Clean Water Act §316(b) Compliance—Cooling Water Intake Structure Case Studies: Part II

Presented by:

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CIBO Policy & Technical Issues Conference I, 14-15 May 2024

Outline of Topics to be Covered

- Overview of the Final Phase II §316(b) Rule
- Applicability and Requirements
- Definitions (***and things lacking definition***)

- CASE STUDY REVISITED: **Citizens Energy Perry K Steam Plant**
- Chronology of Agency Interaction
- Results of Required Studies Performed in 2023
- Next Steps (i.e. *"Are we done yet?"*)

- Other Case Studies

- Wrap-Up: Lessons Learned, Expectations for Current and Potential Future Cooling Water Users

Basis of Clean Water Act §316(b) Rule

***According to USEPA*, withdrawal of cooling water from Waters of the United States (WOTUS) for power production and other industrial purposes:**

- **Accounts for over half of all water withdrawn in the U.S. each year**
- **Removes and kills billions of aquatic organisms each year**
- **Impacts primarily early life stages of fish and shellfish**

The §316(b) Rule is Unique

- The only USEPA rule that applies to facility water **INTAKES**
- Applies to COOLING WATER withdrawn from a Water of the U.S. (WOTUS)
- Designed to provide protections for Fish and Shellfish
- Federal Rule with wide applicability, implemented by State Permitting Authority; **States may be more stringent**

Rule Applicability Criteria:

1. Facility is regulated through an individual NPDES permit;

2. Has a cumulative design intake flow (DIF) of greater than Two million gallons per day (MGD) withdrawn from a WOTUS; and,

3. 25% or more of the water withdrawn is used exclusively for cooling water purposes

- *Facilities using cooling water sourced from a WOTUS that do not meet all of these conditions may still be subject to Best Professional Judgement (BPJ) requirements established by their permitting authority*

EPA's Definition of Cooling Water:

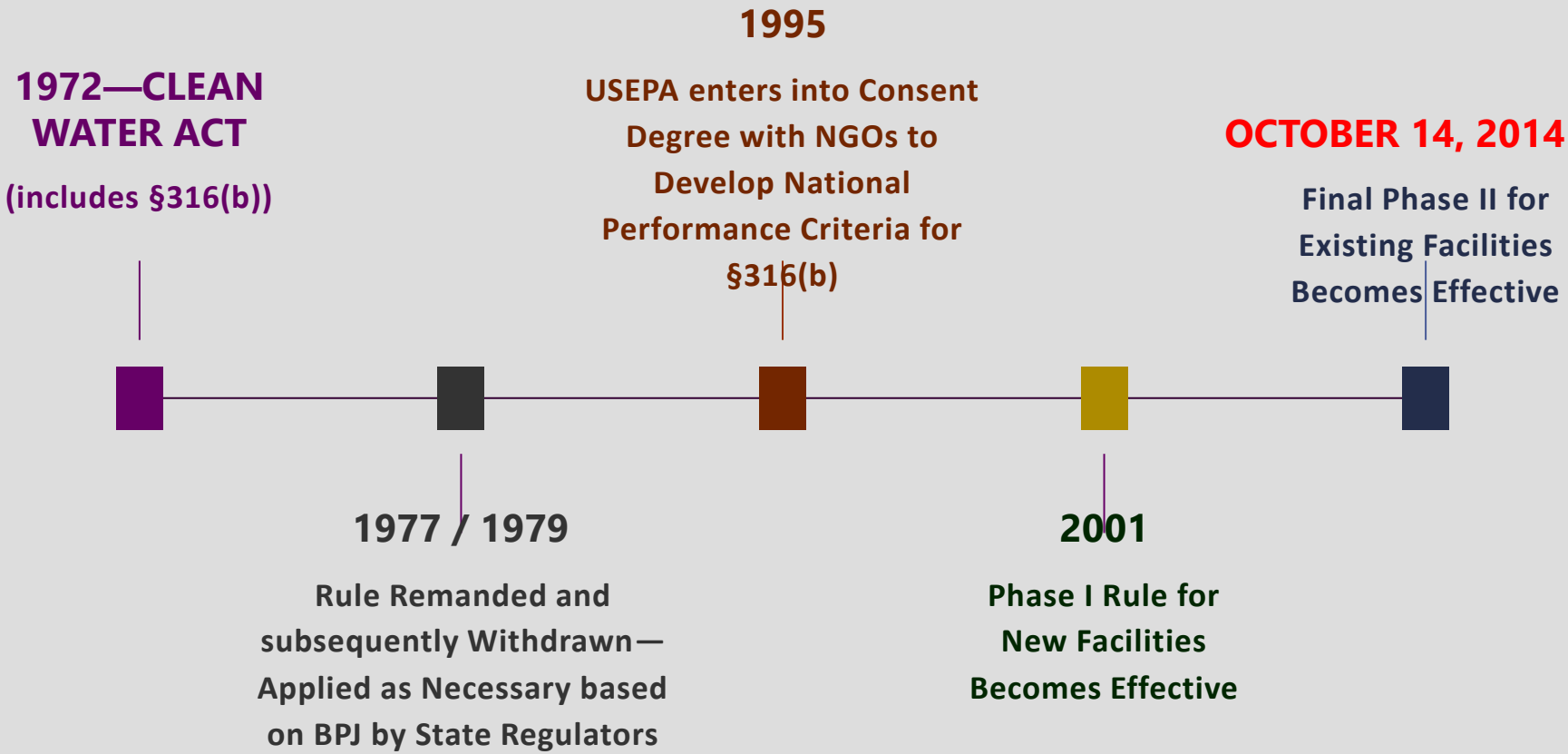
- **COOLING WATER** means water used for contact or non-contact cooling, including water used for **equipment cooling**, **evaporative cooling tower makeup**, and/or **dilution of effluent heat content**

- Does NOT include:

  - Public utility-supplied or reclaimed water, treated effluent, or water recycled for cooling use from other on-site processes

  - *Usually* does not include cooling water withdrawn from a man-made reservoir or perched cooling pond—BUT supporting information must be submitted to the state regulator for concurrence

Regulatory Timeline: 42 Years!



Now, almost TEN years later, states and facilities are <u>still</u> working on implementation of the Rule…

Purpose of the §316(b) Rule:

- Minimize **Adverse Environmental Impacts** (AEI) from Impingement and Entrainment of aquatic organisms resulting from use of Cooling Water Intake Structures (CWIS)
- Includes both fish and shellfish

Types of Facilities Subject to §316(b):

- Steam Electric Power Plants
- Paper Mills
- Chemical Companies
- Steel /Aluminum Mills /Foundries
- Oil Refineries
- Packaging /Container Manufacturers
- Recycling/Resource Recovery
- Grain Processing/Milling
- Sugar Refining
- Lumber Mills

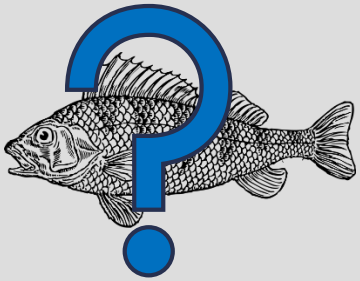
- In addition, any large building that uses surface water for HVAC cooling purposes and meets the other three criteria is subject to the §316(b) Rule (e.g. Data Centers, High Rise Office Buildings)

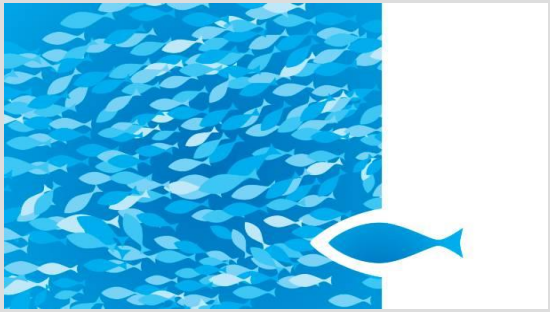
What is Adverse Environmental Impact?

- **No definition is provided by USEPA**

  Prior to the issuance of the 2014 Final Rule, AEI was determined by state regulatory agencies based on Species-Specific, Population-Level Impacts; controls were required when determined to be necessary, based on documented effects

- **2014 Final Rule:**
  - **One fish impinged or entrained = AEI?**
  - **Left up to the states, with little guidance**

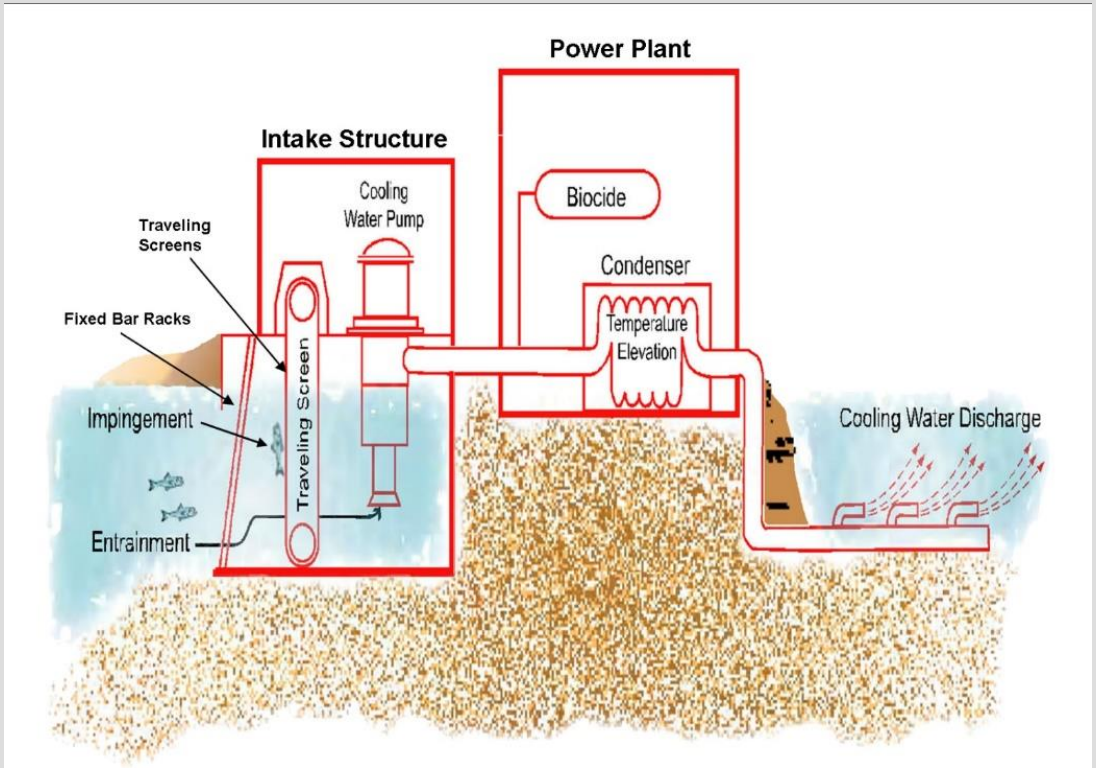




Types of Impact:

- ✓ **IMPINGEMENT:** entrapment of any life stages of fish / shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal

- ✓ **ENTRAINMENT:** any life stages of fish /shellfish in the intake water flow entering and passing through a cooling water intake structure and into a cooling water system, including the condenser or heat exchanger



Impingement:

Source: Delaware.sierraclub.org

Source: EA

Source: EA

Source: Riverkeeper.org

Size Range: > 3/8 inch (9.5 mm)

Entrainment:

Source:
News.nationalgeographic.com

Source: irrec.ifas.ufl.edu

Source: EA

Source: EA

Typical Size Range: 0.5mm and up.

Fine mesh screen controls sized to match head or egg dimensions

"(r)" requirements – 40 CFR §122.21(r):

Information required <u>with each NPDES permit renewal application</u> for Existing Facilities Subject to §316(b)

- **Actual intake flow >2 MGD: (r)(2) through (r)(8)**
- **Actual intake flow >125 MGD must <u>also</u> submit (r)(9) through (r)(13)—APPLIES MOSTLY TO LARGE POWER GENERATORS**

- **Waivers of "r" requirements for man-made lakes/reservoirs stocked and managed by resource agencies may be granted, as long as no threatened or endangered species or critical habitats are present**
- **After first round of §316(b) in NPDES permits, permittees can request reduced (r) report submittal requirements 2.5 years before permit expiration---<u>no guarantee that state will grant such requests</u>**

§122.21(r) Reports: Required for All §316(b) Facilities

- (r)(2): Source Water Physical Data
- (r)(3): Cooling Water Intake Structure Data
- (r)(4): Source Water Baseline Biological Characterization Data
- (r)(5): Cooling Water System Data
- (r)(6): **Intended Method of Compliance with Impingement Mortality Standard**
- (r)(7): Existing Entrainment Performance Studies
- (r)(8): Operational Status

Additional §122.21(r) Reports Required for >125 MGD Intake Flow

- (r)(9): Entrainment Characterization Study (2 years of data)
- (r)(10): Comprehensive Technical Feasibility and Cost Evaluation Study
- (r)(11): Benefits Evaluation Study
- (r)(12): Non-Water Quality and Other Environmental Impacts Study
- (r)(13): Peer Review of (r)(10-12) Reports

➢ State must make determination on facility entrainment compliance status before imposing impingement controls

Entrainment Control

GOAL: Reduce overall cooling water volume withdrawn

TWO PRIMARY OPTIONS: (Both Very Expensive)

- **Install specialized Fine-Mesh Intake Screens (as small as 0.5 mm)**
- **Retrofit to a Closed Cycle Recirculating System (CCRS)**

- ***Site-specific BTA* determined by regulator based on review of information in "r" reports; BPJ for facilities <125 MGD**

citizens energy group

Seven Impingement Control Options §125.94(b):

- **Pre-Approved Technologies:**
  (no on-going biological compliance monitoring required)
  - **Closed Cycle Recirculating System (CCRS)**
  - **Design Intake Velocity <0.5 fps**
  - **Existing Off-Shore Velocity Cap**

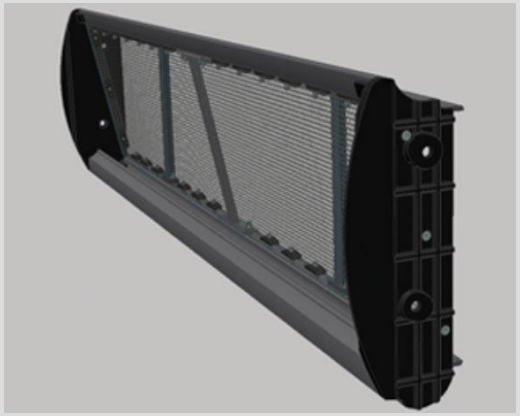
- **Streamlined Compliance Alternatives:**
  (require a 2-year optimization study)
  - **Actual Intake Velocity <0.5 fps**
  - **Modified Traveling Screens with Fish Return System**
  - **System of Technologies Approach**

- **12-Month Performance Standard of No More Than 24% Mortality**
  - **As demonstrated through ON-GOING biological monitoring** (i.e., for life of plant…)

Impingement Control

- Fine Mesh Screen/Off-Shore Intake

- Modified Traveling Screen System



- Fish Return System

- Optimization Studies

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A Few "Off-Ramps" Are Also Provided by the Rule for Impingement (§125.94(c)(10)(11)(12):

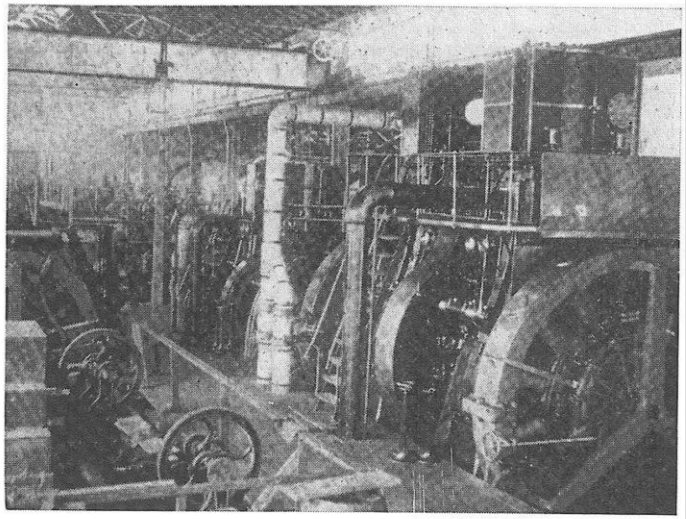
- **Reuse of other water for cooling purposes**

- ***De minimis* rate of impingement**
  - ***"In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified."***
  - **No definition or other guidance on what constitutes "*de minimis*" is provided in the Rule**
  - **This determination is to be made by the state regulator**

- **Low-capacity utilization power generating units**

CASE STUDY: Citizens Energy
Perry K Steam Plant—Indianapolis, Indiana

- ✓ Original plant and boilers (long since removed) constructed in 1893 to provide electricity to the Edison electric light circuit to Union Station
- ✓ Primary output shifted to steam at the turn of the 20th century to meet the demands of the growing industrial users in SW downtown Indianapolis
- ✓ Today: <u>Second largest district steam system in the United States</u>
- ✓ Steam sold to chilled water business to drive chillers that provide district cooling



Engines and generators in the original Kentucky Avenue plant, as pictured in 1897.

Location of Perry K CWIS on the White River

Buried concrete inlet canal that brings water from the Screen House to the softener at Perry K

Perry K Steam Plant (NW corner of South & West Streets)

Perry K and the Clean Water Act

- *316(b):* No prior permit requirements, until Final Rule was issued
- CWIS meets applicability criteria under existing facilities (Phase II) rule:
  - >2 MGD Cooling Water Flow
  - >25% of Intake Flow Used for Cooling
  - Operations Regulated by an NPDES Permit (IN0004677)

Cooling Water Use at Perry K

- 100% surface water used at the plant
  - for once-through cooling water and boiler water
  - Connection to public water system for emergency use only

- Boiler water treated through hot process water softener, anthracite filtration and zeolite polishing before entering the boilers

- Facility Specs:
  - 7 boilers capable of producing approximately 1.9 million pounds per hour of steam
  - Natural gas is the primary fuel for all boilers; Boilers #17 and #18 have oil-firing capability for emergency

§316(b) Facts for Perry K

- **Cooling Water Source: West Fork of White River**
  - A Water of the U.S. and also an Urbanized Stream
  - Long-Term (1931-2022) Annual Mean Flow of 1,603 cfs
  - $Q_{7,10}$: 69 cfs

- **Design Intake Flow: 42.3 MGD (65.43 cfs)**—*theoretical only**
  - Only 4.1% of annual mean flow of the source water

- **Actual Intake Flow: 16.7 MGD (25.83 cfs)**
  - Only 1.6% of annual mean flow of the source water

➢ (Final Rule states that no entrainment controls are necessary for those facilities that withdraw less than 5% of annual mean source water flow)

- **Intake Velocity: <0.5 fps at design flow**
  - ➢ (i.e. below USEPA criteria for impingement effects)

Perry K NPDES §316(b) History

- Section 122.21(r)(2) through (r)(8) information, **including the results of a year-long impingement study conducted in 2013-2014**, was provided to the Indiana Department of Environmental Management (IDEM) by Citizens concurrent with the July 2016 Perry K Plant NPDES permit renewal application.

- Data showed that the existing facility CWIS configuration and operation met the criteria to be considered under **§125.94(c)(11)—*De minimis* rate of impingement**

- In IDEM's 2016 BPJ determination, they fundamentally agreed, based on the information provided at that time, that **the existing configuration and operation of the Perry K CWIS was compliant with the intent of the Final Rule, in that it represented a BPJ determination of BTA for the minimization of adverse environmental impacts**

Perry K NPDES §316(b) History—(continued)

- HOWEVER, the official response from IDEM was that they were ***"…unable at this time to determine whether a 'de minimis' determination is appropriate"***

- Additional information was submitted to IDEM to provide support for both a BTA Entrainment decision (June 2019), as well as further support for a *de minimis* determination

- Discussions were held with IDEM staff during the permit renewal process to try to limit 316(b) requirements based on submitted information--without much success

- **No technical explanation has ever been provided by IDEM as to why the *de minimis* exemption could not be granted for the Perry K Plant, other than the fact that they did not want to support it**

2013-2014 Impingement Study

- A total of 11 fish with a combined weight of 3.2 ounces was collected over an entire year; six common species
- Extrapolated values, based on AIF, were 109 fish, weighing a total of 3.38 pounds
- No federal or state threatened or endangered species were found
- Extrapolated Impingement numbers show collection dominated by Bluegill (35%) and by Gizzard Shad (25%), which is considered as an invasive species in the state of Indiana

➢ But IDEM still doesn't consider this to be *de minimis*?

EA Retained to Assist Citizens in 2021

- EA was founded in 1973 to provide 316(a)/316(b) support to industry
- EA has performed 316(b)-related work in 14 different states, at over 180 different facilities on various source waters
- EA's expertise includes the design of site-specific study plans, execution of field work, lab identification and processing, report preparation, and continuing technical and regulatory negotiation support
- EA worked with Citizens to develop a proposed impingement "control" option that would satisfy IDEM

Perry K NPDES Permit Requirements

- IDEM concurred with the selection of BTA impingement compliance alternative 40 CFR §125.94(c)(6): System of Technologies Approach
  - This option required an additional year of impingement data, even through the facility had already determined minimal impingement
  - A site-specific entrainment study was also required, even through the facility already met the low flow percentage test
  - These requirements were incorporated into the subsequent NPDES Permit—issued January 1, 2022
- Study Plans were required to be submitted and approved by IDEM prior to the initiation of work
  - Submitted for review: July 2023
  - "Tentative" approval: December 2023
  - Study Start date: January 2023 (IM)/April 2023 (ENT)
  - Final approval: May 2023 (AFTER studies began!)

Field Work Site: Perry K CWIS

Impingement Sampling Set-Up

- 36 individual 24-hour samples taken throughout the course of the year
- Photos of basket required by IDEM to be taken <u>during each event prior to processing</u>

The Total 2023 Impingement "Catch":

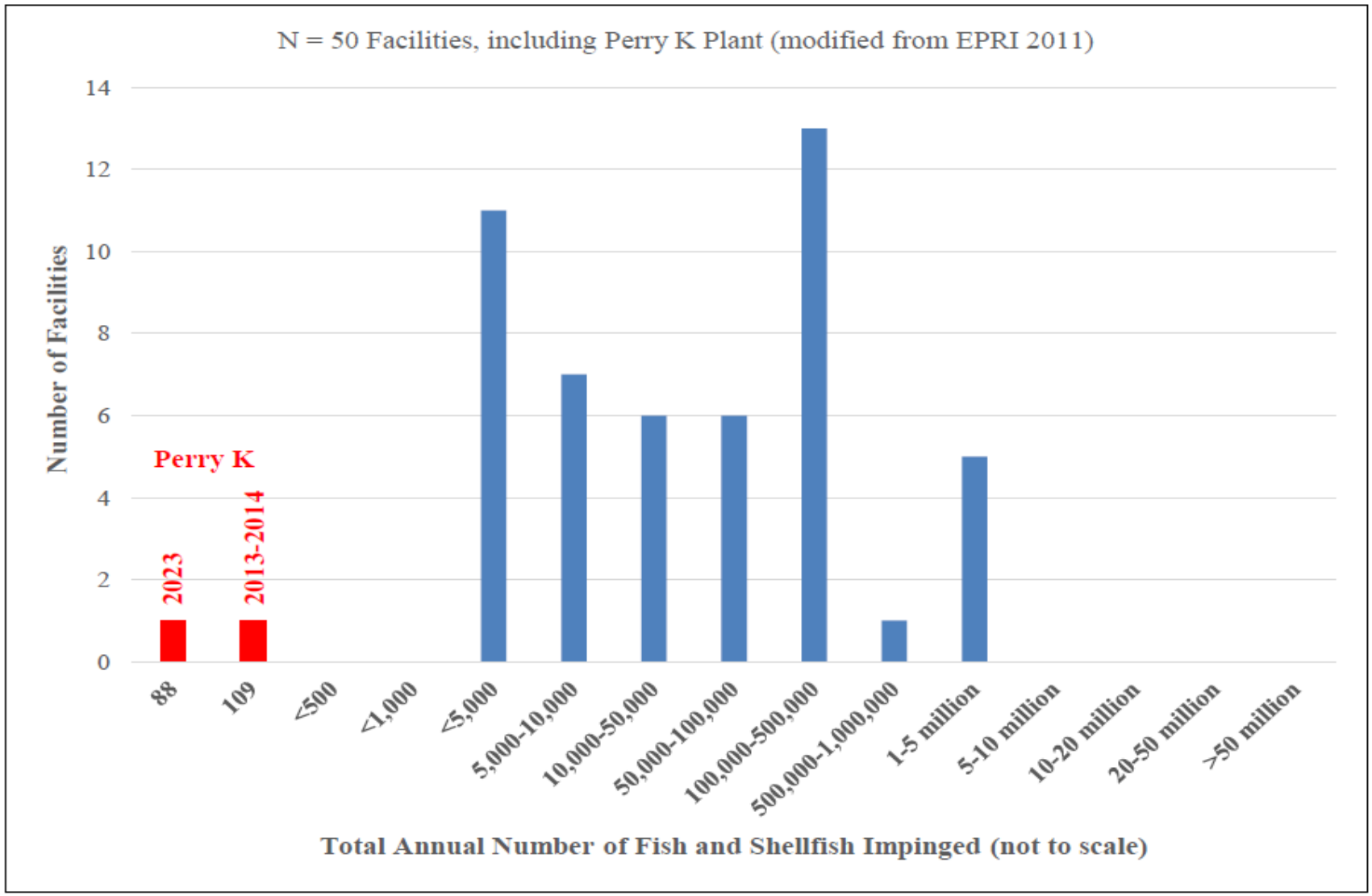
- After 36 individual 24-hour sampling events, under a variety of river, weather, and facility operating conditions, a grand total of **13 fish** were collected---along with an abundance of Chinese Mystery Snails and Rusty Crayfish (both invasive)

2013/2014 and 2023 Impingement Results

- 33 separate 24-hr sampling events over 12-month period
- 11 Individual Fish representing 6 common species:
  - Bluegill
  - Flathead Catfish
  - Largemouth Bass
  - Longear Sunfish
  - Orangespotted Sunfish
  - White Crappie
  - Gizzard Shad
- Total combined weight: 3.2 ounces

- 36 separate 24-hr sampling events over a calendar year
- 13 Individual Fish representing 4 common species:
  - Bluegill
  - Flathead Catfish
  - Largemouth Bass
  - Longear Sunfish
- Total combined weight: 4.4 ounces

Comparison to Other Facilities on Similar Waterways



Impingement Technology Optimization

- Report submitted to IDEM in March 2024
- Provided data and documentation to show that there were no correlations between facility operations, weather, river flow and impingement numbers
- Reiterated the same *de minimis* levels of impingement found in site-specific studies separated by approximately 10 years
- Therefore, concluded that there were no opportunities for further "optimization" of impingement numbers (i.e. facility is already BTA)
- **IDEM RESPONSE: None yet…**

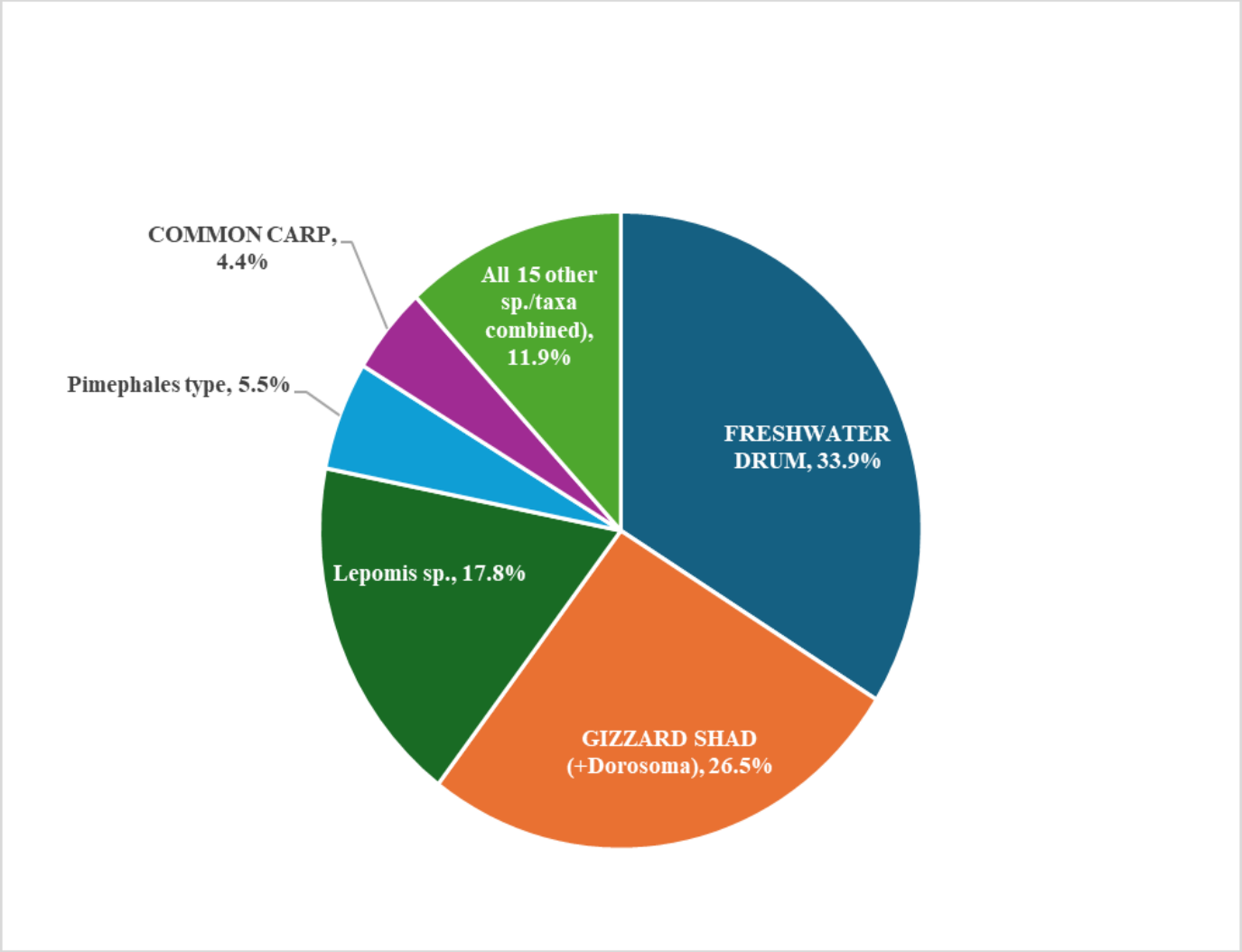
Entrainment Sampling Set-Up

Water was pumped from intake canal through 3/8” mesh strainer and put into 335µm net—fish eggs and larvae were retained, preserved, and identified in EA’s laboratory

16 sample events with three depth-integrated diurnal samples per date from April through September 2023 for a total of 48 individual samples

Final 2023 Entrainment Results:

- Very small number of fish eggs and larvae collected (N = 1588)
- Typical Distribution based on Spawning Time
- All Common Species/Taxa
- Over 25% composed of fragile / state invasive species
- No State or Federally Threatened or Endangered Species



What's Next for Perry K Regarding §316(b)?

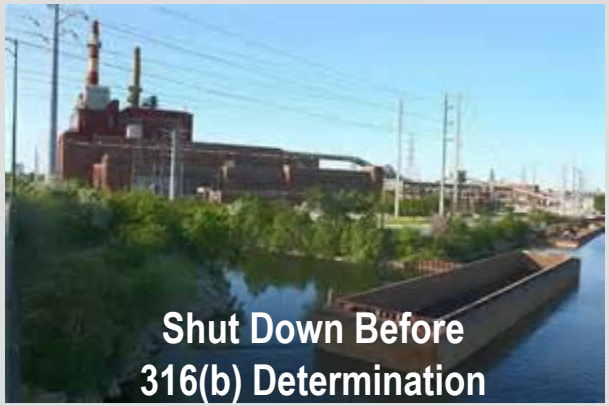
- Final Entrainment Report is due 36 months from the approval of the study plan (May 2026)
- Request for reduced §316(b) information for the next permit renewal needs to be submitted by June 2024—2.5 years before current NPDES Permit expires
- New permit must contain IDEM's final determination on Entrainment BTA, as well as an agency opinion regarding Perry K's impingement mortality optimization status
- **BEST CASE:** Perry K's CWIS will be found to be BTA for both Impingement and Entrainment with no additional technologies or operational measures needed

Similar Case Studies: Midwest

- EA was responsible for all aspects of §316(b) submittal requirements for a large independent power producer with seven fossil-fueled facilities on five different waterways:

  Lake Michigan (1)
  South Branch of Chicago River (1)
  Chicago Sanitary and Ship Canal (2)
  Lower Des Plaines River (2)
  Illinois River (1)

316(b) Compliance Outcomes



Similar Case Studies--Midwest

- EA developed and executed a year-long impingement study for large corn-processing industry, along with required r reports

OUTCOME:

- *De minimis* determination for impingement (342 organisms), no T&E species
- BTA determination for entrainment, based on low flow in proportion to source water (<5%)

Similar Case Study: East Coast

- EA was responsible for all aspects of §316(b) requirements for multi-unit power plant on the east coast, located in tidal waters:

Similar Case Study: East Coast

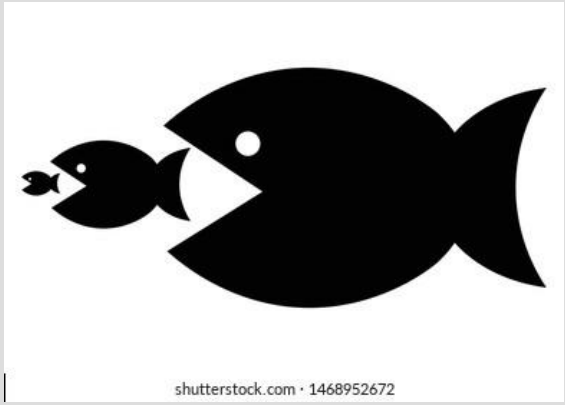
- Work included two years of entrainment sampling, as well as review of prior impingement study results (included commercially important Blue Crab)
  - 122.21(r)(9-13) prepared by consultant team and submitted in January 2024
  - 122.21(r)(2-8)—in progress
- Expected Result:
  - Low capacity utilization determination for impingement / entrainment BTA based on low flow volume (due to peaking operation)
  - Short remaining life of plant will also influence regulator's decision regarding need for any additional impingement / entrainment controls

§316(b) Lessons Learned

- Every state regulatory agency handles §316(b) differently, even though they are all bound by the same federal rule baseline requirements
- Even though the Rule allows for state flexibility and the power to make BPJ decisions, some state regulators are hesitant, even when provided with an abundance of supporting information
- Requiring additional studies to delay the decision-making process places an unwarranted financial burden on permittees to collect additional data that is not always necessary to make an informed decision
- <u>There should be a strong technical and/or regulatory basis for requests for additional data collection</u>

Considering a New Facility That Uses Cooling Water?

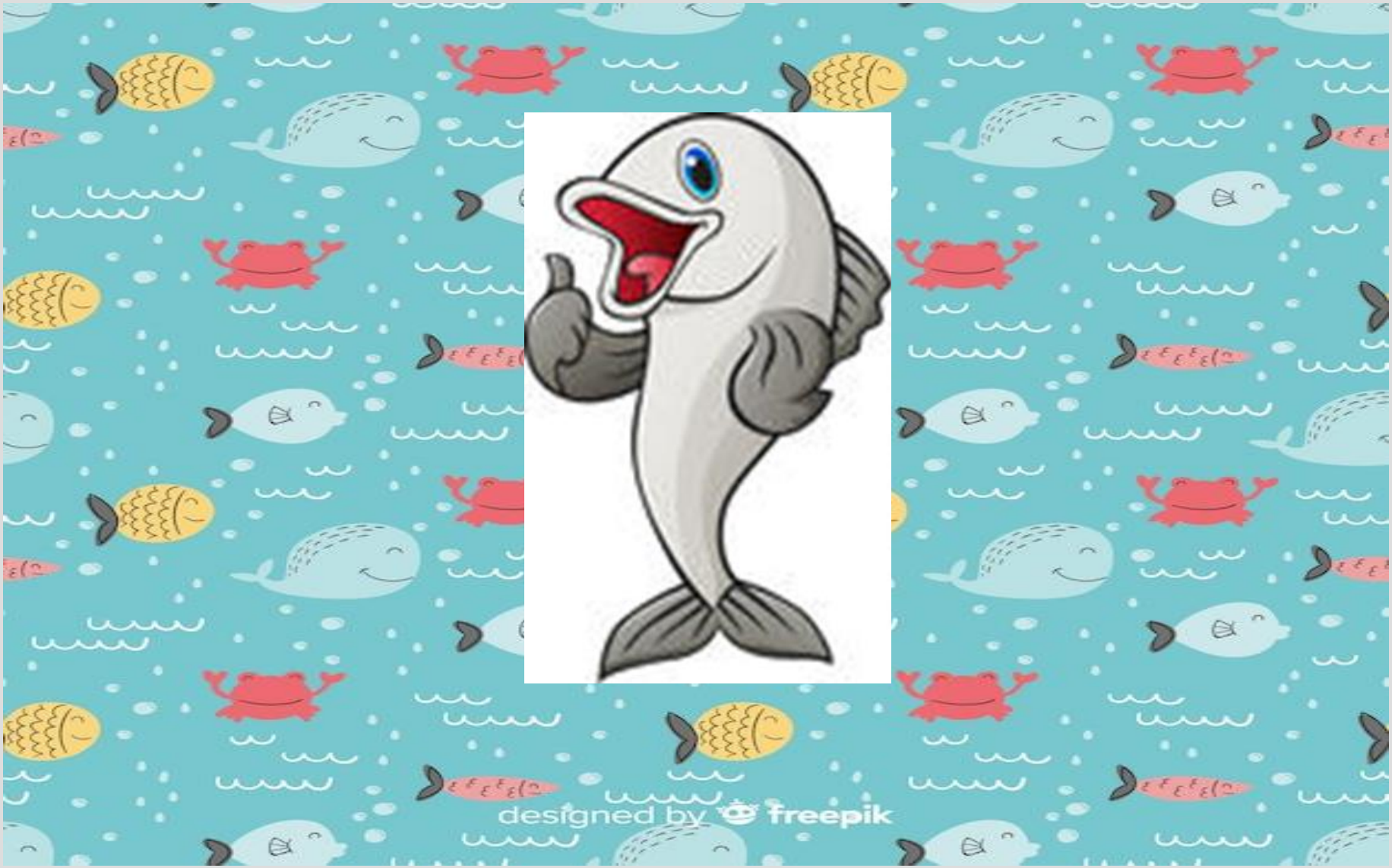
- The Phase I §316(b) Rule requires that new facilities with WOTUS source water be designed at the outset to be fully compliant for impingement and entrainment control
  - Through-screen intake velocity of <0.5 fps
  - Intake flow commensurate with closed cycle cooling
- Even so, There are MANY additional on-going reporting requirements
  - Impingement and Entrainment studies to demonstrate no impact
  - Velocity measurements to document <0.5 fps
- NO FREE LUNCH!



#1 Advice: Know the Ins and Outs of the Rule

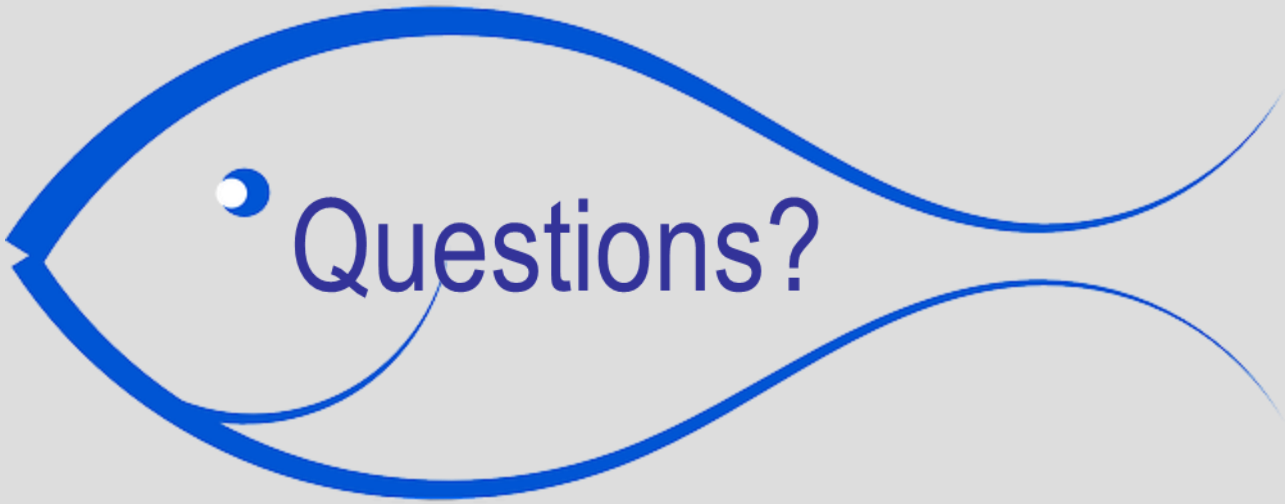
- Do your homework--Visit the USEPA website: https://www.epa.gov/cooling-water-intakes
- Be proactive in identifying facility characteristics and data that will help lead to a BTA determination (for either impingement and/or entrainment, as applicable)
- Work with your regulator as needed to help them better understand the Rule requirements, as well as their responsibility to make reasonable BTA decisions supported by defensible data
- Look for precedents in your own state, or others, that can help make your case
- Be prepared to collect additional data anyway (even if you don't think you need it)
- Get help from a knowledgeable, experienced consultant

If your facility does not fall under the Rule:



If you are unsure if your facility is or could be subject to §316(b) requirements:

- **Don't** interpret the Rule requirements in a vacuum
- **Do** ask an experienced consultant, or other knowledgeable source, for guidance and recommendations



Thank You!

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(P.S. We do more than just §316(b)/fisheries work: eaest.com)