Appendix A for DOA Form 2049
For
NR111 Rule Background:
Annualized Costs of Compliance to Regulated Entities

April 2019

Background
The department currently regulates impingement and entrainment at cooling water intake structures by requiring use of the best technology available (BTA), as determined using best professional judgment (BPJ) and on a case-by-case basis. This authority is granted under s. 283.31(6), Wis. Stats. In 2002 and 2014, respectively, the EPA promulgated rules that specify requirements for New Facilities and Existing Facilities that address impingement and entrainment at cooling water intake structures. The department is working on rule development to adopt the new facilities and existing facilities rules (40 CFR 122-125) as a state rule.

The department made estimates by assuming typical costs of compliance with the Federal rule. For example, the department assumed that many permittees will comply by installing submerged passive screen intakes or traveling screens with fish return and that a small number of permittees will need to install cooling towers. Some permittees in the state might choose to install technologies different than assumed here. To the extent that permittees install different technologies and to the extent costs are significantly different from the assumed technologies, estimates of costs on the statewide basis will be higher or lower than assumed. As a further example, the department estimated costs for traveling screens based on a design intake flow of 90 MGD (the average design intake flow for facilities not currently in compliance with the 0.5 fps standard that are <125 MGD). To the extent that permittees have flow rates greater or less than the assumed flow, estimates of costs on the statewide basis will be higher or lower than assumed.

Summary

This proposed State rule does not add any additional compliance cost to impacted facilities beyond what Federal EPA standards require. **The cost analysis presented below is for the cost of compliance with the Federal regulations**.

The long term annual costs as a low or least costly estimate are $13 million per year for all facilities in the state (2019 dollars).

Procedures:
This document shows calculation of costs for two scenarios:

- Maximum Annual Costs per Year for any Permittees
- Long term Annualized Costs per Year for All Permittees

Costs of compliance, in general, consist of capital costs and cost of operation and maintenance (O&M). The permittees that are subject to these requirements will in almost all cases annualize the capital costs over a period estimated to be 10 to 30 years. Note that EPA in various rule development documents refers to useful life of 10 to 30 years. The useful life will depend on specifics of the facility and on the technology and actions taken to comply (as shown below, the department used 20 years an average useful life). Therefore, the annual costs are the total of annual capital costs and O&M cost per year.

Cost per year = annual capital cost + O&M cost per year

The cost of compliance for a specific individual permittee will in most cases start when the department issues the permit requiring compliance with the regulation. The details will depend on the permittee's size and impacts on the fish and shellfish in the location where the intake is located. Note that the specific requirements will be based on a case-by-case permittee specific determination in the permit based on standards for minimizing impingement and Best Professional Judgment (BPJ) for minimizing entrainment. For this analysis, the department observed permittees' intake flow rates and velocities and, based on these, separated permittees into four categories. Associated with each category is an estimate of costs of compliance based on the technical and regulatory complexity of each scenario. It is important to note that these are estimates; some permittees in one category may experience compliance costs more closely commensurate with compliance costs projected for a facility of a different category due to site specific factors. Also, these projections should not be interpreted as a department indication as to whether a specific facility is or is not in compliance with best technology available requirements; these site-specific decisions will be made during each facility's permitting process. Flow rates and through screen velocities were taken from fact sheets, permit applications, and application attachments where the values were available.

Four Categories Showing Qualitative Requirements

Category of Facility	Count of Facilities in State (#)	Status	Capital Requirements	O&M Requirements
1	3	Currently in compliance with 0.5 fps standard; smaller intake (<12 MGD DIF)	Not needed	O&M is assumed to be ½ of EPA's average O&M estimates because these are smaller facilities.
2	9	Currently in compliance with 0.5 fps standard; larger intake (>12 MGD DIF)	Not needed	O&M is assumed to be at EPA average O&M estimates because these facilities have a larger intake relative to smaller facilities.
3	14	Not in compliance with 0.5 fps standard; smaller intake (<125 MGD AIF) or compliance is expected to have low costs.	Less expensive technology required: Examples include passive screens or fish return.	O&M is assumed to be at EPA's average O&M estimates.
4	2	Not in compliance with 0.5 fps standard; larger intake (>125 MGD AIF) or expected to have high costs	More expensive technology required: Most likely technology to be used will be a closed cycle recirculating system (cooling	O&M is assumed to be at EPA's average O&M estimates.

			tower), where offshore intakes do not already exist.	

As noted above, capital costs will typically be annualized. The main result of this is that the maximum costs in a two-year period will probably occur in the long term when all facilities have received permits and have started both payment of debt and O&M cost per year.

Maximum Total Annual Costs per Year in any Two Year Window for All Permittees = Long Term Annual Costs per Year for All Permittees

To estimate annual capital cost and O&M cost per year, the department estimated costs for each category. Capital costs were annualized based on 20 years and 5% discount rate. Note that EPA in various rule development documents refers to useful life of 10 to 30 years (the department used 20 years as an average useful life).

Annualized Capital Cost Factor (20 years at 5% discount rate) = 0.08

O&M COST PER YEAR

The department used estimates for O&M cost per year that EPA prepared for the rule (see References below).

The maximum cost a facility is estimated to incur for its monitoring, record keeping, and reporting activities is approximately $84,361/facility/year to $99,900/facility/year in 2002 dollars ($119,902 to $141,988 in 2019 dollars) for Freshwater River/Stream, Lake, and Great Lake.

Using the mean of the range or $131,000/facility/year for all of the categories except category 1: for category 1, the department assumed costs would be one half of EPA's estimate because costs are expected to be smaller for less complicated compliance options.

O&M cost per year (2019 dollars) = $131,000/facility/year for all groups except category 1
O&M cost per year (2019 dollars) = $65,500/facility/year for category 1

ANNUAL CAPITAL COST

The department considered submerged passive screen intakes and traveling screens with fish return as two examples of less expensive technology and considered recirculating systems as a more expensive technology.

Less expensive technology

The department used estimates for Submerged Passive Screen Intakes and Traveling Screens with Fish Return that EPA prepared for the rule (see References below).

For this section the department used the average design intake flow of Category 3 facilities. This flow was 90 MGD.

Example of installed fine and very fine mesh t-screen system at existing shoreline based intakes:

Using the EPA's capital cost estimates, the cost range for submerged passive screen intakes, the department estimated $880,339/facility to $5,971,492 in 2002 dollars ($1,254,225/facility to $8,487,274/facility in 2019 dollars) for freshwater installations at locations 20 meters offshore to 500 meters offshore[1].

Example of capital cost of traveling screen with fish return:

The capital cost of traveling screen equipment is highly dependent on the size and surface area of the screens employed. Given the water depth, intake flow, and through screen velocity, the aggregate width of the intake screens can be estimated using the following equation:

Screen Width (Ft) =
Design Flow (cfs) / (Screen Velocity (fps) x Water Depth (Ft) x Open Area (decimal %))

For a mesh size of 3/8 inch, the corresponding percent open area for a square mesh screen using 14-gauge wire is 68%.

EPA reported that the median value of the ratio of the water depth to the screen well depth for all facilities that reported was 0.66. Thus, based on median reported values, the screen well depth can be estimated by assuming it is 1.5 times the water depth where only water depth is reported. For the previous rule for those facilities that reported water depth data, the median water depth at the intake was 18.0 ft.

For this estimate DNR assumed the medium water depth of 18 feet and intake flow of 90 MGD (139.3 cubic feet per second) to calculate screen width of 22.5 feet at the standard of 0.5 fps.

22.5 = 139.3/(0.5 x 18 x 0.68)

The well depth is then 27 feet.

27 = 18 x 1.5

For adding fine mesh with fish handling and return freshwater environments EPA shows costs as $436,224/facility to $661,024/facility per facility in 2002 dollars ($620,005/facility to $939,513/facility in 2019 dollars) for total width of 20 feet and range of well depth from 25 to 50 feet. The department used the estimate based on a screen with width of 30 feet.

In conclusion, the department estimates a capital cost per facility for scenarios where a less expensive technology is required is in the range of $620,005/facility to $8,487,274/facility (2019 dollars).
The mean of the range is $4,553,640/facility (2019 dollars)

The department used the mean of the range as an estimate of capital cost per facility for scenarios where a less expensive technology is required.
The department estimated the average capital cost for scenarios where a less expensive technology is required is $ 4,553,640/facility (2019 dollars).

[1]From equations in Figure 1-2: Capitol Cost for Fie Mesh Passive Screen Relocation Offshore in Freshwater at 20 m and Figure 1-7: Capital Costs for Very Fine Mesh Passive Screen Relocation Offshore in Freshwater with Zebra Mussels at 500 m

The department assumed the Annualized Capital Cost Factor (20 years at 5% discount) = 0.08 is applicable to scenarios where less expensive technology is required.

The department estimated annual capital cost per facility for scenarios where a less expensive technology is required is $364,291/facility/year = $4,553,640/facility (2019 dollars) x 0.08 (2019 dollars).

More expensive technology.

The department used estimates for recirculating systems that the EPA used for the rule (see References below).

EPA estimates that wet cooling towers will cost $263/gpm (2009 dollars) of water (for installations of average difficulty). Addition of plume abatement technology is predicted to increase capital cost by $120/gpm (2009 dollars).

Based on a small facility with 125 MGD the EPA based estimate per is $23 million /facility to $33 million /facility (2009 dollars) per facility or $27.5 million /facility to $40 million /facility (2019 dollars).

In conclusion, the department estimates an annual capital cost for scenarios where a more expensive technology is required is in the range of $27.5 million to $40 million (2019 dollars).
The department used the low value of the range as an estimate of capital cost for scenarios where a more expensive technology is required.
The department estimated capital cost per facility for scenarios where a more expensive technology is required is $27.5 million /facility (2019 dollars).
The department assumed the Annualized Capital Cost Factor (20 years at 5% discount) = 0.08 is applicable to scenarios where more expensive technology is required.
The department estimated annual capital cost per facility for scenarios where a more expensive technology is required is $2,200,000/year/facility = $27,500,000/facility x 0.08.

COST PER YEAR

Cost per year = annual capital cost + O&M cost per year

The following table shows the total cost per year based on the above estimates.

Four Categories Showing Estimated Costs per Facility (2019 dollars)

Category of Facility	Capital Cost		O&M Cost		Total Annual Cost Per Year ($/facility/year)
	Capital Requirements	Capital Cost ($/facility/year)	O&M Requirements	O&M Cost ($/facility/year)	
1	Not needed	0	½ of EPA's average O&M estimate	65,500	65,500
2	Not needed	0	EPA average O&M estimate	131,000	131,000
3	Less expensive technology	364,291	EPA's average O&M estimate	131,000	495,291
4	More expensive technology required	2,200,000	EPA's average O&M estimate	131,000	2,331,000

The following table summarizes statewide costs based on the above estimates.

Four Categories Showing Long Term Annualized Costs of Compliance Statewide (2019 dollars)

Category of Facility	Count of Facilities in State (#)	Annual Capital And O&M Cost Per Year For Facility In A Category ($/facility/year)	Total Of Annual Capital And O&M Cost Per Year For State For All Facilities In A Category ($/state/year)
1	3	65,500	196,500
2	9	131,000	1,179,000
3	14	495,291	6,934,074
4	2	2,331,000	4,662,000
State total for all categories	28	NA	12,971,574

Based on these estimates, the long term annual cost to come into compliance with the federal rule for the entire state is $13 million per year (2019 dollars). The total in any 2-year window would be two times the long term annual cost or $26 million for a two year period (2019 dollars).

In conclusion, costs are difficult to estimate because the cost of technology will depend on case-by-case permit decision for each facility. The costs here are based on lower end estimates of likely scenarios.

References:
The department used estimates for O&M cost per year from the following EPA document.

- Economic and Benefits Analysis for the Final Section 316(b) Phase II Existing Facilities Rule. EPA-821-R-04-005. February 2004.

    - Table B1-4 lists the estimated costs of each of the monitoring, record keeping, and reporting activities described in the EPA report. Certain activities are expected to be more costly for marine facilities than for freshwater facilities.

The department used estimates for capital costs for fine mesh screens and very fine mesh screens and travelling screens from the following EPA document.

- Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule EPA 821-R-04-007 DCN 6-0004 February 12, 2004.

    - Figure 1-2 presents the total capital costs of the complete system for fine mesh screens in freshwater at selected offshore distances. Figure 1-7 presents the total capital costs of the complete system for fine mesh screens in freshwater with Zebra Mussels at selected offshore distances.

    - Section 2.1 explains how width and depth can be estimated.

    - Table 2-12, Total Capital Costs for Scenario C - Adding Fine Mesh with Fish Handling and Return Freshwater Environments shows costs as $436,224 to $661,024 (2002 dollars) for total width of 20 feet and range of well depth from 25 to 50 feet.

The department used estimates for recirculating systems from the following EPA document.

- "Technical Development Document for the Final Section 316(b) Existing Facilities Rule," U.S. Environmental Protection Agency EPA-821-R-14-002 (May 2014).