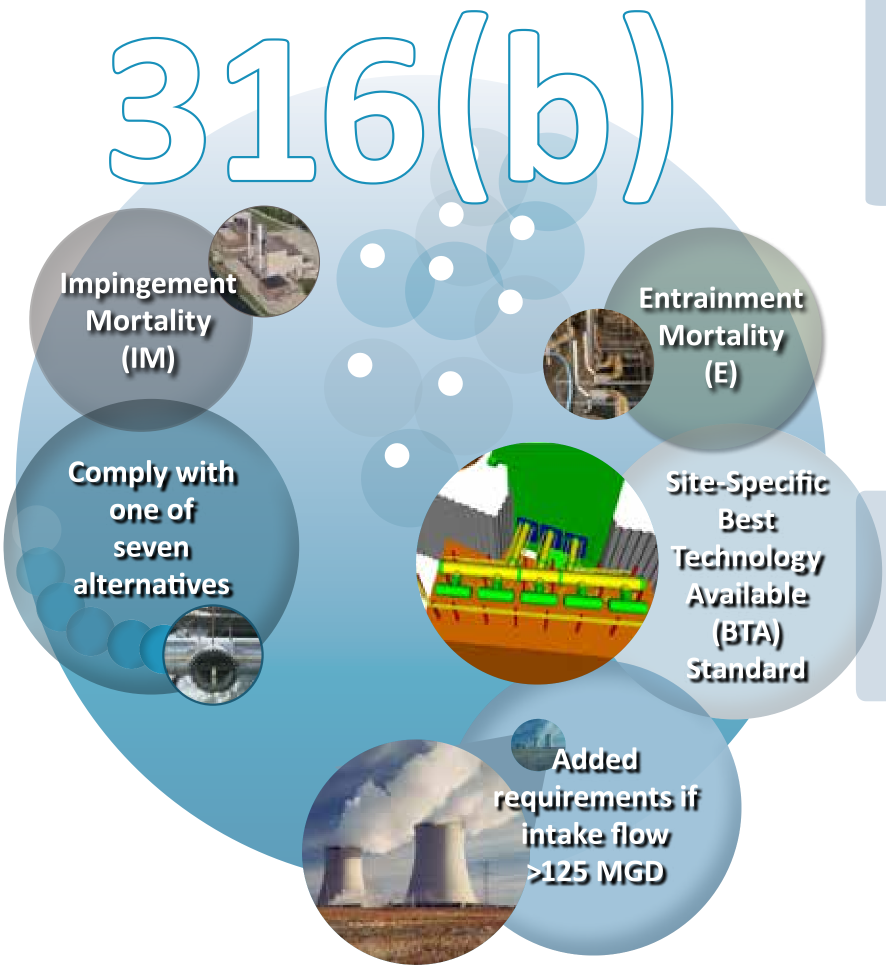
Sargent & Lundy LLC

316(b) Compliance Planning and Implementation

316(b) Compliance Planning and Implementation for Cooling Water Intake Structures

On August 15, 2014 the U.S. Environmental Protection Agency (EPA) published a final rule implementing Section 316(b) of the Federal Clean Water Act for existing power generating, manufacturing, and industrial facilities that withdraw more than 2 million gallons per day (MGD) of cooling water from waters of the United States. The rule establishes national 316(b) standards applicable to cooling water intake structures at these facilities by requiring the Best Technology Available (BTA) to minimize adverse environmental impacts associated with both impingement mortality and entrainment.



IM

For **impingement mortality**, the final rule requires existing facilities to comply with one of seven alternatives identified as BTA, including closed-cycle cooling, achieving a maximum through-screen intake velocity of 0.5 feet per second (fps) or less, and installing modified traveling screens with fish collection and return systems.

E

For **entrainment**, the rule requires existing facilities to evaluate and implement entrainment control measures on a facility-specific basis. Facility-specific requirements must reflect the permitting agency's determination of the maximum reduction in entrainment warranted after consideration of all factors relevant to the BTA determination.

Raj Gaikwad
Director Environmental Services

rajendra.gaikwad@sargentlundy.com
312-269-3830

316(b) Environmental Services

Sargent & Lundy's environmental services group supports the preparation of all required permit application material. In some cases, for example, the entrainment characterization study and benefits valuation study, the expertise of a biological consultant is required.

Sargent & Lundy's full-service support for 316(b) can start with the permit application phase and extend throughout project implementation.

PERMIT APPLICATION PHASE

Sargent & Lundy Support

- Technology Evaluation
- Cost Evaluation
- Non Water Quality Impact Study
- BTA Determination Support
- Peer Review
- Entrainment Study*
- Benefits Valuation*
- Permit Application

IMPLEMENTATION PHASE

- Project Management
- Detailed Engineering
- Project Controls
- Procurement Support
- Construction Management
- Commissioning and Testing Support

*by biological consultants

Raj Gaikwad
Director Environmental Services
rajendra.gaikwad@sargentlundy.com
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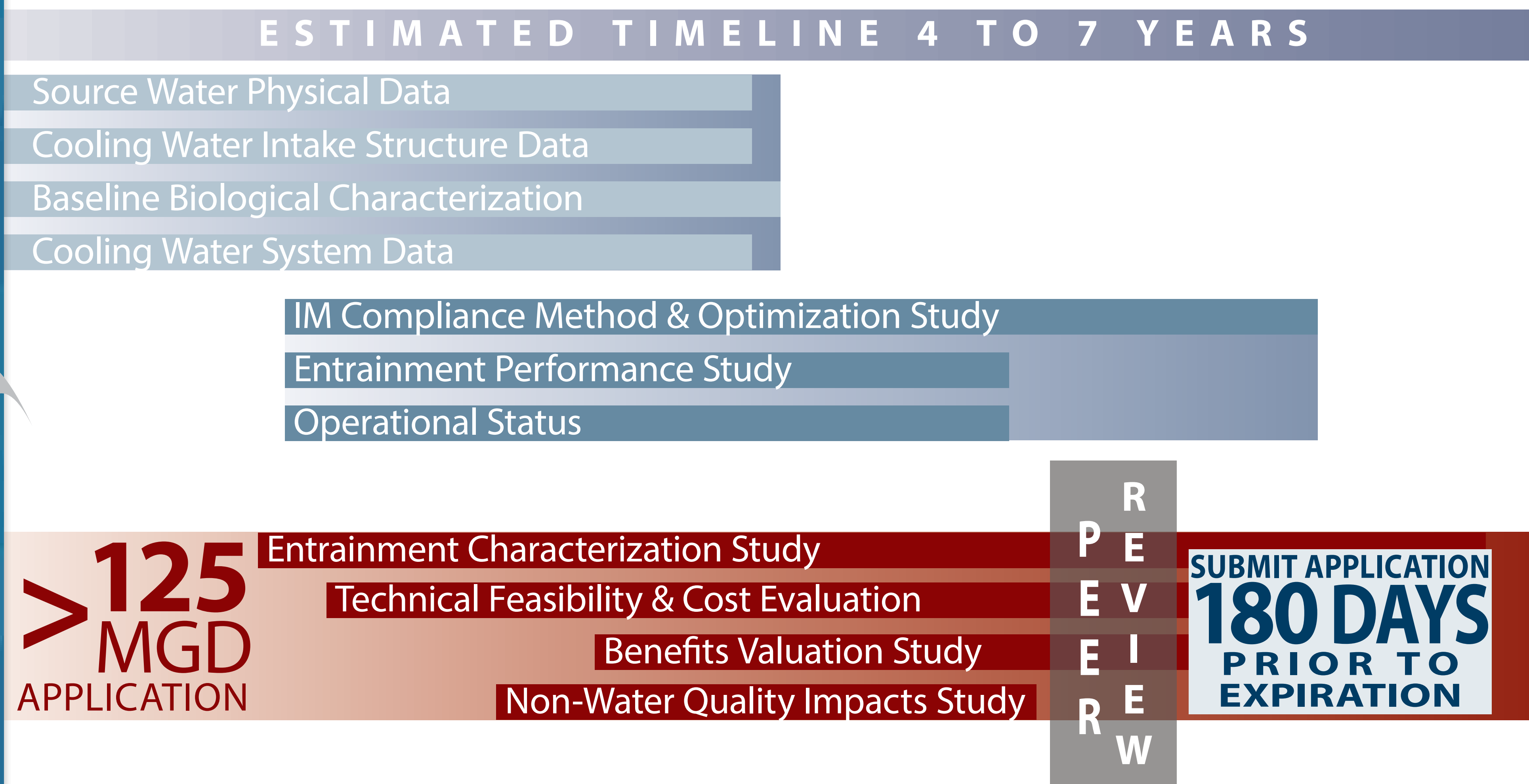
316(b) Final EPA Rule Implementation Timeline



The permitting authority has the discretion to set a timeline for compliance, including interim compliance milestones in the NPDES permit. Sargent & Lundy 's permitting services include an overall project execution plan to ensure stations fulfill all permit application requirements on time.

EXAMPLE PROJECT 316(b)

RIVERSIDE COMBINED-CYCLE COOLING WATER INTAKE MODIFICATIONS

Client	**Xcel Energy Services**
Project	**Riverside Repowering**
Location	**Minneapolis, MN**
Size	**466 MW**
Fuel	**Coal-to-Gas Conversion**
Configuration	**2x2x1**
CT Supplier/Type	**GE 7FA**
Start	**2006**
Commercial Operation	**2009**

In 2003, Xcel Energy initiated implementation of the Metropolitan Emissions Reduction Project (MERP), with the twofold goal of significantly reducing flue gas emissions, while increasing the amount of electricity produced at three Twin Cities coal-fired power plants. MERP was a voluntary program pursued by Xcel Energy to convert two of the coal plants to natural gas combined-cycle arrangements (the Riverside and High Bridge plants) and to install emission control equipment on the third coal plant (the Allen S. King Plant).

Repowering of the Riverside plant required the project to reduce impingement by limiting the maximum through-screen design intake velocity to 0.5 ft/s or less, which could not be met by the existing traveling screens.

A study was performed to evaluate the technical acceptability and economics of the available technologies for intake screening. The number of available intake screening options was limited by the short timeframe allowed for actual construction of the intake. Installation of the new intake could not affect the operation of the plant until Unit 7 went into an extended outage starting in September of 2008, and had to be completed by the time the repowered plant initiated startup activities in January of 2009. Further, special consideration had to be taken to ensure all river work was completed before the river froze in November 2008.

Use of underwater wedge-wire screens was determined to be the best technically acceptable option. The versatility of the wedge-wire screens enabled them to be incorporated into the existing intake structure with relatively minor modifications. Five wedge-wire screens extend into the Mississippi River and are connected via an underwater pipe header to a new steel bulkhead installed at the existing Unit 7 intake screenhouse. A 3-D model view illustrating the new intake as designed is shown on page 6.

The river area in the vicinity of the Unit 7 intake was dredged and rip-rap was placed during a planned outage in the summer prior to installing the new intake. During the installation of the new intake, piles were driven into the river bottom to support the wedge-wire screens and the piping header. The new bulkhead and all underwater piping were shop-prefabricated and modularized so that underwater installation involved only the setting of the pieces and bolting up the flanges. The intent of the design was to minimize the need for any underwater welding. The photo on page 6 shows one of the modular piping sections being lowered into the river.

Project-Unique Features

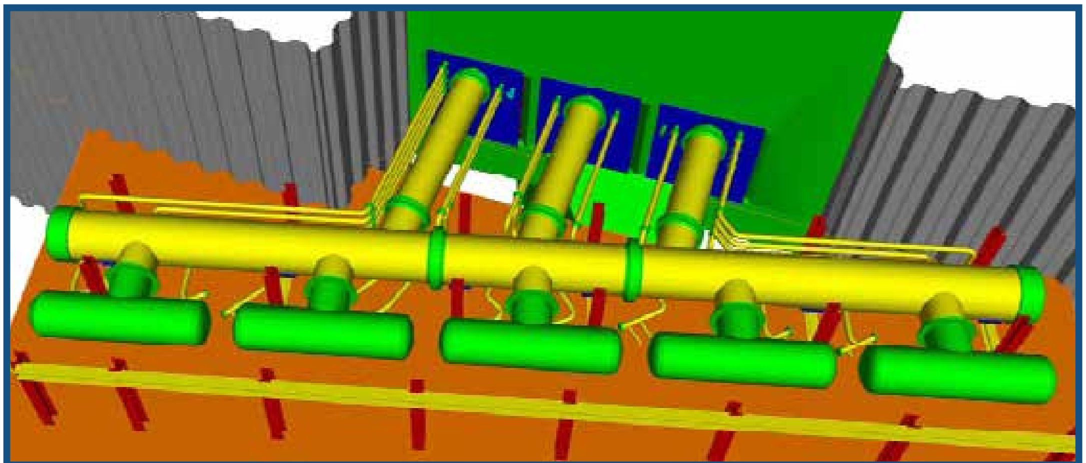
Challenges associated with the design of the new circulating water intake included the shallow river water depths in the vicinity of the existing intake, periods of heavy river debris and silting, incorporation of the wedge-wire screens into the existing intake structure, and avoiding the circulating water discharge pipe directly below the intake that extends to the middle of the river. Air burst, silt sluicing, and river warming systems were designed and installed to mitigate the varying types of screen fouling and keep the screens operating at peak performance.

Raj Gaikwad
Director Environmental Services
rajendra.gaikwad@sargentlundy.com
312-269-3830

EXAMPLE PROJECT 316(b)

RIVERSIDE COMBINED-CYCLE COOLING WATER INTAKE MODIFICATIONS

Riverside Plant, Minneapolis, MN



New Circulating Water Intake Screens

Lowering of New Circulating Water Intake Piping into River

Raj Gaikwad
Director Environmental Services

rajendra.gaikwad@sargentlundy.com
312-269-3830