



Economic Analysis of the Final Regulations Addressing Cooling Water Intake Structures for New Facilities

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**U.S. Environmental Protection Agency
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Chapter 1: Introduction and Overview

INTRODUCTION

EPA is promulgating regulations implementing section 316(b) of the Clean Water Act (CWA) for new facilities (33 U.S.C. 1326(b)). The final rule establishes national technology-based performance requirements applicable to the location, design, construction, and capacity of cooling water intake structures (CWIS) at new facilities. The final national requirements establish the best technology available (BTA) to minimize the adverse environmental impact (AEI) associated with the use of these structures. Means by which CWIS cause AEI include impingement (where fish and other aquatic life are trapped on equipment at the entrance to CWIS) and entrainment (where aquatic organisms, eggs, and larvae are taken into the cooling system, passed through the heat exchanger, and then discharged back into the source water body).

The final rule applies to new greenfield and stand-alone facilities that use CWIS to withdraw water from waters of the U.S. and that have or require a National Pollutant Discharge Elimination System (NPDES) permit.

Not covered under this final regulation are existing facilities operating CWIS, including existing facilities proposing substantial additions or modifications to their operations. These facilities will be addressed by a separate rule.

1.1 SCOPE OF THE FINAL RULE

The *Economic Analysis of the Final Regulations Addressing Cooling Water Intake Structures for New Facilities* (EA) assesses the economic impacts of the final section 316(b) New Facility Rule. Facilities covered under this regulation include any facility that meets the “new facility” criteria established for this regulation, is considered a point source under Sections 301 or 306 of the CWA, and proposes to operate a CWIS that will withdraw water for cooling purposes from a water of the United States.

For this final regulation, EPA divided new facilities into two groups:

- ▶ **Electric generators:** new facilities engaged in the generation of electricity using a steam electric prime mover; and
- ▶ **Manufacturing facilities:** new facilities engaged in a primary economic activity other than electricity generation.

EPA estimates that 83 new electric generators and 38 new manufacturing facilities will be subject to the final section 316(b) New Facility Rule over the next 20 years.

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1.2 DEFINITIONS OF KEY CONCEPTS

This EA presents EPA’s analyses of costs, benefits, and potential economic impacts as a result of the final section 316(b) rule. In addition to important economic concepts, which will be presented in the following chapters, understanding this document requires familiarity with a few key concepts applicable to CWA section 316(b) and this regulation. This section defines these key concepts.

- ▶ **Cooling Water Intake Structure (CWIS):** The total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the U.S. The CWIS extends from the point at which water is withdrawn from the water source up to, and including, the intake pumps.
- ▶ **Entrainment:** The incorporation of all life stages of fish and shellfish with intake water flow entering and passing through a CWIS and into a cooling water system.
- ▶ **Impingement:** The entrapment of all life stages of fish and shellfish on the outer part of an intake structure or against screening devices during periods of intake water withdrawal.
- ▶ **Manufacturing Facility:** An establishment engaged in the mechanical or chemical transformation of materials or substances into new products. Manufacturing facilities are classified under Standard Industrial Classification (SIC) Codes 20 to 39 (U.S. DOL, 2001).
- ▶ **New Facility:** Any building, structure, facility, or installation that meets the definition of a “new source” or “new discharger” in 40 CFR 122.2 and 122.29(b)(1), (2), and (4); commences construction after the effective date of this rule; and has a new or modified CWIS.
- ▶ **Steam Electric Generator:** A facility employing one or more generating units in which the prime mover is a steam turbine. The turbines convert thermal energy (steam or hot water) produced by generators or boilers to mechanical energy or shaft torque. This mechanical energy is used to power electric generators, which convert the mechanical energy to electricity, including combined-cycle electric generating units. Electric generators are classified under SIC Major Group 49 (*Electric, Gas, and Sanitary Services*).

1.3 SUMMARY OF THE FINAL RULE

The final section 316(b) New Facility Rule establishes national requirements for BTA, based on a two-track approach, for minimizing AEI at CWIS at new facilities. Facilities are subject to the rule only if they meet the following criteria:

- ▶ they use a CWIS to withdraw from a water of the U.S.;
- ▶ they have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the Clean Water Act (CWA);
- ▶ they have a design intake flow of equal to or greater than two million gallons per day (MGD); and
- ▶ they use at least twenty-five percent of the water withdrawn for cooling purposes.

Based on size, Track I establishes uniform requirements. Track II allows for a site-specific study to demonstrate that alternatives to the Track I requirements will reduce impingement mortality and entrainment for all life stages of fish and shellfish to a level of reduction comparable to the level the facility would achieve at the CWIS if Track I requirements were met.

The following subsections discuss the role of location in the final section 316(b) New Facility Rule and present the specific BTA standards required under the rule.

1.3.1 Location

For costing purposes, EPA distinguishes between two types of water body: freshwater bodies and marine water bodies. Freshwater bodies include freshwater rivers or streams, and lakes or reservoirs. Marine water bodies include tidal rivers or estuaries, and oceans. For the purposes of this rule, these water body types are defined as follows:

- ▶ **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.
- ▶ **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 seven 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 seven days or less should be considered a freshwater river or stream.
- ▶ **Tidal river** means the most seaward reach of a river or stream where the salinity is 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. **Estuary** means all or part of the mouth of a river or stream or other body of water having an unimpaired natural connection with open seas and within which the sea water 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 less than 30 parts per thousand (by mass).
- ▶ **Ocean** means marine open coastal waters with a salinity greater than or equal to 30 parts per thousand (by mass).

1.3.2 BTA Standards for the Final Rule

The final section 316(b) New Facility Rule establishes technology-based performance requirements, based on a two-track approach, that reflect BTA for minimizing AEI of a CWIS.

- ▶ Track I, the “fast track,” establishes national intake capacity (based on size) and velocity requirements, as well as location- and capacity-based requirements to reduce intake flow below certain proportions of certain water bodies (referred to as “proportional-flow requirements”). It also requires the permit applicant to select and implement design and construction technologies to minimize impingement mortality and entrainment of all life stages of fish and shellfish.¹
- ▶ Track II, the “demonstration track,” allows permit applicants to conduct site-specific studies to demonstrate that alternatives to the Track I requirements will achieve a level of impingement mortality and entrainment reduction for all stages of fish and shellfish at the CWIS comparable to the level of reduction that would be achieved under Track I. Track II also requires the applicant to meet the same proportional flow requirements that apply in Track I.

The main requirements of the final rule relate to (1) design intake flow, (2) design intake velocity, (3) other design and construction technologies, and (4) additional requirements defined by the Director. The following subsections discuss these four requirements.

a. Design intake flow

Intake flow refers to the volume of water that is withdrawn through the intake structure. The intake flow of a CWIS is a primary factor affecting the entrainment of organisms. Organisms entrained include small fish and immature life stages (eggs and larvae) of many species that lack sufficient mobility to move away from the intake structure. Limiting the volume of the water withdrawn from a water body can limit the potential for these organisms to be entrained.

¹ These design and construction technologies may be modified by the permit director in subsequent permits if the original design and construction technologies do not meet the environmental goals of today’s rule, or if such modifications are necessary because of the effects of multiple intakes on the same water body, seasonal variations in the aquatic environment, or the presence of regional important, threatened, or endangered species.

Design intake flow standards restrict the maximum flow a facility may withdraw from a water body. The final rule includes two restrictions on intake flows. First, it sets maximum flow rates relative to the flow of the source water body. These flow rates are expressed as a percentage of the water bodies' mean annual flow or volume. Second, the final rule requires that facilities with intake flows equal to or greater than 10 MGD reduce their flow to a level commensurate with that achievable with a closed-cycle recirculating cooling system (Track I).

b. Design intake velocity

Velocity refers to the speed with which water is drawn into a CWIS. Intake velocity is a key factor that affects the impingement of fish and other aquatic biota. The final rule requires that the design through-screen velocity must be less than or equal to 0.5 ft/sec (Track I). Through-screen or through-technology velocity is the velocity that is measured through the screen face or just as the organisms are entering the technology.

c. Other design and construction technologies

In addition to design flow and velocity requirements, the final section 316(b) New Facility Rule requires implementation of additional technologies that help reduce the impact on the aquatic environment. Such other design and construction technologies include operational measures that minimize I&E of fish, eggs, and larvae.

Examples of technologies that minimize I&E include technologies such as fine mesh screens, intake traveling screens, and Gunderbooms that exclude smaller organisms from entering the CWIS; passive intake systems such as wedge wire screens, perforated pipes, porous dikes, and artificial filter beds; and diversion and/or avoidance systems. Examples of technologies that maximize survival of organisms after they have been impinged include fish handling systems such as bypass systems, fish buckets, fish baskets, fish troughs, fish elevators, fish pumps, spray wash systems, and fish sills. A facility with an intake equal to or greater than 10 MGD must select design and construction technologies if certain conditions exist at the location of the CWIS. A facility with an intake flow equal to 2 MGD and less than 10 MGD must select technologies to minimize entrainment but only has to install technologies to reduce impingement if certain conditions exist.

1.4 ORGANIZATION OF THE EA REPORT

The remaining chapters of this EA are organized as follows:

- ▶ **Chapter 2:** The Section 316(b) Industries and the Need for Regulation provides a brief discussion of the industries affected by this regulation, discusses the environmental impacts from operating CWIS, and explains the need for this regulatory effort.
- ▶ **Chapter 3:** Profile of the Electric Power Industry presents a profile of the market in which affected electric generators will operate.
- ▶ **Chapter 4:** Profile of Manufacturers presents profiles of the market in which affected manufacturing facilities will operate.
- ▶ **Chapter 5:** Baseline Projections of New Facilities describes EPA's methodology and data sources for estimating the number of new electric generators and manufacturing facilities subject to this regulation.
- ▶ **Chapter 6:** Facility Compliance Costs summarizes the technology costs detailed in the *Technical Development Document* (U.S. EPA, 2001) of this regulation and estimates the costs of compliance for each facility in scope of the final rule. The chapter also presents facility compliance costs aggregated to the national level and provides compliance cost estimates for six additional facility analyses.
- ▶ **Chapter 7:** Economic Impact Analysis presents the methodology used to estimate the economic impacts of the regulation and presents the impact analysis results.
- ▶ **Chapter 8:** Regulatory Flexibility Analysis presents EPA's estimates of small business impacts from the final section 316(b) New Facility Rule.

- ▶ **Chapter 9:** Other Economic Analyses outlines the requirements for analysis under the Unfunded Mandates Reform Act and presents the results of the analysis for this regulation. This chapter also addresses EPA's compliance with Executive Order 13132 on "Federalism," Executive Order 13211 on "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," and the Paperwork Reduction Act of 1995, and presents the total social cost of the rule.
- ▶ **Chapter 10:** Alternative Regulatory Options describes three alternative regulatory options considered by EPA and their costs.
- ▶ **Chapter 11:** CWIS Impingement and Entrainment (I&E) Impacts and Potential Benefits presents a discussion of environmental impacts resulting from the operation of CWIS and provides a qualitative assessment of potential benefits from the final rule.

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