UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

MEMORANDUM

SUBJECT: Transmittal of the Revised Framework for Best Professional Judgment for Cooling Water Intake Structures at Hydroelectric Facilities

FROM: Andrew Sawyers, PhD, Director
Office of Wastewater Management

ANDREW SAWYERS
Digitally signed by ANDREW SAWYERS
Date: 2022.07.06 10:51:27 -04'00'

TO: Water Division Directors
Regions 1 – 10

The purpose of this memorandum is to transmit to EPA Regional Water Division Directors a revised memorandum (below) and framework (attached) to replace the memorandum and "framework" that EPA issued on January 13, 2021, to evaluate whether, based on the Agency's best professional judgment (BPJ), additional measures may be necessary at hydroelectric generating facilities to minimize impingement and entrainment of fish and other aquatic organisms at cooling water intake structures (CWIS). The prior memo is void and the Agency's position on these issues can be found here.[1] EPA has reviewed the prior memorandum and "framework" and while the conclusions of the memorandum and "framework" remain the same, some of the legal reasoning and technical analysis has been revised for accuracy and to reflect lessons learned from recent permitting actions.

REVISED MEMORANDUM

Section 316(b) of the Clean Water Act (CWA) requires EPA to issue regulations on the design and operation of CWIS, to minimize adverse impacts from impingement and entrainment of fish and other aquatic organisms. In 2014, EPA promulgated a regulation to implement section 316(b) which establishes Best Technology Available (BTA) requirements for existing CWIS that meet certain operational thresholds (known as the

[1] These issues are also discussed in more detail in the responses to comments and fact sheet for Lower Snake River Federal Dams NPDES Permits - September 30, 2021 (epa.gov)

existing facility rule).[2] EPA regulations at 40 C.F.R. § 125.90(b) further provide that a CWIS that is not subject to the substantive provisions of the existing facility rule or another regulation implementing CWA section 316(b) must meet BTA requirements that are established on a case-by-case, BPJ basis. This memorandum addresses whether CWIS at hydroelectric facilities are subject to the substantive requirements of the 2014 rule or, instead, site-specific BPJ requirements pursuant to 40 C.F.R. § 125.90(b). In addition, it responds to some recent arguments that have been made asserting that Section 316(b) does not apply to hydroelectric facilities.

Consistent with the prior memorandum, the Agency maintains its view that, in light of the text, structure, history and purpose of the 2014 existing facilities rule, the rule is ambiguous as to the applicability of the substantive requirements to CWIS at hydroelectric facilities. The Agency also maintains its interpretation that because EPA did not intend that the 2014 rule's substantive provisions would apply to CWIS at hydroelectric facilities and instead, pursuant to 40 C.F.R. §125.90(b), CWIS at hydroelectric facilities are subject to site-specific requirements set on a BPJ basis. This interpretation is discussed further below.

The record for the 2014 rule does not discuss cooling water use at hydroelectric facilities as would be expected if the substantive provisions were meant to apply to such facilities. The one instance in which the preamble to the proposed rule mentions hydroelectric facilities may be read to suggest that EPA did not contemplate that the rule would apply to dams. (76 Fed. Reg. 22,174, 22,190 (Apr. 20, 2011) ("Warming water at liquefied natural gas terminals, and *hydro-electric plant withdrawals for electricity generation* are not cooling water uses and not addressed by today's proposal.") (emphasis supplied). The record does not indicate how the rule would increase costs at hydropower facilities, nor does the record contain information of any site visits to hydropower facilities or comments from these facilities on the substantive aspects of the rule. Importantly, many of the provisions, especially the permit application requirements, cannot be implemented at hydroelectric facilities. For example, 40 C.F.R. § 122.21(r)(6) (i) requires an impingement technology performance optimization study if the facility chooses to comply with the BTA standard for impingement at § 125. 94(c)(6). Most of the intakes at hydroelectric facilities are located in the dam itself, either in the penstocks or the scroll case of the turbine. Given the location of the cooling water intake structure at most hydroelectric facilities within the dams, it is a virtual impossibility to develop this information or to otherwise optimize the operation of the cooling water intake structure itself.

In several recent contexts, hydroelectric facilities and their representatives have expressed agreement with the interpretation that the substantive provisions of the 2014 rule do not apply to hydroelectric facilities but have urged the Agency to interpret the statute to exempt hydropower facilities from Section 316(b) altogether. EPA disagrees that cooling water intake structures at hydroelectric facilities that otherwise require NPDES permits are exempt from section 316(b) of

[2] The existing facilities rule states that the substantive provisions of the rule apply to any facility that 1) is a point source 2) uses or proposes to use one or more cooling water intake structures with a cumulative design intake flow of greater than 2 MGD, 3) Twenty-five percent or more of the water the facility withdraws on an actual intake flow basis is used exclusively for cooling purposes. 40 C.F.R. § 125.91(a).

the statute and, for the purpose of informing stakeholders of our longstanding reasoning, the remainder of this memorandum summarizes why. The attached framework explains how to address the statutory requirements at these facilities on a best professional judgment basis, indicating that many facilities may have already employed measures that meet the statutory requirements.

EPA's existing regulations, including 40 C.F.R. § 125.90(b), plainly reflect the Agency's current and longstanding interpretation of CWA section 316(b) as requiring compliance by any CWIS that is located at a facility subject to the NPDES permit program. This conclusion is plain on the face of the existing facility rule; 40 CFR § 125.90(b) states that "Cooling water intake structures not subject to requirements under §§ 125.94 through 125.99 or subparts I or N of [part 125] must meet requirements under section 316(b) of the CWA established by the Director on a case-by-case, best professional judgment (BPJ) basis." EPA's interpretation of CWA section 316(b) is longstanding. In 1977, when the first substantive Clean Water Act section 316(b) rule was invalidated in *Appalachian Power Co. v. Train*, 566 F.2d 451, 457-58 (4th Cir. 1977), EPA removed the substantive provisions of the rule; however, the BPJ regulation for existing facilities remained in effect. EPA then promulgated a similar BPJ provision in the 2001 Phase I rule for new facilities to address facilities not subject to the substantive provisions of that rule. 40 CFR § 125.80(c).[3] A similar BPJ regulatory provision for existing facilities was included as part of the predecessor 2004 Phase II Rule. *See* 69 Fed. Reg. 41576, 41683 (July 9, 2004). The proposal for the current existing facility rule included language requiring BPJ permitting language similar to that adopted in the final rule. 76 Fed. Reg. 22174, 22280 (April 20, 2011).

The key argument made by those taking the position that dams are outside the scope of section 316(b) is a claim that EPA cannot issue section 316(b) regulations without the existence of an accompanying effluent guideline applicable to that sector. EPA's longstanding interpretation that section 316(b) applies to any point source required to obtain an NPDES permit reflects the plain language of the statute. Section 316(b) states: *Any standard established pursuant to section 1311 [301] of this title or section 1316 [306] of this title 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.*

Section 316(b)'s reference to "any standard" under section 301 references effluent limitations applicable to any point source discharge, both technology-based and water quality-based. Section 316(b)'s reference to "applicable to a point source" supports EPA's view that any point source subject to 301, *i.e.*, one that requires an NPDES permit, must also have in that permit conditions on the location, design, construction, and capacity of cooling water intake structures reflecting the best technology available for minimizing adverse environmental impact.[4]

---

[3] *See e.g.,* 65 Fed. Reg. 49,060 (Aug. 10, 2000) ("This proposed rule would apply to new facilities that use cooling water intake structures to withdraw water from waters of the U.S. and that have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the CWA."); 66 Fed. Reg. 65,258 (the final rule "applies to a new facility that has or is required to have a National Pollutant Discharge Elimination System (NPDES) permit.") (Dec. 18, 2001).

[4] EPA disagrees with any suggestions that EPA's first proposed section 316(b) rule stating, "The

In a recent permitting action, EPA developed a framework to consider various technologies currently installed at hydroelectric generating facilities to establish case-by-case BPJ conditions. EPA presented the framework in the Fact Sheets for certain draft permits[5] and solicited comments on the framework. EPA received public comments on the framework from 11 entities,[6] and made revisions to improve clarity and the utility of the framework. EPA considered Regional comments concerning aspects of the prior framework that did not make sense when implemented in site-specific and general NPDES permits issued by the Regions. Accordingly, the attached framework has been revised and replaces the framework issued by Andrew Sawyers on January 13, 2021 ("January 2021 Framework"). The attached revised framework resolves these issues and, where appropriate, explains the rationale for the revisions.

Attachment - Revised Framework for Considering Existing Hydroelectric Facility Technologies in Establishing Case-by-Case, Best Professional Judgment Clean Water Act § 316(b) NPDES Permit Conditions

provisions of this part are applicable to cooling water intake structures for point sources for which *effluent limitations guidelines are established pursuant to section 301 or standards of performance are established pursuant to section 306 of the Act*," 38 Fed. Reg. 34410, 34412 (December 13, 1973) (emphasis supplied), means that 316(b) applies only where there first are effluent guidelines because the final rule omitted the word "guidelines" and the term effluent limitations is broader, applying to any point source discharge under section 301. Some have also cited an early permitting decision, *In re Central Hudson Gas and Electric Corp., EPA Decision of the General Counsel, NPDES Permits* (July 29, 1977) to make the argument that effluent guidelines must be promulgated first for 316(b) to apply. That decision, however, is ambiguous because it cites more than effluent guidelines as a predicate to establishing section 316(b) conditions. That decision expressly references CWA section 301(b)(1)(C), which applies to all NPDES permits and requires water-quality-based effluent limitations where technology-based effluent limits are insufficient to meet applicable water quality standards.

[5] See Fact Sheet for Federal Hydroelectric Projects in the Lower Columbia River (Bonneville Project – WA0026778, The Dalles Lock and Dam – WA0026701, John Day Project – WA0026832, McNary Lock and Dam – WA0026824) and Fact Sheet for Lower Snake River Federal Hydroelectric Projects in the Lower Snake River (Ice Harbor Lock and Dam – WA0026816, Lower Monumental Lock and Dam – WA0026808, Little Goose Lock and Dam – WA0026786, and Lower Granite Lock and Dam – WA0026794)

[6] See https://www.epa.gov/sites/production/files/2020-06/documents/r10-npdes-usace-lower-columbia-snake-river-hydroelectric-facilities-public-comments-2020.pdf

Attachment:
Revised Framework for Considering Existing Hydroelectric Facility Technologies in Establishing Case-by-Case, Best Professional Judgment Clean Water Act § 316(b) NPDES Permit Conditions[1]

EPA generally expects that hydroelectric facilities' existing controls are technologies that can be determined to satisfy the CWA requirements to minimize entrainment and impingement mortality. EPA is aware that many hydroelectric facilities are required to implement measures that reduce impacts of the dam, including the impacts to passage of aquatic life through the dam, as conditions of a license issued by the Federal Energy Regulatory Commission or a Biological Opinion issued under the Endangered Species Act by US Fish and Wildlife Service or the National Marine Fisheries Service. While these measures are generally not employed at the cooling water intake structure (CWIS), such measures may minimize the passage of aquatic life past the intake structures inside the penstocks of the dam and thus minimize entrainment and impingement mortality.

EPA recommends that permitting authorities consider the following factors as relevant to a BPJ-based § 316(b) determination for a cooling water intake structure at a hydroelectric facility to minimize adverse environmental impact. In most cases, EPA expects existing documentation can be used to evaluate these factors. Some facilities may have technologies other than those identified below that may also address adverse environmental impact at the CWIS and that may be used in a BPJ analysis.

Changes made as part of the reconsideration of the January 13, 2021 Framework

This framework revises the version issued by Andrew Sawyers on January 13, 2021 ("January 2021 Framework"). The January 2021 Framework presented several factors as the best technology available (BTA) for hydroelectric facilities which did not make sense when implemented in site-specific and general NPDES permits issued by the Regions. This framework addresses these issues. The key changes to the document and the reasons for the changes are described below:

a. The January 2021 Framework proposed a factor (factor 1) based on the amount of cooling water used per megawatt of electricity generated, as compared to steam electric power plants that reduce their intake volumes by employing closed-cycle cooling. The January 2021 Framework referred to this factor as "efficiency." After further consideration, EPA considers this comparison to be inapt because 1) it does not

[1] Disclaimer: The statements in this document are intended solely as guidance. The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document is not a regulation itself, nor does not it change or substitute for those provisions and regulations. This document is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States. EPA may decide to follow the guidance provided in this document, or to act at variance with the guidance based on its analysis of the specific facts presented. The general description provided here may not apply to a particular situation based upon the circumstances. Interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation. EPA and other decisionmakers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this guidance where appropriate.

contemplate any reduction in cooling water use at a hydroelectric facility and 2) cooling water use at a hydroelectric facility is not directly related to power generation. Closed-cycle recirculating systems at steam electric power plants reduce water withdrawals from CWISs relative to open-cycle cooling systems, which results in a reduction in impingement and entrainment. At hydroelectric facilities, however, there is no reduction in water withdrawals commensurate with a closed-cycle system. Instead, the nature and extent of withdrawals at hydroelectric facilities generally already result in overall low water use. The low volume of water withdrawals at hydroelectric facilities should be considered when determining the BTA for these CWISs, but the comparison to the "efficiency" of a closed-cycle system at a steam electric power plant is illogical because at hydroelectric facilities, cooling water withdrawal is not related to power generation. The artifice of the comparison is clear when the "efficiency" of a hydroelectric facility is compared to the threshold of 460 MWh/BGD used in the January 2021 Framework. A typical hydroelectric facility generates millions of MWh/BGD (i.e., four orders of magnitude greater than a typical steam electric CWIS) because the cooling water use is not directly related to the power generated (i.e., they do not use steam in the power generation process). In addition, a steam electric facility that reduces its intake volume to a level commensurate with closed-cycle cooling, but still employs once-through cooling (for example, by reducing its capacity utilization), does not become any more "efficient" at generating electricity per unit of cooling water used yet may still satisfy the impingement and entrainment standards in the 2014 Existing Facilities Rule. In other words, "efficiency" is not a factor used in the regulations to determine the BTA for any facility subject to that rule. For these reasons, EPA recommends that a comparison of the "efficiency" of a hydroelectric CWIS to a steam electric CWIS not be used, because it lacks both a scientific basis and a foundation in prior 316(b) rulemakings. Accordingly, EPA has revised this factor.

b. The January 2021 Framework discussion of factor 2 stated that hydroelectric facilities that use "5 percent or less of the flow of a river or stream would be deemed to meet BTA requirements to minimize entrainment." This statement is problematic, however, in part because it does not define which river flow should be used as the denominator in the calculation (e.g., 7Q10 low flow or mean annual river flow). In addition, the proportion of the river flow withdrawn as the sole factor for determining the BTA to satisfy § 316(b) conflicts with prior § 316(b) rulemakings. The 2001 Rule for New Facilities ("the Phase I Rule") established that CWISs located in freshwater rivers and streams must withdraw no greater than 5 percent of the source water annual mean flow as one of the requirements to satisfy CWA § 316(b), *see* 40 CFR §§ 125.84(b)(3)(i), 125.84(c)(2)(i), 125.84(d)(2)(i), but the volume of water withdrawn as a percentage of source water flow is not the only requirement necessary to satisfy § 316(b) for these facilities. In the 2014 Final Rule for existing facilities, EPA did not establish requirements based on the proportion of the source waterbody withdrawn for several reasons, including that even relatively low proportional flow can have a large impact on entrainment, especially for multiple facilities located on the same waterbody. *See* Response to Comments on the 2014 Final Rule at 68-9 and Technical Development Document at 5-17. Withdrawal as a percentage of mean annual flow is given as an example of one condition the permitting authority could consider for determining whether an existing facility's impingement rate could be considered de minimis, *see* 79 Fed. Reg. 48,309, but it is not set out as a threshold BTA

below which any individual facility would automatically comply with the entrainment requirements of § 316(b) as proposed in the January 2021 Framework. To the contrary, the 2014 Final Rule suggests that reflexive application of a 5% threshold in the manner suggested by the January 2021 Framework would be inappropriate. Based on data compiled for the Final Rule (Technical Development Document at 4-7 and 5-16), EPA estimates that about 70% of the 331 facilities located on freshwater rivers or streams that would be subject to the Final Rule have actual intake flows less than 5% of the mean annual river flow. If EPA had intended that a withdrawal rate of less than 5% of the river flow satisfied the BTA, most of the existing facilities would automatically comply. *See, e.g.*, Final NPDES Permit for Merrimack Station Response to Comment at III-46 to III-48. The 2014 Final Rule did not establish a flow-based compliance alternative at 40 CFR § 125.94(c) or (d), nor is percentage of source waterbody withdrawn included as one of the factors that must or may be considered for establishing site-specific entrainment requirements under 40 CFR § 125.98(f). The proportion of cooling water withdrawn relative to a source waterbody should be considered as a component of the BTA on a site-specific basis, but to conclude that a hydroelectric facility meets the BTA solely on the basis that it uses 5 percent or less of the flow of a river lacks scientific support and consistency with prior rulemakings.

Thus, the factors EPA recommends permitting authorities consider in developing BTA on a BPJ basis for all hydroelectric facilities are:

1) Volume of cooling water used relative to other power generation facilities and relative to total water use at the facility

- Many power generating facilities use a steam turbine to generate electricity. Significant amounts of cooling water are needed to condense the steam. This is markedly different than the electric power generation at hydroelectric facilities, which use falling water or river currents to spin a turbine. Hydroelectric facilities do not use a steam loop and do not generate the excessive waste heat associated with steam electric power plants. As a result, hydroelectric facilities require relatively low volumes of cooling water as compared to steam electric generators. Thus, the overall low volume of cooling water withdrawn could be a factor that informs the degree of potential entrainment. Cooling water use by a hydroelectric plant is typically limited to cooling the turbine bearings, generator bearings, and gearboxes. The cooling water at hydroelectric facilities is typically withdrawn from falling water that has already been screened for debris. See Section 4.2 of the Technical Development Document for the Final Section 316(b) Existing Facilities Rule[2] (TDD) for more information.
- Based on the cooling water used relative to cooling water use in other industries and as a proportion of the total flow of water diverted through the facility, facilities may be deemed to comply with BTA requirements to minimize entrainment. The volume of water used for cooling at some hydroelectric facilities is a fraction of the cooling water as compared to other electrical generating units, such as steam electric generating units. For facilities that withdraw cooling water from within the dam structure (e.g., from the penstock or scroll case), an applicant could demonstrate that impingement and

[2] Technical Development Document for the Final Section 316(b) Existing Facilities Rule EPA-821-R-14-002, May 2014, available at https://www.epa.gov/sites/default/files/2015-04/documents/cooling-water_phase-4_tdd_2014.pdf

entrainment are minimized based on the minimal volume of water withdrawn for cooling in proportion to the water drawn into the penstock. For example, the cooling water volume of many hydroelectric facilities is less than 0.1% of the volume drawn through the dam (calculated as: (volume of cooling water/volume of turbine capacity) multiplied by 100).

2) Cooling water withdrawn relative to waterbody flow

- In previous rulemakings, EPA stated that

  Entrainment is generally considered to be proportional to flow and therefore a reduction in flow results in a proportional reduction in entrainment, as EPA assumes for purposes of national rulemaking that entrainable organisms are uniformly distributed throughout the source water. EPA has consistently applied this assumption throughout the 316(b) rulemaking process . . . and continues to assume that it is broadly applicable on a national scale . . . .[3]

  Thus, using a low percentage of the mean annual flow of the waterbody for cooling could be a factor that informs the degree of potential entrainment. A facility that uses a very low percentage of the mean annual flow of a river or stream may be deemed to meet BTA requirements to minimize entrainment after consideration of the potential cumulative impacts with co-located cooling water intakes and other relevant factors. Cooling water withdrawn at hydroelectric facilities is typically a small fraction of the overall river flow (to account for flow through fish passage structures or over spillways), often less than 1%.

Proportional flow requirements only address entrainment as most passive floating organisms that are addressed by this factor are not of impingeable size. Thus, EPA will consider proportional flow as a factor for entrainment, but not for impingement.

3) Location of the intake structure

- Hydroelectric facilities vary significantly in terms of design and configuration, especially when it comes to the pipes and structures that divert water for purposes of cooling. Generally, water diverted for cooling is primarily sourced from three locations within the hydroelectric facility: (1) the penstock – a closed conduit or pipe that conveys water from the reservoir to the turbine, (2) the turbine scroll case – a spiral-shaped steel structure distributing water flow through the wicket gates located just prior to the turbine, or (3) a water inlet port located on the face of the dam. There may be other location-specific designs or configurations, because each facility has a unique, location-specific design to take maximum advantage of the hydraulics of that location.
- EPA identified that the location of the intake could be a factor that minimizes both impingement and entrainment. Location of the intake in areas with lower densities of impingeable or entrainable organisms will minimize the adverse impacts associated with the use of the CWIS.

[3] 79 Fed. Reg. 48,300 at 48,331 n.48 (internal citations omitted). August 15, 2014.

- Generally, dams are designed such that the location of the penstock openings on the dam face are at a depth with a lower density of organisms to reduce entrainment through the dam thus minimizing impacts from the operations of the turbine. As the CWIS is within the dam, there is a similar reduction in the density of organisms as compared to an intake on the face of the dam or in the waterbody itself.
- As described above, some dams have water inlet ports on the face of the dam or in the waterbody so this may not be applicable to all hydroelectric facilities. Even in these cases, the permitting authority may determine that no further controls are necessary, based on BPJ, to meet BTA requirements to minimize entrainment.

4) Technologies at the facility

- Design of the facility can also be a factor the permitting authority can consider in determining whether there are technologies that are sufficient to minimize impingement and entrainment. For example, many hydroelectric facilities have some form of technology at the inlet of the dam; generally this was intended for debris protection, but depending on the intake velocity, it could also provide a level of protection, compared to an open pipe, for organisms that are able swim away.
- Most hydroelectric facility cooling water intakes rely upon a passive gravity feed that in some cases might result in a lower initial intake velocity than a pumped system. In such a case, organisms may have enough motility that when they sense the opening of the intake, they have an avoidance response that allows them to swim away and avoid being drawn into the intake. In addition, for cooling water intakes located in a penstock or turbine scroll case, the velocity of water moving through the system to drive turbines may be higher than the velocity into the cooling water intake. This higher velocity along the opening of the cooling water intake may result in organisms being swept past the intake, thus minimizing impingement.

EPA recommends that permit writers consider the four factors as relevant to determining the BTA for a hydroelectric facility on a BPJ basis. The weight given to each of the factors may be assigned by the permitting authority. As described above, EPA generally expects that a hydroelectric facility's existing controls are technologies that can be determined to satisfy the BTA requirement to minimize entrainment and impingement mortality. As also noted above, EPA expects that, in most cases, existing documentation may be used to evaluate these factors and that the selection and use of documentation and data for this purpose will be relatively straightforward.