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Part II

Environmental Protection Agency

40 CFR Parts 9, et al.

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

**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adverse environmental impact from the cooling water intake structure based on water body type, and the amount of water withdrawn by a facility.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 Proposed requirements also vary according to the percentage of the source waterbody withdrawn, and facility utilization rate.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. 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 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."

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.¹ 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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¹ Proposed § 125.93 defines "existing facility" as any facility that commenced construction before

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

- IV. Overview of Facility Characteristics (Cooling Water Systems & Intakes) for Industries Potentially Subject to Proposed Rule
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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).² 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

² 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,³ 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.

³ 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.⁴ 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

⁴ 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 cooperatives⁷. 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

⁷ 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.⁸ 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,⁹ planktonic,¹⁰ and nektonic¹¹ 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

⁸ 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.

⁹ 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.

¹⁰ 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.

¹¹ 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.^{12, 13} Naked goby larvae demonstrated mortality rates as low as 2 percent whereas bay anchovy larvae mortality rates were as high as 97 percent.¹⁴ Macroinvertebrate mortality ranged from 0 to 84 percent for several species evaluated, but rates were usually less than 29 percent.^{15, 16}

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

¹² 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.

¹³ 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.

¹⁴ *Ibid.*

¹⁵ 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.

¹⁶ 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.¹⁷ 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,¹⁸ (2) disruption of nutrient, carbon, and energy transfers among the physical and biological ecosystem compartments,¹⁹ (3) alteration of overall aquatic habitat,²⁰ and (4) alteration of species composition and overall levels of biodiversity.²¹

¹⁷ Personal communication, D. Hart (EPA) and L. Kline (ASMFC), 2001.

¹⁸ 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.

¹⁹ 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).

²⁰ 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).

²¹ 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.²² 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.

²² 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.²³

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

²³ *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 annually²⁴), serious reductions in forage species and recreational and commercial landings (e.g., 23 tons lost per year²⁵), and extensive losses over relatively short intervals of time (e.g., one million fish lost during a three-week study period).²⁶

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.²⁷ 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.²⁸ 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.”²⁹ 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.³⁰ 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.³¹ 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.”³²

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.³³ 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.³⁴ 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.³⁵ 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.³⁶ 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.³⁷ Since

²⁴ 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.

²⁵ 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.

²⁶ 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.

²⁷ 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.

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

²⁹ 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.

³⁰ 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.

³¹ 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.

³² 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.

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

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

³⁵ 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.

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

³⁷ *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.³⁸ 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.³⁹ In contrast, relative abundances of bottom-dwelling adult queenfish and white croaker increased in the vicinity of SONGS.⁴⁰ 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.⁴¹

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.⁴² 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.⁴³

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.⁴⁴ 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.⁴⁵

- The Pilgrim Nuclear Power Station, located on Cape Cod Bay, Massachusetts, has an intake flow of 446 MGD.⁴⁶ 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 MGD⁴⁷ 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.⁴⁸ 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.⁴⁹

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

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

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

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

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

⁴² 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.

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

⁴⁴ 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.

⁴⁵ *Ibid.*

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

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*

⁴⁹ 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.^{50 51}

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

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

⁵¹ 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 Price 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.⁵² 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.⁵³ 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
Total	550	100

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

⁵² 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.

⁵³ 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.⁵⁴ 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
Total	131	100

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

⁵⁴ 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.⁵⁵ 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.⁵⁶ 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

⁵⁵ 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.

⁵⁶ 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.⁵⁷ 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

⁵⁷ 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.⁵⁸ 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.⁵⁹ 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.

⁵⁸ 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.

⁵⁹ 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.⁶⁰

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

⁶⁰ 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 (SO₂, NO_x, CO₂, 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
Total	550	100

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
Total	131	100

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.

125.90 What are the purpose and scope of this subpart?

125.91 Who is subject to this subpart?

125.92 When must I comply with this subpart?

125.93 What special definitions apply to this subpart?

125.94 As an owner or operator of an existing facility, what must I do to comply with this subpart?

125.95 As an owner or operator of an existing facility, may I undertake restoration measures to mitigate adverse environmental impact?

125.96 Will alternate State requirements and methodologies for determining the best technology available for minimizing adverse environmental impact be recognized?

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?

125.98 As an owner or operator of an existing facility, must I perform monitoring?

125.99 As an owner or operator of an existing facility, must I keep records and report?

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)⁶¹ 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

⁶¹ 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).⁶² At the Seabrook Nuclear Power Station, EPA Region I

⁶² 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.⁶³

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 percent⁶⁴, that is, higher than other categories of major permits (data indicate a backlog of 23.1 percent for major permits in general).⁶⁵ 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

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

⁶⁴ 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.

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

weakness.⁶⁶ 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)⁶⁷ 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.⁶⁸ 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.

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

⁶⁷ The Environmental Council Of States is a national non-profit association of state and territorial environmental commissioners. See website: 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.)

⁶⁸ 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).⁶⁹

(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,

⁶⁹ *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.