limited options for how EPA can develop national-level benefits estimates from a diverse set of over 500 regulated entities. EPA could only develop a limited number of case studies, and to interpret these cases in a national context, the Agency identified a range of settings that reflect the likely benefits potential of a given type of facility (and its key stressor-related attributes) in combination with the waterbody characteristics (receptor

attributes) in which it is located. Benefits potential settings can thus be defined by the various possible combinations of stressor (facility) and receptor (waterbody, etc) combinations.

Ideally, case studies would be selected to represent each of these “benefits potential” settings and then could be used to extrapolate to like-characterized facility-waterbody setting cooling water intake structure sites. However, data limitations and other considerations precluded EPA from developing enough case studies to reflect the complete range of benefits-potential settings. Data limitations also made it difficult to reliably assign facilities to the various benefits potential categories.

Based on the difficulties noted above, EPA adopted a more practical, streamlined extrapolation version of its preferred approach, as this is the only viable approach available to the Agency.

To develop a feasible, tractable manner for developing national benefits estimates from a small number of case study investigations, EPA made its national extrapolations on the basis of a combination of three relevant variables: (1) The volume of water (operational flow) drawn by a facility; (2) the level of recreational angling activity within the vicinity of the facility; and (3) the type of waterbody on which the facility is located. Extrapolations were then made across facilities according to their respective waterbody type.

The first of these variables—operational flow (measured as millions of gallons per day, or MGD)—reflects the degree of stress caused by a facility. The second variable—the number of angler days in the area (measured as the number of recreational angling days within a 120 mile radius) — reflects the degree to which there is a demand

(value) by local residents to use the fishery that is impacted. The third variable—waterbody type (e.g., estuary, ocean, freshwater river or lake, or Great Lakes)—reflects the types, numbers, and life stages of fish and other biological receptors that are impacted by the facilities. Accordingly, the extrapolations based on these three variables reflect the key factors that affect benefits: the relevant stressor, the biological receptors, and the human demands for the natural resources and services impacted.

*Flow:* The flow variable the Agency developed is the monetized benefits per volume of water flowing through cooling water intake structures, in specific, applying a metric of “dollars per million gallons per day” (\$/MGD), where MGD levels are based on average operational flows as reported by the facilities in the EPA Section 316(b) Detailed Questionnaire and Short Technical Questionnaire responses, or through publically available data.

*Angler days.* The angler day variable the Agency used is based on data developed by the U.S. Fish and Wildlife Survey as part of its 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. These data were interpreted within a GIS-based approach to estimate the level of recreational angling pursued by populations living within 120 miles of each facility (additional detail is provided in the EBA).

In developing the index, EPA used a GIS analysis to identify counties within a 120 mile radius of each facility. The area for each facility included the county the facility is located in and any other county with 50 percent or more of its population residing within 120 miles of the facility. EPA estimated angling activity levels for two types of angling days for each county: freshwater angling days and saltwater angling days. Estimated angling days for the appropriate waterbody type were summed across all counties in a facility’s area to yield estimated angling days near the facility. For each type of angling, EPA estimated angling days by county residents as a percentage of the State angling days by residents 16 years and older reported in the 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (USFWS, 1997). Angling days in each State were partitioned into days by urban anglers and days by rural anglers based on the U.S. percentages reported in the 1996 National Survey.

For urban counties,  
 Angling Days = State Urban Angling  
 Days \* County Pop/State Pop in  
 Urban Counties

For rural counties,  
 Angling Days = State Rural Angling  
 Days \* County Pop/State Pop in Rural  
 Counties

EPA determined urban and rural population by State by summing the 1999 county populations for the State’s urban and rural counties respectively. EPA determined each county’s urban/rural status using definitions developed by the U.S. Department of Agriculture (as included in NORSIS 1997). These index values are based upon the estimated number of angling days by residents living near the facility. The index value for each facility is a measure of the facility’s share of the total angling days estimated at all in scope facilities located on a similar waterbody.

The analysis then proceeded by waterbody type.

### Estuaries

National baseline losses and benefits for estuaries were based on the Salem and Tampa Bay case studies. The case studies were extrapolated to other facilities on the basis of regional fishery types, in an effort to reflect the different types of fisheries that are impacted in various regions of the country’s coastal waters. As such, the Tampa Bay case study results were applied to estuary facilities located in Florida and other Gulf Coast States, and the Salem results were applied to all remaining estuary facilities (note that the Salem results used for the extrapolation differ from the case study results presented above in order to reflect losses without a screen currently in place at the facility). Ideally, a West Coast facility would have served as the basis of extrapolation to estuarine facilities along the Pacific Coast, but EPA could not develop a suitable case study for that purpose in time for this proposal. However, EPA intends to develop such a western estuary case study and report its findings in an anticipated forthcoming Notice of Data Availability.

In order to extrapolate baseline losses from the Salem and Big Bend facilities to all in scope facilities on estuaries, EPA calculated an index of angling activity for each of these in scope facilities. The angling index is a percentage value that ranges from 0 to 1. Dividing baseline losses at a facility by the index value provides an estimate of total baseline losses at all in scope facilities located on waterbodies in the same category.

### Rivers and Lakes

EPA combined rivers, lakes and reservoirs into one class of freshwater-based facilities (Great Lakes are not

included in this group, and were considered separately). The waterbody classifications for freshwater rivers and lakes/reservoirs were grouped together for the extrapolation due to similar ecological and hydrological characteristics of freshwater systems used as cooling water. The majority of these hydrologic systems have undergone some degree of modification for purposes such as water storage, flood control, and navigation. The degree of modification can vary very little or quite dramatically. A facility falling into the lake/reservoir category may withdraw cooling water from a lake that has been reclassified as a reservoir due to the addition of an earthen dam, or from a reservoir created by the diversion of a river through a diversion canal for use as a cooling lake. The species composition and ecology of these two waterbodies may vary greatly. While the ecology of river systems and lakes or reservoirs are considerably different, due to structural modifications these two classifications may be quite similar ecologically depending on the waterbody in question. For example, many river systems, including the Ohio River, are now broken up into a series of navigational pools controlled by dams that may function more similarly to a reservoir than a naturally flowing river.

Baseline losses and benefits in the Ohio case study were based on 29 in scope facilities in the Ohio River case study area. The Agency extrapolated these losses to all in scope facilities on other freshwater rivers, lakes, and reservoirs.

### Oceans and Great Lakes

Oceans and Great Lakes estimates were based on extrapolations from the Pilgrim and JR Whiting facility case studies, respectively. For these two facilities (and their associated waterbody types), the valuation method applied by EPA in the national extrapolations was based on the Habitat-based Replacement Cost approach, which reflects values for addressing a much greater number of impacted species (not just the small share that are recreational or commercial species that are landed by anglers). For example, at JR Whiting, the benefits transfer approach developed values for recreational angling amounted to only 4 percent of the estimated total impingement losses, and reflected only 0.02 percent of the age 1 fish lost due to impingement. At Pilgrim, the benefits transfer approach reflected recreational losses for only 0.5 percent of the entrained age 1 equivalent fish at that site. Because the Agency was able to

develop HRC values for these sites and recreational fishery impacts were such a small part of the impacts, EPA extrapolated only based on HRC estimates and used only the flow-based

(MGD) index for oceans and the Great Lakes.

**Results**

The results of the index calculations for operational flow and angling effort

used for extrapolating case study baseline losses to national baseline losses for all in scope facilities are reported in Exhibit 23 below.

EXHIBIT 23.—FLOW AND ANGLING INDICES

Waterbody Type	Based on	Normalized MGD percent	Percent of in scope angling base
Estuary-N. Atlantic .....	Salem .....	4.39	2.10
Estuary-S. Atlantic .....	4 Tampa Bay facilities .....	19.24	20.28
Freshwater systems .....	29 Ohio River facilities .....	9.30	12.34
Great Lake .....	JR Whiting .....	3.92	13.89
Ocean .....	Pilgrim .....	3.42	6.54

**Waterbody**

EPA further tailored its extrapolation approach, so that monetized benefits estimates are based on available data for similar types of waterbody settings. Thus, for example, the case study results for the Salem facility (located in the Delaware Estuary) and the Tampa facilities are applied (on a per MGD and angling day index basis) only to other facilities located in estuary waters. Likewise, results from Ohio River facilities are applied to inland freshwater water cooling water intake structures (excluding facilities on the Great Lakes), and losses estimated for the Pilgrim facility are applied to facilities using ocean waters at their intakes, and results for J.R. Whiting are used for the Great Lakes facilities.

As noted above, the waterbody classifications for freshwater rivers and lakes or reservoirs were grouped together for the extrapolation due to similar ecological and hydrological characteristics of freshwater systems used as cooling water. The majority of these hydrologic systems have undergone some degree of modification for purposes such as water storage, flood control, and navigation. Due to structural modifications, these freshwater waterbody types be quite similar ecologically. For example, many river systems, including the Ohio River, are now broken up into a series of navigational pools controlled by dams that may function more similarly to a reservoir than a naturally flowing river.

The natural species distribution, genetic movement, and seasonal migration of aquatic organisms that may be expected in a natural system is affected by factors such as dams, stocking of fish, and water diversions. Since the degree of modification of inland waterbodies and the occurrence of fish stocking could not be determined for every cooling water source, the

waterbody categories “freshwater rivers”, and “lakes/reservoirs” were grouped together.

The facilities chosen for extrapolation are expected to have relatively average benefits per MGD and angling day index, for their respective waterbody types. Benefits per MGD and angling day index are not expected to be extremely high or low relative to other facilities. EPA was careful not to use facilities that were unusual in this regard. Salem is located in the transitional zone of the estuary, a lesser productive part of the estuary.

The use of flow and angler day basis for extrapolation has some practical advantages and basis in logic; however, it also has some less than fully satisfactory implications. The advantages of using this extrapolation approach include:

- Feasibility of application, because the extrapolation relies on waterbody type, angler demand, and MGD data that are available for all in scope facilities.

- Selectively extrapolating case study results to facilities on like types of waterbodies reflects the type of aquatic setting impacted, which is intended to capture the number and types of species impacted by impingement and entrainment at such facilities (i.e., impacts at facilities on estuaries are more similar to impacts at other estuary-based cooling water intake structures than they are to facilities on inland waters).

- Flow in MGD is a useful proxy for the scale of operation at cooling water intake structures, a variable that typically will have a large impact on baseline losses and potential regulatory benefits.

- While there may be a high degree of variability in the actual losses (and benefits) per MGD across facilities that impact similar waterbodies, the extrapolations are expected to be reasonably accurate on average for

developing an order-of-magnitude national-level estimate of benefits.

- The recreational participation level (angler day) variable provides a logical basis to reflect the extent of human user demands for the fishery and other resources affected by impingement and entrainment.

- The estimates are not biased in either direction.

Some of the disadvantages of the use of extrapolating results on the basis of waterbody type, recreational angling day data, and operational flows (MGD) include:

- The approach may not reflect all of the variability that exists in impingement and entrainment impacts (and monetized losses or benefits) within waterbody classifications. For example, within and across U.S. estuaries, there may be different species, numbers of individuals, and life stages present at different cooling water intake structures.

- The approach may not reflect all of the variability that exists in impingement and entrainment impacts (and monetized losses or benefits) across operational flow levels (MGD) at different facilities within a given waterbody type.

Extrapolating to national benefits according to flow (MGD), angling levels, and waterbody type, as derived from estimates for a small number of case studies, may introduce inaccuracies into national estimates. This is because the three variables used as the basis for the extrapolation (MGD, recreational angling days, and waterbody type) may not account for all of the variability expected in site-specific benefits levels. The case studies may not reflect the average or “typical” cooling water intake structures impacts on a given type of waterbody (i.e., the extrapolated results might under- or over-state the physical and dollar value of impacts per MGD and fishing day index, by

waterbody type). The inaccuracies introduced to the national-level estimates by this extrapolation approach are of unknown magnitude or direction (i.e., the estimates may over- or understate the anticipated national-level benefits), however EPA has no data to indicate that the case study results are atypical for each waterbody type.

2. Results of National Benefits Extrapolation

National benefits for 3 regulatory compliance options were estimated for

the 539 facilities found to be in scope of the section 316(b) Phase II rulemaking. The benefits estimates were derived in a multi-step process that used operational flows and the recreational fishing index as the basis for extrapolating case study results to the national level.

In the first step, EPA used the baseline losses (dollars per year) derived from the analysis of facilities examined in the case studies. In some instances, the case study facilities had already implemented some measures to reduce

impingement and/or entrainment. In such cases, baseline losses as appropriate to the national extrapolation were estimated using data for years prior to the facilities' actions (e.g., based on impingement and entrainment before the impingement deterrent net was installed at JR Whiting). These pre-action baselines provide a basis for examining other facilities that have not yet taken actions to reduce impingement and/or entrainment. Baseline losses at the selected case study facilities are summarized in Exhibit 24.

**EXHIBIT 24.—BASELINE LOSSES FROM SELECTED CASE STUDIES**

[Baseline losses from selected case studies, values in thousands of 2001\$]

Case study	Impingement			Entrainment		
	Low	Mid	High	Low	Mid	High
Salem .....	\$528	\$704	\$879	\$16,766	\$23,657	\$30,548
Brayton .....	9	450	890	235	14,261	28,288
Contra Costa .....	2,666	5,726	8,785	6,413	13,630	20,847
Pittsburgh .....	10,096	22,268	34,440	19,166	40,760	62,354
4 Tampa Bay Facilities .....	801	809	817	20,007	20,454	20,901
29 Ohio Facilities .....	3,452	4,052	4,652	9,257	9,584	9,912
Monroe .....	742	3,190	5,639	1,307	7,604	13,902
JR Whiting .....	358	797	1,235	42	873	1,703
Pilgrim Nuclear .....	4	256	507	642	4,960	9,279

In the second step, EPA extrapolated the baseline dollar loss estimates from the case study models to all of the remaining 539 facilities by multiplying

the index of operational flow for each facility by the estimated dollar losses at baseline per unit flow, based on each facility's source waterbody type, were

extrapolated. This resulted in a national estimate of baseline monetizable losses for all 539 in scope facilities as summarized in Exhibit 25.

**EXHIBIT 25.—BASELINE LOSSES EXTRAPOLATED TO ALL IN SCOPE FACILITIES USING MGD ONLY**

[Baseline losses extrapolated to all in scope facilities—MGD only, values in thousands of 2001\$]

Facility	Case study	Impingement			Entrainment		
		Low	Mid	High	Low	Mid	High
<b>Estuary, Non Gulf</b>							
Salem .....	Delaware .....	\$528	\$704	\$879	\$16,766	\$23,657	\$30,548
Brayton Point .....	Brayton .....	9	450	890	235	14,261	28,288
Contra Costa .....	California .....	2,666	5,726	8,785	6,413	13,630	20,847
Pittsburgh .....	California .....	10,096	22,268	34,440	19,166	40,760	62,354
All Other In Scope .....	.....	11,167	14,875	18,583	354,346	499,991	645,636
All 78 In Scope .....	.....	24,467	44,022	63,578	396,925	592,298	787,672
<b>Estuary, Gulf Coast</b>							
4 Tampa Facilities .....	Tampa Bay .....	801	809	817	20,007	20,454	20,901
All Other In Scope .....	.....	3,361	3,395	3,429	83,982	85,857	87,732
All 30 In Scope .....	.....	4,162	4,204	4,247	103,989	106,311	108,633
<b>Freshwater</b>							
29 Ohio Facilities .....	Ohio .....	3,452	4,052	4,652	9,257	9,584	9,912
Monroe .....	Monroe .....	742	3,190	5,639	1,307	7,604	13,902
All Other In Scope .....	.....	33,317	39,111	44,906	89,348	92,514	95,679
All 393 In Scope .....	.....	37,511	46,353	55,196	99,911	109,702	119,493
<b>Great Lake</b>							
JR Whiting .....	JR Whiting .....	358	797	1,235	42	873	1,703
All Other In Scope .....	.....	8,774	19,523	30,271	1,025	21,385	41,745
All 16 In Scope .....	.....	9,132	20,319	31,506	1,067	22,257	43,448

EXHIBIT 25.—BASELINE LOSSES EXTRAPOLATED TO ALL IN SCOPE FACILITIES USING MGD ONLY—Continued  
 [Baseline losses extrapolated to all in scope facilities—MGD only, values in thousands of 2001\$]

Facility	Case study	Impingement			Entrainment		
		Low	Mid	High	Low	Mid	High
<b>Ocean</b>							
Pilgrim Nuclear .....	Pilgrim .....	4	256	507	642	4,960	9,279
All Other In Scope .....	.....	115	7,219	14,323	18,127	140,146	262,165
All 22 In Scope .....	.....	119	7,475	14,830	18,769	145,106	271,444
<b>Total All Facilities</b>							
All 539 In Scope .....	.....	75,390	122,374	169,357	620,661	975,675	1,330,690

In the third step, the Agency extrapolated baseline losses from the case studies were also developed using the angling index values for each case study. The calculation of the index is described above. The results are summarized in Exhibit 26.

EXHIBIT 26.—BASELINE LOSSES EXTRAPOLATED—ANGLING DAYS ONLY  
 [Values in thousands of 2001\$]

Facility	Case Study	Impingement			Entrainment		
		Low	Mid	High	Low	Mid	High
<b>Estuary, Non Gulf</b>							
Salem .....	Delaware .....	\$528	\$704	\$879	\$16,766	\$23,657	\$30,548
Brayton Point .....	Brayton .....	9	450	890	235	14,261	28,288
Contra Costa .....	California .....	2,666	5,726	8,785	6,413	13,630	20,847
Pittsburgh .....	California .....	10,096	22,268	34,440	19,166	40,760	62,354
All Other In Scope .....	.....	23,840	31,755	39,671	756,471	1,067,399	1,378,327
All 78 In Scope .....	.....	37,139	60,903	84,667	799,050	1,159,706	1,520,363
<b>Estuary, Gulf Coast</b>							
4 Tampa Facilities .....	Tampa Bay .....	\$801	\$809	\$817	\$20,007	\$20,454	\$20,901
All Other In Scope .....	.....	3,148	3,180	3,212	78,664	80,421	82,177
All 30 In Scope .....	.....	3,949	3,989	4,029	98,672	100,875	103,078
<b>Freshwater</b>							
29 Ohio Facilities .....	Ohio .....	\$3,452	\$4,052	\$4,652	\$9,257	\$9,584	\$9,912
Monroe .....	Monroe .....	742	3,190	5,639	1,307	7,604	13,902
All Other In Scope .....	.....	23,203	27,238	31,273	62,224	64,429	66,633
All 393 In Scope .....	.....	27,396	34,480	41,564	72,787	81,617	90,447
<b>Great Lake</b>							
JR Whiting .....	JR Whiting .....	\$358	\$797	\$1,235	\$42	\$873	\$1,703
All Other In Scope .....	.....	2,231	4,965	7,698	261	5,438	10,616
All 16 In Scope .....	.....	2,589	5,761	8,933	302	6,311	12,319
<b>Ocean</b>							
Pilgrim Nuclear .....	Pilgrim .....	\$4	\$256	\$507	\$642	\$4,960	\$9,279
All Other In Scope .....	.....	56	3,529	7,001	8,861	68,504	128,147
All 22 In Scope .....	.....	60	3,784	7,508	9,502	73,464	137,426
<b>Total All Facilities</b>							
All 539 In Scope .....	.....	\$71,134	\$108,918	\$146,701	\$980,314	\$1,421,974	\$1,863,633

As a fourth step, EPA calculated the average baseline losses of the flow-based results and the angling-based results. This develops results that reflect an equal-weighted extrapolation measure of each case study facility's baseline loss, based on it's percent share of flow and recreational fishing relative to all in scope facilities in each waterbody type. The results of this average are reported in Exhibit 27.

**EXHIBIT 27.—BASELINE LOSSES EXTRAPOLATED TO ALL IN SCOPE FACILITIES—MEANS OF MGD AND ANGLING**  
[Values in thousands of 2001\$]

Facility	Case Study	Impingement			Entrainment		
		Low	Mid	High	Low	Mid	High
<b>Estuary, Non Gulf</b>							
Salem .....	Delaware .....	\$528	\$704	\$879	\$16,766	\$23,657	\$30,548
Brayton Point .....	Brayton .....	9	450	890	235	14,261	28,288
Contra Costa .....	California .....	2,666	5,726	8,785	6,413	13,630	20,847
Pittsburgh .....	California .....	10,096	22,268	34,440	19,166	40,760	62,354
All Other In Scope .....	.....	17,503	23,315	29,127	555,409	783,695	1,011,981
All 78 In Scope .....	.....	30,803	52,463	74,122	597,988	876,002	1,154,017
<b>Estuary, Gulf Coast</b>							
4 Tampa Facilities .....	Tampa Bay .....	\$801	\$809	\$817	\$20,007	\$20,454	\$20,901
All Other In Scope .....	.....	3,255	3,288	3,321	81,323	83,139	84,955
All 30 In Scope .....	.....	4,055	4,097	4,138	101,330	103,593	105,856
<b>Freshwater</b>							
29 Ohio Facilities .....	Ohio .....	\$3,452	\$4,052	\$4,652	\$9,257	\$9,584	\$9,912
Monroe .....	Monroe .....	742	3,190	5,639	1,307	7,604	13,902
All Other In Scope .....	.....	28,260	33,175	38,089	75,786	78,471	81,156
All 393 In Scope .....	.....	32,453	40,417	48,380	86,349	95,660	104,970
<b>Great Lake</b>							
JR Whiting .....	JR Whiting .....	\$358	\$797	\$1,235	\$42	\$873	\$1,703
All Other In Scope .....	.....	5,503	12,244	18,985	643	13,412	26,180
All 16 In Scope .....	.....	5,861	13,040	20,220	685	14,284	27,884
<b>Ocean</b>							
Pilgrim Nuclear .....	Pilgrim .....	\$4	\$256	\$507	\$642	\$4,960	\$9,279
All Other In Scope .....	.....	86	5,374	10,662	13,494	104,325	195,156
All 22 In Scope .....	.....	90	5,629	11,169	14,135	109,285	204,435
<b>Total All Facilities</b>							
All 539 In Scope .....	.....	\$73,262	\$115,642	\$158,029	\$800,487	\$1,198,824	\$1,597,162

In the fifth step, EPA selected the set of extrapolation values the Agency believes are the most reflective of the baseline loss scenarios that applied in each waterbody type. For estuaries and freshwater facilities, EPA used the midpoint of its loss estimates of impingement and entrainment at the case study facilities, and then applied the average of the MGD- and angler-based extrapolation results. This provides estimates of national baseline losses that reflect the broadest set of values and parameters (i.e., the full

range of loss estimates, plus the application of all three extrapolation variables).

For oceans and the Great Lakes, EPA developed national-scale estimates using its HRC-based loss estimates, because EPA was able to develop HRC estimates for these sites, and because these HRC values are more comprehensive than the values derived using the more traditional benefits transfer approach. The HRC estimates cover losses for a much larger percentage of fish lost due to

impingement and entrainment, whereas the benefits transfer approach addressed losses only for a small share of the impacted fish. Since recreational fish impacts were an extremely small share of the total fish impacts at these sites, EPA extrapolated the HRC findings using only the MGD-based index (i.e., the angler-based index was not relevant).

The results of EPA's assessment of its best estimates for baseline losses due to impingement and entrainment are shown in Exhibit 28.

**EXHIBIT 28.—BEST ESTIMATE BASELINE LOSSES**  
[Best estimate baseline losses, values in thousands of 2001\$]

Facility	Case study	Impingement	Entrainment
Salem .....	Delaware .....	\$704	\$23,657
Brayton Point .....	Brayton .....	450	14,261
Contra Costa .....	California .....	5,726	13,630
Pittsburgh .....	California .....	22,268	40,760
All Other In Scope .....	.....	23,315	783,695
All 78 In Scope .....	.....	52,463	876,002

EXHIBIT 28.—BEST ESTIMATE BASELINE LOSSES—Continued

[Best estimate baseline losses, values in thousands of 2001\$]

Facility	Case study	Impingement	Entrainment
<b>Estuary and Gulf Coast</b>			
4 Tampa Facilities .....	Tampa Bay .....	\$809	\$20,454
All Other In Scope .....	.....	3,288	83,139
All 30 In Scope .....	.....	4,097	103,593
<b>Freshwater</b>			
29 Ohio Facilities .....	Ohio .....	\$4,052	\$9,584
Monroe .....	Monroe .....	3,190	7,604
All Other In Scope .....	.....	30,891	73,069
All 393 In Scope .....	.....	38,133	90,258
<b>Great Lake</b>			
JR Whiting .....	JR Whiting .....	\$1,235	\$1,703
All Other In Scope .....	.....	30,271	41,745
All 16 In Scope .....	.....	31,506	43,448
<b>Ocean</b>			
Pilgrim Nuclear .....	Pilgrim .....	\$507	\$9,279
All Other In Scope .....	.....	14,323	262,165
All 22 In Scope .....	.....	14,830	271,444
<b>Total All Facilities</b>			
All 539 In Scope .....	.....	\$141,029	\$1,384,745

In the sixth and final step, EPA estimated the potential benefits of each regulatory option by applying a set of estimated percent reductions in baseline losses. The percent reduction in baseline losses for each facility reflects EPA assessment of (1) regulatory baseline conditions at the facility (i.e., current practices and technologies in place), and (2) the percent reductions in impingement and entrainment that EPA estimated would be achieved at each facility that the Agency believes would be adopted under each regulatory option. The options portrayed in the Exhibits correspond to the following technical descriptions of each alternative:

Option 1 requires all Phase II existing facilities located on different categories of waterbodies to reduce intake capacity

commensurate with the use of closed-cycle, recirculating cooling water systems based on location and the percentage of the source waterbody they withdraw for cooling;

Option 2 is variation of Option 1, but embodies a two-track approach whereby some facilities may use site-specific studies to comply using alternative approaches;

Option 3 (the Agency's preferred option) requires all Phase II existing facilities to reduce impingement and entrainment to levels established based on the use of design and construction or operational measures, except for facilities that are below flow thresholds for lakes and rivers;

Option 3a is a variation of Option 3, wherein all Phase II existing facilities are required to reduce impingement and

entrainment to levels established based on the use of design and construction or operational measures;

Option 4 requires all Phase II existing facilities to reduce intake capacity commensurate with the use of closed-cycle, recirculating cooling water systems;

Option 5 requires that all Phase II existing facilities reduce intake capacity commensurate with the use of dry cooling systems.

The results of EPA approach to estimating national benefits are shown in Exhibits 29 through 32 (note that the percent reductions shown in these exhibits are the flow-weighted average reductions across all facilities in each waterbody category for each regulatory option).

EXHIBIT 29.—IMPINGEMENT BENEFITS FOR VARIOUS OPTIONS—BY REDUCTION LEVEL

Waterbody Type	Facility	Baseline impingement loss	Percentage Reductions					
			OPTION 1 percent	OPTION 2 percent	OPTION 3 percent	OPTION 3a percent	OPTION 4 percent	OPTION 5 percent
Estuary—NonGulf	All 78 In Scope .....	\$52,463	64.5	47.5	33.2	25.0	40.9	97.5
Estuary—Gulf .....	All 30 In Scope .....	4,097	63.2	45.9	26.5	30.0	45.3	96.7
Freshwater .....	All 393 In Scope .....	40,417	47.3	47.3	47.3	46.7	59.0	98.0
Great Lake .....	All 16 In Scope .....	31,506	80.0	80.0	80.0	77.0	88.6	96.3
Ocean .....	All 22 In Scope .....	14,830	73.2	59.0	50.6	47.2	59.7	88.8
ALL .....	All 539 In Scope .....	143,312						

EXHIBIT 30.—IMPINGEMENT BENEFITS FOR VARIOUS OPTIONS—BY BENEFIT LEVEL

Waterbody type	Facility	Baseline impingement loss	Benefits (Values in thousands of 2001\$)					
			OPTION 1	OPTION 2	OPTION 3	OPTION 3a	OPTION 4	OPTION 5
Estuary—NonGulf	All 78 In Scope .....	\$52,463	\$33,834	\$24,909	\$17,418	\$13,125	\$21,470	\$51,141
Estuary—Gulf .....	All 30 In Scope .....	4,097	2,588	1,882	1,087	1,230	1,856	3,961
Freshwater .....	All 393 In Scope ...	40,417	19,117	19,117	19,117	18,855	23,828	39,605
Great Lake .....	All 16 In Scope .....	31,506	25,205	25,205	25,205	24,260	27,900	30,326
Ocean .....	All 22 In Scope .....	14,830	10,849	8,746	7,503	6,995	8,858	13,168
ALL .....	All 539 In Scope ...	143,312	91,593	79,858	70,329	64,465	83,911	138,201

EXHIBIT 31.—ENTRAINMENT BENEFITS FOR VARIOUS OPTIONS—BY REDUCTION LEVEL

Waterbody type	Facility	Baseline loss	Entrainment percentage reductions					
			OPTION 1 percent	OPTION 2 percent	OPTION 3 percent	OPTION 3a percent	OPTION 4 percent	OPTION 5 percent
Estuary—NonGulf	All 78 In Scope .....	\$876,002	67.2	59.1	48.5	47.1	79.2	97.5
Estuary—Gulf .....	All 30 In Scope .....	103,593	66.9	52.3	47.0	47.8	79.3	96.7
Freshwater .....	All 393 In Scope ...	95,660	12.4	12.4	12.4	44.2	72.7	98.0
Great Lake .....	All 16 In Scope .....	43,448	57.8	57.8	57.8	57.8	88.6	96.3
Ocean .....	All 22 In Scope .....	271,444	74.2	58.9	45.0	45.0	74.1	88.8
ALL .....	All 539 In Scope ...	1,390,147						

EXHIBIT 32.—ENTRAINMENT BENEFITS FOR VARIOUS OPTIONS—BY BENEFIT LEVEL

Waterbody type	Facility	Baseline loss	Entrainment benefit (Values in thousands of 2001\$)					
			OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6
Estuary—NonGulf	All 78 In Scope .....	\$876,002	\$588,552	\$517,960	\$424,708	\$412,696	\$693,420	\$853,940
Estuary—Gulf .....	All 30 In Scope .....	103,593	69,324	54,206	48,645	49,508	82,186	100,175
Freshwater .....	All 393 In Scope ...	95,660	11,883	11,883	11,883	42,277	69,575	93,738
Great Lake .....	All 16 In Scope .....	43,448	25,092	25,092	25,092	25,092	38,474	41,820
Ocean .....	All 22 In Scope .....	271,444	201,301	159,809	122,098	122,098	201,025	241,020
ALL .....	All 539 In Scope ...	1,390,147	896,152	768,950	632,426	651,671	1,084,681	1,330,694

In addition, EPA developed a more generic illustration of potential benefits, based on a broad range (from 10 percent to 90 percent) of potential reductions in impingement and entrainment. These illustrative results are shown in Exhibit 33. Finally, the benefits estimated for Option 3, the Agency's preferred option, are detailed in Exhibit 34.

EXHIBIT 33.—SUMMARY OF POTENTIAL BENEFITS ASSOCIATED WITH VARIOUS IMPINGEMENT AND ENTRAINMENT REDUCTION LEVELS

Reduction level percent	Facility	Benefits (values in thousands of 2001\$)	
		Impingement	Entrainment
10 .....	All 539 In Scope .....	\$14,331	\$139,015
20 .....	All 539 In Scope .....	28,662	278,029
30 .....	All 539 In Scope .....	42,994	417,044
40 .....	All 539 In Scope .....	57,325	556,059
50 .....	All 539 In Scope .....	71,656	695,073
60 .....	All 539 In Scope .....	85,987	834,088
70 .....	All 539 In Scope .....	100,319	973,103
80 .....	All 539 In Scope .....	114,650	1,112,118
90 .....	All 539 In Scope .....	128,981	1,251,132

EXHIBIT 34.—SUMMARY OF BENEFITS FROM IMPINGEMENT CONTROLS ASSOCIATED WITH OPTION 3

Waterbody type	Facility	Benefits (values in thousands of 2001\$)	
		Impingement	Entrainment
Estuary—NonGulf .....	All 78 In Scope .....	\$17,418	\$424,708
Estuary—Gulf .....	All 30 In Scope .....	1,087	48,645
Freshwater .....	All 393 In Scope .....	19,117	11,883

EXHIBIT 34.—SUMMARY OF BENEFITS FROM IMPINGEMENT CONTROLS ASSOCIATED WITH OPTION 3—Continued

Waterbody type	Facility	Benefits (values in thousands of 2001\$)	
		Impingement	Entrainment
Great Lake .....	All 16 In Scope .....	25,205	25,092
Ocean .....	All 22 In Scope .....	7,503	122,098
ALL .....	All 539 In Scope .....	70,329	632,426

Under today’s proposal, facilities can choose the Site-Specific Determination of Best Technology Available in § 125.94(a) in which a facility can demonstrate to the Director that the cost of compliance with the applicable performance standards in § 125.94(b) would be significantly greater than the costs considered by EPA when establishing these performance standards, or the costs would be significantly greater than the benefits of complying with these performance standards. EPA expects that if facilities were to choose this approach, then the overall national benefits of this rule will decrease markedly. This is because under this approach facilities would choose the lowest cost technologies possible and not necessarily the most effective technologies to reduce impingement and entrainment at the facility.

**X. Administrative Requirements**

*A. E.O. 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;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- 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, it has been 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 will be documented in the public record.

*B. Paperwork Reduction Act*

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 et seq. EPA has prepared an Information Collection Request (ICR) document (EPA ICR No. 2060.01) and you may obtain a copy from Susan Auby by mail at Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW.; Washington, DC 20007, by e-mail at [auby.susan@epamail.epa.gov](mailto:auby.susan@epamail.epa.gov), or by calling (202) 260-49011. You also can download a copy off the Internet at <http://www.epa.gov/icr>. The information collection requirements relate to existing electric generation facilities with design intake flows of 50 million gallons per day or more collecting information for preparing comprehensive demonstration studies, monitoring of impingement and entrainment, verifying compliance, and preparing yearly reports.

The total burden of the information collection requirements associated with today’s proposed rule is estimated at 4,251,240 hours. The corresponding estimates of cost other than labor (labor and non-labor costs are included in the total cost of the proposed rule discussed in Section VIII of this preamble) is \$191 million for 539 facilities and 44 States and one Territory for the first three years after promulgation of the rule. Non-labor costs include activities such as capital costs for remote monitoring devices, laboratory services, photocopying, and the purchase of supplies. The burden and costs are for the information collection, reporting, and recordkeeping requirements for the three-year period beginning with the assumed effective date of today’s rule. Additional information collection requirements will occur after this initial

three-year period as existing facilities continue to be issued permit renewals and such requirements will be counted in a subsequent information collection request. EPA does not consider the specific data that would be collected under this proposed rule to be confidential business information. However, if a respondent does consider this information to be confidential, the respondent may request that such information be treated as confidential. All confidential data will be handled in accordance with 40 CFR 122.7, 40 CFR part 2, and EPA’s Security Manual Part III, Chapter 9, dated August 9, 1976.

Burden is defined as the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

Compliance with the applicable information collection requirements imposed under this proposed rule (see §§ 122.21(r), 125.95, 125.96, 125.97, and 125.98) is mandatory. Existing facilities would be required to perform several data-gathering activities as part of the permit renewal application process. Today’s proposed rule would require several distinct types of information collection as part of the NPDES renewal application. In general, the information would be used to identify which of the requirements in today’s proposed rule apply to the existing facility, how the existing facility would meet those requirements, and whether the existing facility’s cooling water intake structure reflects the best technology available for minimizing environmental impact.

Categories of data required by today's proposed rule follow.

- Source waterbody data for determining appropriate requirements to apply to the facility, evaluating ambient conditions, and characterizing potential for impingement and entrainment of all life stages of fish and shellfish by the cooling water intake structure;
- Intake structure data, consisting of intake structure design and a facility water balance diagram, to determine appropriate requirements and characterize potential for impingement and entrainment of all life stages of fish and shellfish;
- Information on design and construction technologies implemented to ensure compliance with applicable requirements set forth in today's proposed rule; and
- Information on supplemental restoration measures proposed for use with or in lieu of design and construction technologies to minimize adverse.

In addition to the information requirements of the permit renewal application, NPDES permits normally specify monitoring and reporting requirements to be met by the permitted entity. Existing facilities that fall within the scope of this proposed rule would be required to perform biological monitoring as required by the Director to demonstrate compliance, and visual or remote inspections of the cooling water intake structure and any additional technologies. Additional

ambient water quality monitoring may also be required of facilities depending on the specifications of their permits. The facility would be expected to analyze the results from its monitoring efforts and provide these results in an annual status report to the permitting authority. Finally, facilities would be required to maintain records of all submitted documents, supporting materials, and monitoring results for at least three years. (Note that the Director may require that records be kept for a longer period to coincide with the life of the NPDES permit.)

All impacted facilities would carry out the specific activities necessary to fulfill the general information collection requirements. The estimated burden includes developing a water balance diagram that can be used to identify the proportion of intake water used for cooling, make-up, and process water. Facilities would also gather data to calculate the reduction in impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved by the technologies and operational measures they select. The burden estimates include sampling, assessing the source waterbody, estimating the magnitude of impingement mortality and entrainment, and reporting results in a comprehensive demonstration study. The burden also includes conducting a pilot study to evaluate the suitability of the technologies and operational measures based on the species that are found at the site.

Some of the facilities (those choosing to use restoration measures to maintain fish and shellfish) would need to prepare a plan documenting the restoration measures they would implement and how they would demonstrate that the restoration measures were effective. The burden estimates incorporate the cost of preparing calculations, drawings, and other materials supporting the proposed restoration measures, as well as performing monitoring to verify the effectiveness of the restoration measures.

Some facilities may choose to request a site-specific determination of BTA because of costs significantly greater than those EPA considered in establishing the performance standards or because costs are significantly greater than the benefits of complying with the performance standards. These facilities must perform a comprehensive cost evaluation study and/or a valuation of the monetized benefits of reducing impingement and entrainment, as well as submitting a site-specific technology plan characterizing the design and construction technologies, operational measures and restoration measures they have selected.

Exhibit 35 presents a summary of the maximum burden estimates for a facility to prepare a permit application and monitor and report on cooling water intake structure operations as required by this rule.

**EXHIBIT 35.—MAXIMUM BURDEN AND COSTS PER FACILITY FOR NPDES PERMIT APPLICATION AND MONITORING AND REPORTING ACTIVITIES**

Activities	Burden (hr)	Labor cost	Other direct costs (lump sum) <sup>a</sup>
Start-up activities .....	43	\$1,964	\$50
Permit application activities .....	242	9,071	500
Source water baseline biological characterization data .....	265	10,622	750
Proposal for collection of information for comprehensive demonstration study <sup>b</sup> .....	271	11,407	1,000
Source waterbody flow information .....	116	3,794	100
Design and construction technology plan .....	146	5,260	50
Impingement mortality and entrainment characterization study <sup>b</sup> .....	5,264	289,061	13,000
Evaluation of potential cooling water intake structure effects <sup>b</sup> .....	2,578	144,838	500
Information for site-specific determination of BTA .....	692	32,623	200
Site-specific technology plan .....	177	6,963	75
Verification monitoring plan .....	128	5,489	1,000
Subtotal .....	9,922	521,092	17,225
Biological monitoring (impingement sampling) .....	388	20,973	650
Biological monitoring (entrainment sampling) .....	776	42,044	4,000
Visual or remote inspections <sup>c</sup> .....	253	8,994	100
Verification study <sup>d</sup> .....	122	5,927	500
Yearly status report activities .....	324	14,906	750
Subtotal .....	1,863	92,844	\$6,000

<sup>a</sup>Cost of supplies, filing cabinets, photocopying, boat renting, etc.

<sup>b</sup> The Impingement Mortality and Entrapment Characterization Study and Evaluation of Potential CWIS Effects also have capital, O&M and contracted service costs associated with them.

<sup>c</sup> Remote monitoring equipment also has capital and O&M costs associated with it.

<sup>d</sup> The verification monitoring also has contracted services associated with it.

EPA believes that all 44 States and one Territory with NPDES permitting authority will undergo start-up activities in preparation for administering the provisions of the proposed rule. As part of these start-up activities, States and Territories are expected to train junior technical staff to review materials submitted by facilities, and then use these materials to evaluate compliance with the specific conditions of each facility's NPDES permit.

Each State's/Territory's actual burden associated with reviewing submitted

materials, writing permits, and tracking compliance depends on the number of new in-scope facilities that will be built in the State/Territory during the ICR approval period. EPA expects that State and Territory technical and clerical staff will spend time gathering, preparing, and submitting the various documents. EPA's burden estimates reflect the general staffing and level of expertise that is typical in States/Territories that administer the NPDES permitting program. EPA considered the time and

qualifications necessary to complete various tasks such as reviewing submitted documents and supporting materials, verifying data sources, planning responses, determining specific permit requirements, writing the actual permit, and conferring with facilities and the interested public. Exhibit 36 provides a summary of the maximum burden estimates for States/Territories performing various activities with the proposed rule.

EXHIBIT 36.—ESTIMATING STATE/TERRITORY MAXIMUM BURDEN AND COSTS FOR ACTIVITIES

Activities	Burden (hr)	Labor cost	Other direct costs (lump sum) <sup>a</sup>
Start-up activities (per State/Territory) .....	100	\$3,496	\$50
State/Territory permit issuance activities (per facility) .....	811	32,456	300
Verification study review (per facility) .....	21	689	50
Review of alternative regulatory requirements (per facility) .....	192	6,237	50
Annual State/Territory activities (per facility) .....	50	1,662	50
Subtotal .....	1,174	44,540	500

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information, unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

EPA requests comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW, Washington, DC 20460; and to the Office of Information and Regulatory Affairs; Office of Management and Budget; 725 17th Street, NW.; Washington, DC 20503, marked "Attention: Desk Officer for EPA." Include the ICR number in any correspondence. Because OMB is required to make a decision concerning the ICR between 30 and 60 days after April 9, 2002, a comment is best assured of having its full effect if OMB receives it by May 9, 2002. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

*C. Unfunded Mandates Reform Act*

1. UMRA Requirements

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104-4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and Tribal governments and the private sector. Under section 202 of UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with "Federal mandates" that may result in expenditures to State, local, and Tribal governments, in the aggregate, or to the private sector, of \$100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative

was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including Tribal governments, it must have developed under section 203 of UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant intergovernmental mandates, and informing, educating, and advising small governments on compliance with regulatory requirements.

EPA estimated total annualized (post-tax) costs of compliance for the proposed rule to be \$182 million (\$2001). Of this total, \$153 million is incurred by the private sector and \$19.6 million is incurred by State and local governments that operate in-scope facilities.<sup>82</sup> Permitting authorities incur an additional \$3.6 million to administer the rule, including labor costs to write permits and to conduct compliance monitoring and enforcement activities. EPA estimates that the highest

<sup>82</sup> In addition, 13 facilities owned by Tennessee Valley Authority (TVA), a federal entity, incur \$9.8 million in compliance costs. The costs incurred by the federal government are not included in this section.

undiscounted cost incurred by the private sector in any one year is approximately \$480 million in 2005. The highest undiscounted cost incurred by government sector in any one year is approximately \$42 million in 2005. Thus, EPA has determined that this rule contains a Federal mandate that may result in expenditures of \$100 million or more for State, local, and Tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared a written statement under § 202 of UMRA, which is summarized below.

2. Analysis of Impacts on Government Entities

Governments may incur two types of costs as a result of the proposed regulation: (1) Direct costs to comply with the rule for facilities owned by government entities; and (2) administrative costs to implement the regulation. Both types of costs are discussed below.

a. Compliance Costs for Government-Owned Facilities

Exhibit 37 below provides an estimate of the number of government entities that operate facilities subject to the

proposed rule, by ownership type and size of government entity. The exhibit shows that 23 large government entities operate 43 facilities subject to the proposed regulation. There are 22 small government entities that operate 22 facilities subject to regulation. No small government entity operates more than one affected facility. Of the 65 facilities that are owned by government entities, 48 are owned by municipalities, eight are owned by political subdivisions, seven are owned by state governments, and two are owned by municipal marketing authorities.

EXHIBIT 37.—NUMBER OF GOVERNMENT ENTITIES AND GOVERNMENT-OWNED FACILITIES

Ownership type	Number of government entities (by size)			Number of facilities (by government entity size)		
	Large	Small	Total	Large	Small	Total
Municipality .....	16	19	35	29	19	48
Municipal marketing authority .....	0	2	2	0	2	2
State Government .....	4	0	4	7	0	7
Political Subdivision .....	3	1	4	7	1	8
<b>Total .....</b>	<b>23</b>	<b>22</b>	<b>45</b>	<b>43</b>	<b>22</b>	<b>65</b>

Exhibit 38 summarizes the annualized compliance costs incurred by State, local, and Tribal governments for the proposed rule. The exhibit shows that the estimated annualized compliance costs for all government-owned facilities are \$19.6 million. The 43 facilities owned by large governments would incur costs of \$13.6 million; the 22 facilities owned by small governments would incur costs of \$6 million.

EXHIBIT 38.—NUMBER OF REGULATED GOVERNMENT-OWNED FACILITIES AND COMPLIANCE COSTS BY SIZE OF GOVERNMENT FOR PROPOSED RULE

Size of Government	Number of facilities subject to regulation	Compliance costs (million \$2001)
Facilities Owned by Large Governments .....	43	\$13.6
Facilities Owned by Small Governments .....	22	6.0
All Government-Owned Facilities .....	65	19.6

EPA's analysis also considered whether the proposed rule may significantly or uniquely affect small governments. EPA estimates that 22 facilities subject to the proposed rule are owned by small governments (i.e., governments with a population of less

than 50,000). The total compliance cost for all the small government-owned facilities incurring costs under the proposed rule is \$6.0 million, or approximately \$273,000 per facility. The highest annualized compliance costs for a government-owned facility is \$965,000. In comparison, all non-government-owned facilities subject to this rule are expected to incur annualized compliance costs of \$176 million, or \$330,000 per facility. The highest annualized cost for a facility not owned by a small government is \$4.3 million. EPA therefore concludes that these costs do not significantly or uniquely affect small governments. The *Economic and Benefits Assessment* provides more detail on EPA's analysis of impacts on governments.

b. Administrative Costs

The requirements of Section 316(b) are implemented through the NPDES (National Pollutant Discharge Elimination System) permit program. Forty-five states and territories currently have NPDES permitting authority under section 402(b) of the Clean Water Act (CWA). EPA estimates that states and territories will incur four types of costs associated with implementing the requirements of the proposed rule: (1) Start-up activities; (2) first permit issuance activities; (3) repermitting activities, and (4) annual activities. EPA estimates that the total annualized cost for these activities will be \$3.6 million.

Exhibit 39 below presents the annualized costs of the major administrative activities.

EXHIBIT 39.—ANNUALIZED GOVERNMENT ADMINISTRATIVE COSTS (MILLION \$2001)

Activity	Cost
Start-up Activities .....	\$0.02
First Permit Issuance Activities .....	1.61
Repermitting Activities .....	1.05
Annual Activities .....	0.94
<b>Total .....</b>	<b>3.62</b>

3. Consultation

EPA consulted with State governments and representatives of local governments in developing the regulation. The outreach activities are discussed in Section XI.E (E.O. 13131 addressing Federalism) of this preamble.

4. Alternatives Considered

In addition to the proposed rule, EPA considered and analyzed several alternative regulatory options to determine the best technology available for minimizing adverse environmental impact. EPA selected the proposed rule because it meets the requirement of section 316(b) of the CWA that the location, design, construction, and capacity of CWIS reflect the BTA for minimizing AEI, and it is economically practicable.

*D. Regulatory Flexibility Act as Amended by SBREFA (1996)*

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

After considering the economic impacts of today's proposed rule on small entities, the Agency certifies that this action will not have a significant economic impact on a substantial number of small entities for reasons explained below.

For the purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business according to Small Business Administration (SBA) size standards; (2) a small governmental jurisdiction that is a government of a city, county; town, school district or special district with a

population of less than 50,000; and (3) a small organization that is a not-for-profit enterprise which is independently owned and operated and is not dominant in its field. The SBA thresholds define minimum employment, sales revenue, or MWh output sizes below which an entity qualifies as small. The thresholds used in this analysis are firm-level four-digit Standard Industrial Classification (SIC) codes.<sup>83</sup> Exhibit 40 below presents the SBA size standards used in this analysis.

EXHIBIT 40.—UNIQUE PHASE II ENTITY SMALL BUSINESS SIZE STANDARDS (BY STANDARD INDUSTRY CLASSIFICATION CODES (SIC))<sup>84</sup>

SIC code	SIC description	SBA size standard
1311	Crude Petroleum and Natural Gas	500 Employees
3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills.	1,000 Employees.
4911	Electric Services	4 million MWh.
4924	Natural Gas Distribution	500 Employees.
4931	Electric and Other Services Combined	\$5.0 Million.
4932	Gas and Other Services Combined	\$5.0 Million.
4939	Combination Utilities, NEC	\$5.0 Million.
4953	Refuse Systems	\$10.0 Million.
6512	Operators of Nonresidential Buildings	\$5.0 Million.
8711	Engineering Services	\$6.0 Million.

<sup>84</sup> Information Source: U.S. Small Business Administration, Office of Size Standards, Exhibit of Size Standards ([www.sba.gov/regulations/siccodes/siccodes.html](http://www.sba.gov/regulations/siccodes/siccodes.html))

EPA used publicly available data from the 1999 Forms EIA-860A and EIA-860B as well as information from EPA's 2000 Section 316(b) Industry Survey to identify the parent entities of electric generators subject to this proposed rule. EPA also conducted research to identify recent changes in ownership, including the current owner of each generator, and each owner's primary SIC code, sales revenues, employment, and/or electricity sales. Based on the parent entity's SIC code and the related size standard set by the SBA, EPA identified facilities that are owned by small entities.

Based on this analysis, EPA expects this proposed rule to regulate only a small absolute number of facilities owned by small entities, representing only 1.3 percent of all facilities owned

by small entities in the electric power industry. EPA has estimated that 28 in-scope electric generators owned by small entities would be regulated by this proposed rule. Of the 28 generators, 19 are projected to be owned by a municipality, six by a rural electric cooperative, two by a municipal marketing authority, and one by a political subdivision.

Only facilities with design intake flows of 50 MGD or more are subject to this rule. In addition, only a small percentage of all small entities in the electric power industry, 1.3 percent, is subject to this rule. Finally, of the 28 small entities, two entities would incur annualized post-tax compliance costs of greater than three percent of revenues; nine would incur compliance costs of between one and three percent of

revenues; and the remaining 17 small entities would incur compliance costs of less than one percent of revenues. The estimated compliance costs that facilities owned by small entities would likely incur represent between 0.12 and 5.29 percent of the entities' annual sales revenue.

Exhibit 41 summarizes the results of Regulatory Flexibility Act analysis. From the small absolute number of facilities owned by small entities that would be affected by the proposed rule, the low percentage of all small entities, and the very low impacts, EPA concludes that the proposed rule will not have a significant economic impact on a substantial number of small entities.

EXHIBIT 41.—SUMMARY OF RFA ANALYSIS

Type of Entity	(A) Number of in-scope facilities owned by small entities	(B) Number of small entities with in-scope facilities	(C) Total number of small entities	(D) Percent of small entities in-scope of rule [(B)/(C)]	(E) Annual compliance costs/annual sales revenue
Municipality	19	19	1,110	1.7	0.4 to 5.3%

<sup>83</sup> The North American Industry Classification System (NAICS) replaced the Standard Industrial

Classification (SIC) System as of October 1, 2000. The data sources EPA used to identify the parent

entities of the facilities subject to this rule did not provide NAICS codes at the time of analysis.

EXHIBIT 41.—SUMMARY OF RFA ANALYSIS—Continued

Type of Entity	(A) Number of in-scope facilities owned by small entities	(B) Number of small entities with in-scope facilities	(C) Total number of small entities	(D) Percent of small entities in-scope of rule [(B)/(C)]	(E) Annual compliance costs/annual sales revenue
Municipal Marketing Authority .....	2	2	22	9.1	0.1 to 0.1%
Rural Electric Cooperative .....	6	6	877	0.7	0.2 to 0.5%
Political Subdivision .....	1	1	104	1.0	1.2 to 1.2%
Other Types .....	0	0	97	0.0	n/a
<b>Total .....</b>	<b>28</b>	<b>28</b>	<b>2,210</b>	<b>1.3</b>	<b>0.1–5.3%</b>

The *Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule* presents more detail on EPA’s small entity analysis in support of this proposed rule.

*E. E.O. 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*

Executive Order 12898 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 excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin.

Today’s final rule would require that the location, design, construction, and capacity of cooling water intake structures (CWIS) at Phase II existing facilities reflect the best technology available for minimizing adverse environmental impact. For several reasons, EPA does not expect that this final rule would have an exclusionary effect, deny persons the benefits of the participating in a program, or subject persons to discrimination because of their race, color, or national origin.

To assess the impact of the rule on low-income and minority populations, EPA calculated the poverty rate and the percentage of the population classified as non-white for populations living within a 50-mile radius of each of the 539 in-scope facilities. The results of the analysis, presented in the EBA, show that the populations affected by the in-

scope facilities have poverty levels and racial compositions that are quite similar to the U.S. population as a whole. A relatively small subset of the facilities are located near populations with poverty rates (24 of 539, or 4.5%), or non-white populations (101 of 539, or 18.7%), or both (13 of 539, or 2.4%), that are significantly higher than national levels. Based on these results, EPA does not believe that this rule will have an exclusionary effect, deny persons the benefits of the NPDES program, or subject persons to discrimination because of their race, color, or national origin.

In fact because EPA expects that this final rule would help to preserve the health of aquatic ecosystems located in reasonable proximity to Phase II existing facilities, it believes that all populations, including minority and low-income populations, would benefit from improved environmental conditions as a result of this rule. Under current conditions, EPA estimates approximately 2.2 billion fish (expressed as age 1 equivalents) of recreational and commercial species are lost annually due to impingement and entrainment at the 529 in scope Phase II existing facilities. Under the Agency’s preferred option, over 1.2 billion individuals of these commercially and recreationally sought fish species (age 1 equivalents) will now survive to join the fishery each year (435 million fish due to reduced impingement impacts, and 789 million fish due to reduced entrainment). These additional 1.2 billion fish will provide increased opportunities for subsistence anglers to increase their catch, thereby providing some benefit to low income households located near regulation-impacted waters.

*F. E.O. 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 an economically 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.

*G. E.O. 13175: Consultation and Coordination With Indian Tribal Governments*

Executive Order 13175, entitled “Consultation and Coordination with Indian Tribal Governments” (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 will 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 this proposed rule 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.

#### H. E.O. 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."

This proposed rule recognizes the biological sensitivity of tidal rivers, estuaries, oceans, and the Great Lakes and their susceptibility to adverse environmental impact from cooling water intake structures. This proposal provides the most stringent requirements to minimize adverse environmental impact for cooling water intake structures located on these types of water bodies, including potential reduction of intake flows to a level commensurate with that which can be attained by a closed-cycle recirculating cooling system for facilities that withdraw certain proportions of water from estuaries, tidal rivers, and oceans.

EPA expects that this proposed rule will reduce impingement and entrainment at facilities with design intake flows of 50 MGD or more. The rule would afford protection of aquatic organisms at individual, population, community, or ecosystem levels of ecological structures. Therefore, EPA expects today's proposed rule would advance the objective of the Executive Order to protect marine areas.

#### I. E.O. 13211: Energy Effects

Executive Order 13211 on "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" 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 (66 FR 28355; May 22, 2001):

any action by an agency (normally published in the **Federal Register**) that promulgates or is expected to lead to the promulgation of a final 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 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 proposed rule does not qualify as 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 directly reduce the installed capacity or the electricity production of U.S. electric power generators, for example through parasitic losses or auxiliary power requirements. In addition, based on the estimated costs of compliance, EPA currently projects that the rule will not lead to any early capacity retirements at facilities subject to this rule or at facilities that compete with them. As described in detail in Section VIII, EPA estimates small effects of this rule on installed capacity, generation, production costs, and electricity prices. EPA's therefore concludes that this proposed rule will have small energy effects at a national, regional, and facility-level. As a result, EPA did not prepare a Statement of Energy Effects. EPA recognizes that some of the alternative regulatory options discussed in the preamble would have much larger effects and might well qualify as "significant energy actions" under Executive Order 13211. If EPA decides to revise the proposed requirements for the final rule, it will reconsider its determination under Executive Order 13211 and prepare a Statement of Energy Effects as appropriate.

For more detail on the potential energy effects of this proposed rule or

the alternative regulatory options considered by EPA, see Section VIII above or the *Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule*.

#### J. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) of 1995, Pub. L. 104-113, Sec. 12(d) directs EPA to use voluntary consensus standards in its regulatory activities unless to do 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. EPA welcomes comments on this aspect of the proposed rule and, specifically, invites the public to identify potentially applicable voluntary consensus standards and to explain why such standards should be used in this proposed rule.

#### K. Plain Language Directive

Executive Order 12866 and the President's memorandum of June 1, 1998, require each agency to write all rules in plain language. We invite your comments on how to make this proposed rule easier to understand. For example: Have we organized the material to suit your needs? Are the requirements in the rule clearly stated? Does the rule contain technical language or jargon that is not clear? Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand? Would more (but shorter) sections be better? Could we improve clarity by adding tables, lists, or diagrams? What else could we do to make the rule easier to understand?

#### L. 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 EPA consults with State and local officials early in the process of developing the proposed 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 proposed regulation.

This proposed rule does not have federalism implications. It will 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 an annual burden of 146,983 hours with an annual cost of \$41,200 (non-labor costs) for States to collectively administer this proposed rule. EPA has identified 65 Phase II existing facilities that are owned by federal, state or local government entities. The annual impacts on these facilities is not expected to exceed 2,252 burden hours and \$56,739 (non-labor costs) per facility.

The proposed national cooling water intake structure requirements would be implemented through permits issued under the NPDES program. Forty-three States and the Virgin Islands 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.)

Today’s proposed rule would not 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. Today’s proposed rule establishes national requirements for Phase II existing facilities with cooling water intake structures. NPDES-authorized States that currently do not comply with the final regulations based on today’s proposal 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 proposed rule, the relationship and distribution of power and responsibilities between the Federal government and the States and local governments are established under the CWA (e.g., sections 402(b) and 510); nothing in this proposed rule would alter 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 the proposed rule. During the development of the proposed section 316(b) rule for new facilities, EPA conducted several outreach activities through which State and local officials were informed about this proposal and they 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 participated in other industry conferences, met upon request on numerous occasions with industry representatives, and met on a number of

occasions with representatives of environmental groups.

In the months leading up to publication of the proposed Phase I rule, EPA conducted a series of stakeholder meetings to review the draft regulatory framework for the proposed rule and invited stakeholders to provide their recommendations for the Agency’s consideration. EPA managers have met with the Utility Water Act Group, Edison Electric Institute, representatives from an individual utility, and with representatives from the petroleum refining, pulp and paper, and iron and steel industries. EPA conducted meetings with environmental groups attended by representatives from between 3 and 15 organizations. EPA also 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 also 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). After publication of the proposed Phase I rule, EPA continued to meet with stakeholders at their request.

EPA received more than 2000 comments on the Phase I proposed rule and NODA. In some cases these comments have informed the development of the Phase II rule proposal.

In January, 2001, EPA also attended technical workshops organized by the Electric Power Research Institute and the Utilities Water Action Group. These workshops focused on the presentation of key issues associated with different regulatory approaches considered under the Phase I proposed rule and alternatives for addressing 316(b) requirements.

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.

Finally, in August 21, 2001, EPA staff participated in a technical symposium sponsored by the Electric Power Research Institute in association with the American Fisheries Society on

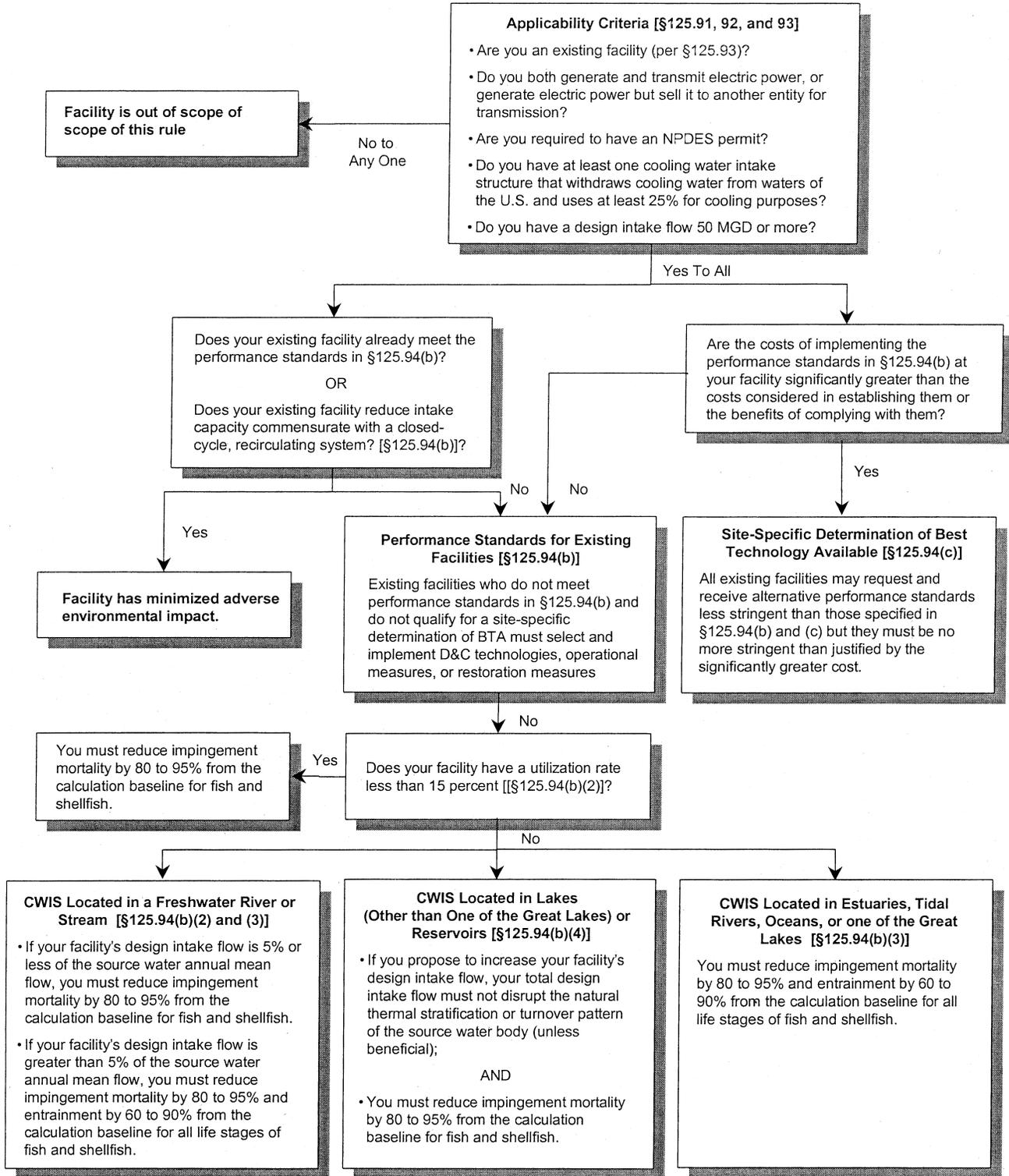
issues relating to the definition and assessment of adverse environmental impact for section 316(b) of the CWA.

In the spirit of this Executive Order and consistent with EPA policy to promote communications between EPA

and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

**BILLING CODE 6560-50-P**

APPENDIX 1.—SECTION 316(B) PHASE II EXISTING FACILITY RULE FRAMEWORK



CWIS = cooling water intake structure  
 MGD = million gallons per day  
 D&C = design and construction

List of Subjects

40 CFR Part 9

Reporting and recordkeeping requirements.

40 CFR Part 122

Administrative practice and procedure, Confidential business information, Hazardous substances, Reporting and recordkeeping requirements, Water pollution control.

40 CFR Part 123

Administrative practice and procedure, Confidential business information, Hazardous substances, Indian-lands, Intergovernmental relations, Penalties, Reporting and recordkeeping requirements, Water pollution control.

40 CFR Part 124

Administrative practice and procedure, Air pollution control, Hazardous waste, Indians-lands, Reporting and recordkeeping requirements, Water pollution control, Water supply.

40 CFR Part 125

Cooling Water Intake Structure, Reporting and recordkeeping requirements, Waste treatment and disposal, Water pollution control.

Dated: February 28, 2002.

Christine Todd Whitman, Administrator.

For the reasons set forth in the preamble, chapter I of title 40 of the Code of Federal Regulations is amended as follows:

PART 9—OMB APPROVALS UNDER THE PAPERWORK REDUCTION ACT

1. The authority citation for part 9 continues to read as follows:

Authority: 7 U.S.C. 135 et seq., 136–136y; 15 U.S.C. 2001, 2003, 2005, 2006, 2601–2671, 21 U.S.C. 331j, 346a, 348; 31 U.S.C. 9701; 33 U.S.C. 1251 et seq., 1311, 1313d, 1314, 1318, 1321, 1326, 1330, 1342, 1344, 1345 (d) and (e), 1361; E.O. 11735, 38 FR 21243, 3 CFR, 1971–1975 Comp. p. 973; 42 U.S.C. 241, 242b, 243, 246, 300f, 300g, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–1, 300j–2, 300j–3, 300j–4, 300j–9, 1857 et seq., 6901–6992k, 7401–7671q, 7542, 9601–9657, 11023, 11048.

2. In § 9.1 the table is amended by revising the entry for “122.21(r)” and by adding entries in numerical order under the indicated heading to read as follows:

§ 9.1 OMB approvals under the Paper Work Reduction Act.

\* \* \* \* \*

	40 CFR citation	OMB control No.
<b>EPA Administered Permit Programs: The National Pollutant Discharge Elimination System</b>		
122.21(r) .....		2040–0241, xxxxx–xxxxx
<b>Criteria and Standards for the National Pollutant Discharge Elimination System</b>		
125.95 .....		xxxx–xxxx
125.96 .....		xxxx–xxxx
125.97 .....		xxxx–xxxx
125.98 .....		xxxx–xxxx

PART 122—EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

1. The authority citation for part 122 continues to read as follows:

Authority: The Clean Water Act, 33 U.S.C. 1251 et seq.

2. Section § 122.21 by revising paragraph (r) to read as follows:

§ 122.21 Application for a permit (applicable to State programs, see § 123.25)

\* \* \* \* \*

(r) Applications for facilities with cooling water intake structures—(1)(i) New facilities with new or modified cooling water intake structures. New facilities with cooling water intake

structures as defined in part 125, subpart I of this chapter must report the information required under paragraphs (r)(2), (3), and (4) of this section and § 125.86 of this chapter. Requests for alternative requirements under § 125.85 of this chapter must be submitted with your permit application.

(ii) Phase II existing facilities. Phase II existing facilities as defined in part 125, subpart J of this chapter must report the information required under paragraphs (r)(2), (3), and (5) of this section and § 125.95 of this chapter. Requests for site-specific determination of best technology available for minimizing adverse environmental impact under § 125.94(c) of this chapter must be submitted with your permit application.

(2) Source Water Physical Data including:

(i) A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the water body type where each cooling water intake structure is located;

(ii) Identification and characterization of the source waterbody’s hydrological and geomorphological features, as well as the methods you used to conduct any physical studies to determine your intake’s area of influence within the waterbody and the results of such studies; and

(iii) Locational maps.

(3) *Cooling Water Intake Structure*

Data including:

(i) A narrative description of the configuration of each of your cooling water intake structures and where it is located in the water body and in the water column;

(ii) Latitude and longitude in degrees, minutes, and seconds for each of your cooling water intake structures;

(iii) A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation and seasonal changes, if applicable;

(iv) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and

(v) Engineering drawings of the cooling water intake structure.

(4) *Source Water Baseline Biological Characterization Data*. This information is required to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. The Director may also use this information in subsequent permit renewal proceedings to determine if your Design and Construction Technology Plan as required in § 125.86(b)(4) should be revised. This supporting information must include existing data (if they are available). However, you may supplement the data using newly conducted field studies if you choose to do so. The information you submit must include:

(i) A list of the data in paragraphs (r)(4)(ii) through (vi) of this section that are not available and efforts made to identify sources of the data;

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance in the vicinity of the cooling water intake structure;

(iii) Identification of the species and life stages that would be most susceptible to impingement and entrainment. Species evaluated should include the forage base as well as those most important in terms of significance to commercial and recreational fisheries;

(iv) Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance for relevant taxa;

(v) Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the cooling water intake structure;

(vi) Identification of all threatened, endangered, and other protected species

that might be susceptible to impingement and entrainment at your cooling water intake structures;

(vii) Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan; and

(viii) If you supplement the information requested in paragraph (r)(4)(i) of this section with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods.

The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

(5) *Phase II Existing Facility Cooling Water System Data*. Phase II existing facilities, as defined in part 125, subpart J of this chapter, must provide the following information:

(i) A narrative description of the operation of each of your cooling water systems, relationship to cooling water intake structures, proportion of the design intake flow that is used in the system, number of days of the year in operation and seasonal changes, if applicable;

(ii) Engineering calculations and supporting data to support the description required by paragraph (r)(5)(i) of this section.

3. Section 122.44 is amended by revising paragraph (b)(3) to read as follows:

**§ 122.44 Establishing limitations, standards, and other permit conditions (applicable to State NPDES programs, see § 123.25).**

\* \* \* \* \*

(b) \* \* \*

(3) Requirements applicable to cooling water intake structures under section 316(b) of the CWA, in accordance with part 125, subparts I and J of this chapter.

\* \* \* \* \*

**PART 123—STATE PROGRAM REQUIREMENTS**

1. The authority citation for part 123 continues to read as follows:

**Authority:** The Clean Water Act, 33 U.S.C. 1251 *et seq.*

2. Section 123.25 is amended by revising paragraph (a)(4) (a) and (36) to read as follows:

**§ 123.25 Requirements for permitting.**

(a) \* \* \*

(4) § 122.21 (a) (b), (c)(2), (e) (k), (m) (p), and (r)—(Application for a permit);

\* \* \* \* \*

(36) Subparts A, B, D, H, I, and J of part 125 of this chapter;

\* \* \* \* \*

**PART 124—PROCEDURES FOR DECISIONMAKING**

1. The authority citation for part 124 continues to read as follows:

**Authority:** Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.*; Safe Drinking Water Act, 42 U.S.C. 300f *et seq.*; Clean Water Act, 33 U.S.C. 1251 *et seq.*; Clean Air Act, 42 U.S.C. 7401 *et seq.*

2. Section 124.10 is amended by revising paragraph (d)(1)(ix) to read as follows:

**§ 124.10 Public notice of permit actions and public comment period.**

\* \* \* \* \*

(d) \* \* \*

(1) \* \* \*

(ix) Requirements applicable to cooling water intake structures under section 316(b) of the CWA, in accordance with part 125, subparts I and J of this chapter.

\* \* \* \* \*

**PART 125—CRITERIA AND STANDARDS FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

1. The authority citation for part 125 continues to read as follows:

**Authority:** Clean Water Act, 33 U.S.C. 1251 *et seq.*; unless otherwise noted.

2. Section 125.83 is amended by revising the definition of cooling water as follows:

**§ 125.83 What special definitions apply to this subpart?**

\* \* \* \* \*

*Cooling water* means water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises. Cooling water that is used in a manufacturing process either before or

after it is used for cooling is considered process water for the purposes of calculating the percentage of a new facility's intake flow that is used for cooling purposes in §§ 125.81(c) and 125.91(c).

\* \* \* \* \*

3. Add subpart J to part 125 to read as follows:

**Subpart J—Requirements Applicable to Cooling Water Intake Structures for “Phase II Existing Facilities” Under Section 316(b) of the Act**

Sec.

125.90 What are the purpose and scope of this subpart?

125.91 What is a Phase II existing facility subject to this subpart?

125.92 When must I comply with this subpart?

125.93 What special definitions apply to this subpart?

125.94 How will requirements reflecting best technology available for minimizing adverse environmental impact be established for my Phase II existing facility?

125.95 As an owner or operator of a Phase II existing facility, what must I collect and submit when I apply for my reissued NPDES permit?

125.96 As an owner or operator of a Phase II existing facility, what monitoring must I perform?

125.97 As an owner or operator of a Phase II existing facility, what records must I keep and what information must I report?

125.98 As the Director, what must I do to comply with the requirements of this subpart?

**Subpart J—Requirements Applicable to Cooling Water Intake Structures for “Phase II Existing Facilities” Under Section 316(b) of the Act**

**§ 125.90 What are the purpose and scope of this subpart?**

(a) This subpart establishes requirements that apply to the location, design, construction, and capacity of cooling water intake structures at existing facilities that are subject to this subpart (Phase II existing facilities). The purpose of these requirements is to establish the best technology available for minimizing adverse environmental impact associated with the use of cooling water intake structures. These requirements are implemented through National Pollutant Discharge Elimination System (NPDES) permits issued under section 402 of the Clean Water Act (CWA).

(b) This subpart implements section 316(b) of the CWA for Phase II existing facilities. Section 316(b) of the CWA provides that any standard established pursuant to sections 301 or 306 of the CWA and applicable to a point source

shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

(c) Existing facilities that are not subject to this subpart must meet requirements under section 316(b) of the CWA determined by the Director on a case-by-case, best professional judgment (BPJ) basis.

(d) Notwithstanding any other provision of this subpart, if a State demonstrates to the Administrator that it has adopted alternative regulatory requirements that will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under § 125.94, the Administrator shall approve such alternative regulatory requirements.

(e) Nothing in this subpart shall be construed to preclude or deny the right of any State or political subdivision of a State or any interstate agency under section 510 of the CWA to adopt or enforce any requirement with respect to control or abatement of pollution that is not less stringent than those required by Federal law.

**§ 125.91 What is a “Phase II Existing Facility” subject to this subpart?**

(a) This subpart applies to an existing facility, as defined in § 125.93, if it:

(1) Is a point source that uses or proposes to use a cooling water intake structure;

(2) Both generates and transmits electric power, or generates electric power but sells it to another entity for transmission;

(3) Has at least one cooling water intake structure that uses at least 25 percent of the water it withdraws for cooling purposes as specified in paragraph (c) of this section; and

(4) Has a design intake flow of 50 million gallons per day (MGD) or more. Facilities that meet these criteria are referred to as “Phase II existing facilities.”

(b) In the case of a cogeneration facility that shares a cooling water intake structure with another existing facility, only that portion of the cooling water intake flow that is used in the cogeneration process shall be considered for purposes of determining whether the 50 MGD and 25 percent criteria in paragraphs (a)(3) and (4) of this section are met.

(c) Use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with an independent supplier (or multiple suppliers) of

cooling water if the supplier or suppliers withdraw(s) water from waters of the United States. Use of cooling water does not include obtaining cooling water from a public water system or use of treated effluent that otherwise would be discharged to a water of the U.S. This provision is intended to prevent circumvention of these requirements by creating arrangements to receive cooling water from an entity that is not itself a point source.

(d) Whether or not 25 percent of water withdrawn is used for cooling purposes must be measured on an average monthly basis. The 25 percent threshold is met if any monthly average of cooling water over any 12 month period is 25 percent or more of the total water withdrawn.

**§ 125.92 When must I comply with this subpart?**

You must comply with this subpart when an NPDES permit containing requirements consistent with this subpart is issued to you.

**§ 125.93 What special definitions apply to this subpart?**

The definitions in Subpart I of Part 125, except the definitions of *cooling water* and *existing facility*, apply to this subpart. The following definitions also apply to this subpart:

*Administrator* means the same as defined in 40 CFR 122.2.

*All life stages* means eggs, larvae, juveniles, and adults.

*Calculation baseline* means an estimate of impingement mortality and entrainment that would occur at your site assuming you had a shoreline cooling water intake structure with an intake capacity commensurate with a once-through cooling water system and with no impingement and/or entrainment reduction controls.

*Capacity utilization rate* means the ratio between the average annual net generation of the facility (in MWh) and the total net capability of the facility (in MW) multiplied by the number of available hours during a year. The average annual generation must be measured over a five year period (if available) of representative operating conditions.

*Cogeneration facility* means a facility that operates equipment used to produce, from the same fuel source: electric energy used for industrial, commercial, and/or institutional purposes at one or more host facilities and/or for sale to another entity for transmission; and forms of useful thermal energy (such as heat or steam), used for industrial commercial,

institutional, heating, and/or cooling purposes at one or more host facilities.

*Cooling water* means water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises. Cooling water that is used in a manufacturing process either before or after it is used for cooling is considered process water for the purposes of calculating the percentage of a facility's intake flow that is used for cooling purposes in § 125.91(c).

*Diel* means sample variation in organismal abundance and density over a 24-hour period due to the influence of water movement and changes in light intensity.

*Director* means the same as defined in 40 CFR 122.2.

*Existing facility* means any facility that commenced construction before January 17, 2002; and

(1) Any modification of such a facility;

(2) Any addition of a unit at such a facility for purposes of the same industrial operation;

(3) Any addition of a unit at such a facility for purposes of a different industrial operation, if the additional unit uses an existing cooling water intake structure and the design capacity of the intake structure is not increased; or

(4) Any facility constructed in place of such a facility, if the newly constructed facility uses an existing cooling water intake structure whose design intake flow is not increased to accommodate the intake of additional cooling water.

*Once-through cooling water system* means a system designed to withdraw water from a natural or other water source, use it at the facility to support contact and/or noncontact cooling uses, and then discharge it to a water body without recirculation. Once-through cooling systems sometimes employ canals/channels, ponds, or non-recirculating cooling towers to dissipate waste heat from the water before it is discharged.

*Phase II existing facility* means any existing facility that meets the criteria specified in § 125.91.

**§ 125.94 How will requirements reflecting best technology available for minimizing adverse environmental impact be established for my Phase II existing facility?**

(a) You may choose one of the following three alternatives for

establishing best technology available for minimizing adverse environmental impact at your site:

(1) You may demonstrate to the Director that your existing design and construction technologies, operational measures, and/or restoration measures meet the performance standards specified in paragraph (b) of this section;

(2) You may demonstrate to the Director that you have selected design and construction technologies, operational measures, and/or restoration measures that will, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the performance standards specified in paragraph (b) of this section; or

(3) You may demonstrate to the Director that a site-specific determination of best technology available for minimizing adverse environmental impact is appropriate for your site in accordance with paragraph (c) of this section.

(b) *Performance Standards.* If you choose the alternative in paragraphs (a)(1) or (a)(2) of this section, you must meet the following performance standards:

(1) You must reduce your intake capacity to a level commensurate with the use of a closed-cycle, recirculating cooling system; or

(2) You must reduce impingement mortality of all life stages of fish and shellfish by 80 to 95 percent from the calculation baseline if your facility has a capacity utilization rate less than 15 percent, or your facility's design intake flow is 5 percent or less of the mean annual flow from a freshwater river or stream; or

(3) You must reduce impingement mortality of all life stages of fish and shellfish by 80 to 95 percent from the calculation baseline, and you must reduce entrainment of all life stages of fish and shellfish by 60 to 90 percent from the calculation baseline if your facility has a capacity utilization rate of 15 percent or greater and withdraws cooling water from a tidal river or estuary, from an ocean, from one of the Great Lakes, or your facility's design intake flow is greater than 5 percent of the mean annual flow of a freshwater river or stream; or

(4) If your facility withdraws cooling water from a lake (other than one of the Great Lakes) or reservoir:

(i) You must reduce impingement mortality of all life stages of fish and shellfish by

80 to 95 percent from the calculation baseline; and

(ii) If you propose to increase your facility's design intake flow, your increased flow must not disrupt the natural thermal stratification or turnover pattern (where present) of the source water, except in cases where the disruption is determined by any Federal, State or Tribal fish or wildlife management agency(ies) to be beneficial to the management of fisheries.

(c)(1) *Site-Specific Determination of Best Technology Available.* If you choose the alternative in paragraph (a)(3) of this section, you must demonstrate to the Director that your costs of compliance with the applicable performance standards in paragraph (b) of this section would be significantly greater than the costs considered by the Administrator when establishing such performance standards, or that your costs would be significantly greater than the benefits of complying with such performance standards at your site.

(2) If data specific to your facility indicate that your costs would be significantly greater than those considered by the Administrator in establishing the applicable performance standards, the Director shall make a site-specific determination of best technology available for minimizing adverse environmental impact that is based on less costly design and construction technologies, operational measures, and/or restoration measures to the extent justified by the significantly greater cost. The Director's site-specific determination may conclude that design and construction technologies, operational measures, and/or restoration measures in addition to those already in place are not justified because of significantly greater costs.

(3) If data specific to your facility indicate that your costs would be significantly greater than the benefits of complying with such performance standards at your facility, the Director shall make a site-specific determination of best technology available for minimizing adverse environmental impact that is based on less costly design and construction technologies, operational measures, and/or restoration measures to the extent justified by the significantly greater costs. The Director's site-specific determination may conclude that design and construction technologies, operational measures, and/or restoration measures in addition to those already in place are not justified because the costs would be significantly greater than the benefits at your facility.

(d) *Restoration Measures.* In lieu of, or in combination with, reducing impingement mortality and entrainment

by implementing design and construction technologies or operational measures to comply with the performance standards specified in paragraph (b) of this section or the Director's determination pursuant to paragraph (c) of this section, you may, with the Director's approval, employ restoration measures that will result in increases in fish and shellfish in the watershed. You must demonstrate to the Director that you are maintaining the fish and shellfish within the waterbody, including community structure and function, to a level comparable to those that would result if you were to employ design and construction technologies or operational measures to meet that portion of the requirements of paragraphs (b) or (c) of this section that you are meeting through restoration. Your demonstration must address species that the Director, in consultation with Federal, State, and Tribal fish and wildlife management agencies with responsibility for fisheries and wildlife potentially affected by your cooling water intake structure, identifies as species of concern.

(e) *More Stringent Standards.* The Director may establish more stringent requirements as best technology available for minimizing adverse environmental impact if the Director determines that your compliance with the applicable requirements of paragraphs (b) and (c) of this section would not meet the requirements of other applicable Federal, State, or Tribal law.

(f) If the Nuclear Regulatory Commission has determined that your compliance with this subpart would result in a conflict with a safety requirement established by the Commission, the Director shall make a site-specific determination of best technology available for minimizing adverse environmental impact that is less stringent than the requirements of this subpart to the extent necessary for you to comply with the Commission's safety requirement.

(g) You must submit the application information required in § 125.95, implement the monitoring requirements specified in § 125.96, and implement the record-keeping requirements specified at § 125.97.

**§ 125.95 As an owner or operator of a Phase II existing facility, what must I collect and submit when I apply for my reissued NPDES permit?**

(a) You must submit to the Director the application information required by 40 CFR 122.21(r)(2), (3) and (5) and the Comprehensive Demonstration required by paragraph (b) of this section at least

180 days before your existing permit expires, in accordance with § 122.21(d)(2).

(b) *Comprehensive Demonstration Study.* All facilities except those deemed to have met the performance standards in accordance with § 125.94(b)(1), must submit a Comprehensive Demonstration Study (Study). This information is required to characterize impingement mortality and entrainment, the operation of your cooling water intake structures, and to confirm that the technology(ies), operational measures, and/or restoration measures you have selected and/or implemented at your cooling water intake structure meet the applicable requirements of § 125.94. The Comprehensive Demonstration Study must include:

(1) *Proposal For Information Collection.* You must submit to the Director for review and approval a description of the information you will use to support your Study. The proposal must include:

(i) A description of the proposed and/or implemented technology(ies), operational measures, and/or restoration measures to be evaluated in the Study;

(ii) A list and description of any historical studies characterizing impingement and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to this proposed Study. If you propose to use existing data, you must demonstrate the extent to which the data are representative of current conditions and that the data were collected using appropriate quality assurance/quality control procedures;

(iii) A summary of any past, ongoing, or voluntary consultation with appropriate Federal, State, and Tribal fish and wildlife agencies that is relevant to this Study and a copy of written comments received as a result of such consultation; and

(iv) A sampling plan for any new field studies you propose to conduct in order to ensure that you have sufficient data to develop a scientifically valid estimate of impingement and entrainment at your site. The sampling plan must document all methods and quality assurance/quality control procedures for sampling and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and include consideration of the methods used in other studies performed in the source waterbody. The sampling plan must include a description of the study area (including the area of influence of the cooling water intake structure), and provide a

taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish).

(2) *Source Waterbody Flow Information.* You must submit to the Director the following source waterbody flow information:

(i) If your cooling water intake structure is located in a freshwater river or stream, you must provide the annual mean flow of the waterbody and any supporting documentation and engineering calculations to support your analysis of which requirements specified in § 125.94(b)(2) or (3) would apply to your facility based on its water intake flow in proportion to the mean annual flow of the river or stream; and

(ii) If your cooling water intake structure is located in a lake (other than one of the Great Lakes) or reservoir and you propose to increase your facility's design intake flow, you must provide a narrative description of the thermal stratification in the water body, and any supporting documentation and engineering calculations to show that the natural thermal stratification and turnover pattern will not be disrupted by the increased flow in a way that adversely impacts water quality or fisheries.

(3) *Impingement Mortality and Entrainment Characterization Study.* You must submit to the Director an Impingement Mortality and Entrainment Characterization Study whose purpose is to provide information to support the development of a calculation baseline for evaluating impingement mortality and entrainment and to characterize current impingement mortality and entrainment. The Impingement Mortality and Entrainment Characterization Study must include:

(i) Taxonomic identifications of those species of fish and shellfish and their life stages that are in the vicinity of the cooling water intake structure and are most susceptible to impingement and entrainment;

(ii) A characterization of those species of fish and shellfish and life stages pursuant to paragraph (b)(3)(i) of this section, including a description of the abundance and temporal/spatial characteristics in the vicinity of the cooling water intake structure, based on the collection of a sufficient number of years of data to characterize annual, seasonal, and diel variations in impingement mortality and entrainment (e.g., related to climate/weather differences, spawning, feeding and water column migration);

(iii) Documentation of the current impingement mortality and entrainment of all life stages of fish and shellfish at

your facility and an estimate of impingement mortality and entrainment under the calculation baseline. The documentation may include historical data that are representative of the current operation of your facility and of biological conditions at the site. Impingement mortality and entrainment samples to support the calculations required in paragraph (b)(4)(iii) and (b)(5)(ii) of this section must be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples must be documented;

(iv) An identification of species that are protected under Federal, State, or Tribal law (including threatened or endangered species) that might be susceptible to impingement and entrainment by the cooling water intake structure(s).

(4) *Design and Construction Technology Plan.* If you choose to use design and construction technologies or operational measures in whole or in part to meet the requirements of § 125.94, you must submit a Design and Construction Technology Plan to the Director for review and approval. In the plan you must provide the capacity utilization rate for your facility and provide supporting data (including the average annual net generation of the facility (in Mwh) measured over a five year period (if available) of representative operating conditions and the total net capacity of the facility (in MW)) and calculations. The plan must explain the technologies and operational measures you have in place or have selected to meet the requirements in § 125.94. (Examples of potentially appropriate technologies may include, but are not limited to, wedgewire screens, fine mesh screens, fish handling and return systems, barrier nets, aquatic filter barrier systems, and enlargement of the cooling water intake structure opening to reduce velocity. Examples of potentially appropriate operational measures may include, but are not limited to, seasonal shutdowns or reductions in flow, and continuous operations of screens.) The plan must contain the following information:

(i) A narrative description of the design and operation of all design and construction technologies or operational measures (existing and proposed), including fish handling and return systems, that you have in place or will use to meet the requirements to reduce impingement mortality of those species expected to be most susceptible to impingement, and information that

demonstrates the efficacy of the technology for those species;

(ii) A narrative description of the design and operation of all design and construction technologies or operational measures (existing and proposed) that you have in place or will use to meet the requirements to reduce entrainment of those species expected to be the most susceptible to entrainment, if applicable, and information that demonstrates the efficacy of the technology for those species;

(iii) Calculations of the reduction in impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved by the technologies and operational measures you have selected based on the Impingement Mortality and Entrainment Characterization Study in paragraph (b)(3) of this section. In determining compliance with any requirements to reduce impingement mortality or entrainment, you must assess the total reduction in impingement mortality and entrainment against the calculations baseline determined in paragraph (b)(3) of this section. Reductions in impingement mortality and entrainment from this calculation baseline as a result of any design and construction technologies and operational measures already implemented at your facility should be added to the reductions expected to be achieved by any additional design and construction technologies and operational measures that will be implemented, and any increases in fish and shellfish within the waterbody attributable to your restoration measures. Facilities that recirculate a portion of their flow may take into account the reduction in impingement mortality and entrainment associated with the reduction in flow when determining the net reduction associated with existing technology and operational measures. This estimate must include a site-specific evaluation of the suitability of the technology(ies) based on the species that are found at the site, and/or operational measures and may be determined based on representative studies (i.e., studies that have been conducted at cooling water intake structures located in the same waterbody type with similar biological characteristics) and/or site-specific technology prototype studies;

(iv) Documentation which demonstrates that the location, design, construction, and capacity of the cooling water intake structure technologies you have selected reflect best technology available for meeting the applicable requirements in § 125.94;

(v) Design calculations, drawings, and estimates to support the descriptions

required by paragraphs (b)(4)(ii) and (iii) of this section.

(5) *Information to Support Proposed Restoration Measures.* If you propose to use restoration measures to meet the performance standards in § 125.94, you must submit the following information with your application for review and approval by the Director:

(i) A list and narrative description of the restoration measures you have selected and propose to implement;

(ii) A quantification of the combined benefits from implementing design and construction technologies, operational measures and/or restoration measures and the proportion of the benefits that can be attributed to each. This quantification must include: the percent reduction in impingement mortality and entrainment that would be achieved through the use of any design and construction technologies or operational measures that you have selected (i.e., the benefits you would achieve through impingement and entrainment reduction); a demonstration of the benefits that could be attributed to the restoration measures you have selected; and a demonstration that the combined benefits of the design and construction technology(ies), operational measures, and/or restoration measures will maintain fish and shellfish at a level comparable to that which would be achieved under § 125.94. If it is not possible to demonstrate quantitatively that restoration measures such as creation of new habitats to serve as spawning or nursery areas or establishment of riparian buffers will achieve comparable performance, you may make a qualitative demonstration that such measures will maintain fish and shellfish in the waterbody at a level substantially similar to that which would be achieved under § 125.94;

(iii) A plan for implementing and maintaining the efficacy of the restoration measures you have selected and supporting documentation to show that the restoration measures, or the restoration measures in combination with design and construction technology(ies) and operational measures, will maintain the fish and shellfish in the waterbody, including the community structure and function, to a level comparable or substantially similar to that which would be achieved through § 125.94(b) or (c);

(iv) A summary of any past, ongoing, or voluntary consultation with appropriate Federal, State, and Tribal fish and wildlife agencies regarding the proposed restoration measures that is relevant to this Study and a copy of any written comments received as a result of such consultation; and

(v) Design and engineering calculations, drawings, and maps documenting that your proposed restoration measures will meet the restoration performance standard at § 125.94(d).

(6) *Information to Support Site-specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact.* If you have chosen to request a site-specific determination of best technology available for minimizing adverse environmental impact pursuant to § 125.94(c) because of costs significantly greater than those EPA considered in establishing the requirements at issue, or because costs are significantly greater than the benefits of complying with the otherwise applicable requirements of § 125.94(b) and (e) at your site, you must provide the following additional information with your application for review by the Director:

(i) *Comprehensive Cost Evaluation Study.* You must perform and submit the results of a Comprehensive Cost Evaluation Study. This information is required to document the costs of implementing your Design and Construction Plan under § 125.95(b)(4) above and the costs of the alternative technologies and operational measures you propose to implement at your site. You must submit detailed engineering cost estimates to document the costs of implementing the technologies or operational measures in your Design and Construction Plan.

(ii) *Valuation of the Monetized Benefits of Reducing Impingement and Entrainment.* If you are seeking a site-specific determination of best technology available for minimizing adverse environmental impact because of costs significantly greater than the benefits of complying with the otherwise applicable requirements of § 125.94(b) and (e) at your site, you must use a comprehensive methodology to fully value the impacts of impingement mortality and entrainment at your site and the benefits achievable by compliance with the applicable requirements of § 125.94. The benefit study must include a description of the methodology used, the basis for any assumptions and quantitative estimates, and an analysis of the effects of significant sources of uncertainty on the results of the study.

(iii) *Site-Specific Technology Plan.* Based on the results of the Comprehensive Cost Evaluation Study and the valuation of the monetized benefits of reducing impingement and entrainment required by paragraphs (b)(7)(i) and (ii) of this section, you must submit a Site-Specific Technology

Plan to the Director for review and approval. The plan must contain the following information:

(A) A narrative description of the design and operation of all design and construction technologies and operational measures, and restoration measures (existing and proposed) that you have selected in accordance with § 125.94(d), and information that demonstrates the efficacy of the technology for those species;

(B) An engineering estimate of the efficacy of the proposed and/or implemented technologies or operational measures for reducing impingement mortality and entrainment of all life stages of fish and shellfish. This estimate must include a site-specific evaluation of the suitability of the technologies or operational measures for reducing impingement mortality and entrainment based on representative studies (e.g., studies that have been conducted at cooling water intake structures located in the same waterbody type with similar biological characteristics) and/or site-specific character type studies;

(C) Documentation which demonstrates that the technologies, operational measures, or restoration measures selected would reduce impingement mortality and entrainment to the extent necessary to satisfy the requirements of § 125.94; and

(D) Design calculations, drawings, and estimates to support the descriptions required by paragraphs (b)(6)(iii)(A) and (B) of this section.

(7) *Verification Monitoring Plan.* You must include in the Study a plan to conduct, at a minimum, two years of monitoring to verify the full-scale performance of the proposed or implemented technologies, operational measures, or restoration measures. The verification study must begin once the technologies, operational measures, and restoration measures are implemented and continue for a period of time that is sufficient to demonstrate that the facility is reducing the level of impingement and entrainment to the levels documented pursuant to paragraphs (b)(4)(iii), (b)(5)(ii), and/or (b)(6)(iii)(B) of this section. The plan must describe the frequency of monitoring and the parameters to be monitored and the basis for determining the parameters and the frequency and duration for monitoring. The plan must also describe the information to be included in a yearly status report to the Director. The Director will use the verification monitoring to confirm that you are meeting the applicable requirements of § 125.94.

**§ 125.96 As an owner or operator of a Phase II existing facility, what monitoring must I perform?**

As an owner or operator of a Phase II existing facility, you must perform monitoring as specified by the Director to demonstrate compliance with the applicable requirements of § 125.94.

**§ 125.97 As an owner or operator of a Phase II existing facility, what records must I keep and what information must I report?**

As an owner or operator of a Phase II existing facility you are required to keep records and report information and data to the Director as follows:

(a) You must keep records of all the data used to complete the permit application and show compliance with the requirements of § 125.94, any supplemental information developed under § 125.95, and any compliance monitoring data conducted under § 125.96, for a period of at least three (3) years. The Director may require that these records be kept for a longer period.

(b) You must provide annually to the Director a status report that includes appropriate monitoring data as specified by the Director.

**§ 125.98 As the Director, what must I do to comply with the requirements of this subpart?**

(a) *Permit Application.* As the Director, you must review materials submitted by the applicant under 40 CFR 122.21(r) and § 125.95 before each permit renewal or reissuance.

(1) After receiving the permit application from the owner or operator of a Phase II existing facility, the Director must determine which of the standards specified in § 125.94 to apply to the facility. In addition, the Director must review materials to determine compliance with the applicable standards.

(2) At each permit renewal, the Director must review the application materials and monitoring data to determine whether requirements, or additional requirements, for design and construction technologies or operational measures should be included in the permit.

(b) *Permitting Requirements.* Section 316(b) requirements are implemented for a facility through an NPDES permit. As the Director, you must consider the information submitted by the Phase II existing facility in its permit application, and determine the appropriate requirements and conditions to include in the permit based on the alternative for establishing best technology available chosen by the facility. The following requirements must be included in each permit:

(1) *Cooling Water Intake Structure Requirements.* The permit conditions must include the performance standards that implement the requirements of § 125.94(b)(2), (3), and (4); § 125.94(c)(1) and (2); § 125.94(d); § 125.94(e); and § 125.94(f). In determining compliance with the flow requirement in § 125.94(b)(4)(ii), the Director must consider anthropogenic factors (those not considered “natural”) unrelated to the Phase II existing facility’s cooling water intake structure that can influence the occurrence and location of a thermocline. These include source water inflows, other water withdrawals, managed water uses, wastewater discharges, and flow/level management practices (e.g., some reservoirs release water from deeper bottom layers). The Director must coordinate with appropriate Federal, State, or Tribal fish or wildlife agencies to determine if any disruption is beneficial to the management of fisheries.

(i) You must review the Design and Construction Technology Plan required in § 125.96(b)(4) to evaluate the suitability and feasibility of the technology or operational measures proposed to meet the requirements of § 125.94. In each reissued permit, you must include a condition requiring the facility to reduce impingement mortality and entrainment commensurate with the implementation of the technologies in the permit. In considering a permit application, the Director must review the performance of the technologies

implemented and require additional or different design and construction technologies, if needed, to meet the impingement mortality and entrainment reduction requirements for all life stages of fish and shellfish. In addition, you may consider any chemical, water quality, and other anthropogenic stresses on the source waterbody in order to determine whether more stringent conditions are needed to comply with the requirements of other applicable Federal, State, or Tribal law in accordance with § 125.94(e).

(ii) If you determine that restoration measures are appropriate at the Phase II existing facility, you must review the Information to Support Proposed Restoration Measures required under § 125.95(b)(5) and determine whether the proposed measures, alone or in combination with design and construction technologies and operational measures, will maintain the fish and shellfish in the waterbody at a comparable level to that which would be achieved under § 125.94. If the application includes a qualitative demonstration for restoration measures that will result in increases in fish and shellfish that are difficult to quantify, you must determine whether the proposed measures will maintain fish and shellfish in the waterbody at a level substantially similar to that which would be achieved under § 125.94. You must also review and approve the proposed Verification Monitoring Plan submitted under § 125.95(b)(7) and

require that the monitoring continue for a sufficient period of time to demonstrate that the restoration measures meet the requirements of § 125.94(d).

(iii) For a facility that requests requirements based on site-specific best technology available for minimizing adverse environmental impact, you must review the application materials and any other information you may have that would be relevant to a determination of whether alternative requirements are appropriate for the facility. If you determine that alternative requirements are appropriate, you must make a site-specific determination of best technology available for minimizing adverse environmental impact in accordance with § 125.95(c).

(2) *Monitoring Conditions.* The permit must require the permittee to perform the monitoring required in § 125.96. In determining applicable monitoring requirements, the Director must consider the facility’s verification monitoring plan, as appropriate. You may modify the monitoring program when the permit is reissued and during the term of the permit based on changes in physical or biological conditions in the vicinity of the cooling water intake structure.

(3) *Record Keeping and Reporting.* At a minimum, the permit must require the permittee to report and keep records as required by § 125.97.

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