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we energies

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December 24, 2004

Mr. Paul Luebke
~~Director,~~ Bureau of Watershed Management
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

SUBJECT: WPDES Permit No. WI-0000957-07-0
Wisconsin Electric Power Company-Point Beach Nuclear Plant
Proposal for Information Collection-
Cooling Water Intake Structure

Dear Mr. Luebke:

As required by U.S. EPA's recently promulgated Final Regulations establishing requirements for cooling water intake structures (69 FR 41576), Wisconsin Electric Power Company, conducting business as We-Energies, is providing our Proposal for Information Collection (PIC). The contents of this PIC have been specified by Section 125.95 of this rule. According to 125.95, the licensee is to provide the State Director:

- A description of the proposed and /or implemented technologies and /or restoration measures to be evaluated in the Compliance Demonstration Study (CDS);
- A list and description of any historical studies characterizing impingement and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to the proposed CDS;
- A summary of any past ,ongoing, or voluntary consultations with appropriate Federal, State, or Tribal fish and wildlife agencies that are relevant to the CDS;
- A sampling plan for any new field studies we propose to conduct in order to ensure sufficient data for developing scientifically valid estimates of impingement and entrainment for the cooling water system in question.

To this end, the PIC for Point Beach Nuclear Plant is attached. Development of final study plans will occur via consultation with you and /or your designees prior to studies being undertaken.

If you have any questions regarding this matter, please contact me at (414)-221-3235. You may also contact David Michaud at (414)-221-2187 with questions regarding this submittal.

Sincerely,

Elizabeth Hellman

Elizabeth Hellman

Enclosures

cc: Mr. Russell Rasmussen, DNR- Madison
Mr. David Gerdman, DNR-Mishicot Office

Proposal for Information Collection
Prepared as Part of the CWA Section 316(b) Phase II Compliance Effort

Point Beach Nuclear Plant
6610 Nuclear Road
Two Rivers, WI 54241

NPDES Facility Number WI-000095-7

December 24, 2004

Prepared for:
We Energies

Prepared by:
ENSR International

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TABLES

APPENDICES

EXECUTIVE SUMMARY

The Point Beach Nuclear Plant (PBNP) is subject to both the impingement mortality and entrainment performance goals under the Section 316(b) Phase II Rule (Rule).

The current cooling water intake structure is located 1,750 feet offshore in approximately 22 feet of water. The structure consists of a ring of stone blocks with gaps between the rocks and three large diameter pipes. The structure was recently cut down to submerge it in about 10 feet of water. This submergence has apparently been effective at reducing the encounters between alewife schools, which congregate in the thermal plume, and the structure. The submergence of the structure has also substantially reduced cormorant entry into the offshore intake. The top of the reconfigured structure is covered with a plastic grate to exclude debris. A high-frequency acoustic deterrence system is seasonally deployed and has been optimized to deter alewife. Traveling water screens are located in the pump house and are equipped with a system that returns fish to the discharge canal. Therefore, because alewife represent the majority of the impinged fish (about 85%) and the offshore intake, with its sonic deterrent, is designed to greatly limit alewife from entering the intake, the combination of these factors suggests that the impingement mortality goal is likely to be met at PBNP. For this reason, We Energies will pursue Compliance Alternative 2, demonstrating that existing technologies or measures meet the Rule's goals, for impingement mortality.

While the offshore location is likely to reduce the rate of entrainment relative to the calculated baseline (shoreline) condition, the magnitude of the effect is uncertain. Therefore, We Energies staff are not certain that this location is likely to be fully effective at achieving the entrainment performance goal of the Rule. On the other hand, We Energies staff believe that any entrainment control technology is not likely to be cost-effective and also will be prone to blockage caused by icing or aquatic vegetation. Therefore, entrainment control technologies may not be acceptable to Nuclear Regulatory Commission (NRC) on safety and reliability grounds. For this reason, We Energies intends to pursue Compliance Alternative 5 based on the cost-benefit test.

This document provides a focused review of available mitigation technologies and concludes that no impingement mortality measure is likely to be more cost-effective than the current configuration. The measures to mitigate entrainment are also reviewed and, as noted above, no technology is found to be suitable. The potential for restoration measures to be cost-effective will be evaluated further as part of the Comprehensive Demonstration Study (CDS).

Significant literature is available on the fisheries of Lake Michigan and their interaction with once-through cooling systems. This includes a comprehensive study performed at PBNP from 1975 to 1976. We Energies staff believe that the existing data are very useful, but proposes to supplement them with one additional year of data collection. The current rates of impingement with the reconfigured structure will be quantified on a weekly basis and compared to historical rates. Rates of entrainment will also be measured weekly to serve as the basis for estimation of the monetized benefits as part of Compliance Alternative 5.

The proposed component chapters of the CDS are listed and a tentative schedule for its completion consistent with the WPDES permit renewal and the compliance schedule is presented.

The procedures for sample collection, analysis, and reporting are presented and are consistent with recent WDNR-approved procedures.

1.0 INTRODUCTION

PBNP is located on the shore of Lake Michigan about 80 miles north of Milwaukee in Manitowoc County. This facility has two steam generating reactor units and is rated to generate 1,050 MW.

The goals of this Proposal for Information Collection (PIC) for PBNP include the following:

- Address the requirements of the Code of Federal Regulations (CFR), Title 40, Section 125.95(b)(1); and
- Facilitate the compliance process by explaining We Energies' proposed approach.

40 CFR Section 125.95(b)(1) describes the PIC requirements as follows:

> "You must submit to the Director for review and comment a description of the information you will use to support your Study. The Proposal for Information must be submitted prior to the start of information collection activities, but you may initiate such activities prior to receiving comment from the Director. The proposal must include:
>
> (i) A description of the proposed and/or implemented technologies, operational measures, and/or restoration measures to be evaluated in the Study;
>
> (ii) A list and description of any historical studies characterizing impingement mortality and entrainment and/or physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to this proposed Study. If you propose to use existing data, you must demonstrate the extent to which the data are representative of current conditions and that the data were collected using appropriate quality assurance/quality control procedures;
>
> (iii) A summary of any past or ongoing consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to this Study and a copy of written comments received as a result of such consultations; and
>
> (iv) A sampling plan for any new field studies you propose to conduct in order to ensure that you have sufficient data to develop a scientifically valid estimate of impingement mortality and entrainment at your site. The sampling plan must document all methods and quality assurance/quality control procedures for sampling and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and include consideration of the methods used in other studies performed in the source waterbody. The sampling plan must include a description of the study area (including the area of influence of the cooling water intake structure(s)), and provide a taxonomic identification of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish)."

The following tabulation provides the section of the PIC where each of the above mentioned regulatory requirements are presented.

Regulatory Requirement	PIC Section
§ 125.95(b)(1)(i) – Review of Measures and Technologies	2.0
§125.95(b)(1)(ii) – Historical Studies	3.0
§ 125.95(b)(1)(iii) – Agency Consultations	4.0
§ 125.95(b)(1)(iv) – Proposed Sampling Plan	6.0

The Phase II Rule allows for significant discretion by the WDNR Director during the implementation process. In fact, the Rule allows for flexibility in the compliance approach taken at a facility by including several specific criteria associated with assessing compliance including:

- On which species and life stages to base the compliance assessment;
- Whether to base the assessment on numbers of individuals or biomass;
- The specifics of estimating the Calculation Baseline condition;
- The averaging period to use in estimating the Calculation Baseline or assessing compliance;
- The ability to discount "unavoidable, episodic impingement or entrainment events" in the assessment of performance;
- The specific design parameters (e.g., slot size) for the cooling water intake structure (CWIS);
- The need for, and nature of, peer review for assessment of restoration and/or monetized benefits;
- The need for additional information collection to support the CDS;
- The nature of the Technology Installation and Operation Plan;
- The nature of Approved Technology (i.e., Compliance Option 4);
- The definition of "significantly greater" under site-specific Best Technology Available (BTA); and
- The timing of the component reports of the CDS.

We Energies staff believe that this level of discretion allows WDNR to oversee a focused and efficient compliance program to:

- Assess the current performance of the CWIS and operation/restoration measures;
- Review the alternative measures for ones that are feasible and cost effective;
- If appropriate, implement cost-effective measures; and
- Develop a CDS within the context of one of the Rule's compliance approaches.

Toward this end, We Energies has prepared this PIC that both addresses the requirements of the Rule and defines We Energies recommended Phase II compliance program.

1.1 Goals, Process, and Timing of the Rule

The U.S. Environmental Protection Agency (EPA) has produced final regulations under Clean Water Act Section 316(b) that establish performance standards for existing CWISs for electricity generators using in excess of 50 million gallons per day (MGD). The so-called Phase II Rule was published in the Federal Register on July 9, 2004 and became effective on September 7, 2004.

The Phase II Rule calls for an 80 to 95 percent reduction in impingement mortality from the "calculation baseline," essentially the impingement mortality rate at a similarly sized once-through shoreline CWIS with no impingement and/or entrainment reduction controls at the same location. These rates of protection are deemed by EPA to be "commensurate with closed cycle cooling." There is no requirement for power plants to adopt closed-cycle cooling. The Rule also provides for site-specific BTA in the event that site specific costs of compliance are "significantly greater" than either the costs estimated by EPA for the station or for the monetized benefits of compliance at the station.

The Rule allows for five different means of demonstrating compliance with the requirements of the Rule.

- Option #1: Flow Reduction. Under Option 1(a) the facility owner can demonstrate that it uses closed-cycle cooling to show compliance with the Rule. Alternatively, if the through-screen velocity can be shown to be less than or equal to 0.5 ft/s, the performance goals relative to impingement mortality will be deemed to be met under Option 1(b). This latter approach does not address the potential entrainment performance goals, if applicable.
- Option #2: Demonstrate that the current system achieves the relevant goals. Through the execution of a CDS, the plant can show that it is currently meeting the performance goals through some combination of technologies as well as operation and restoration measures.
- Option #3: Demonstrate that a newly installed and operated system (i.e., technology and operation/restoration measures) will meet the goals. Again, through development of a CDS, the plant can design and implement a set of controls estimated to achieve the performance goals.
- Option #4: Install and operate an approved technology. As part of the Rule, EPA designated wedge wire screens in a riverine environment as an approved technology. Proper installation and operation of this technology will meet the goals of the Rule. NPDES Permit Directors have the ability to designate other technologies as "Approved."
- Option #5: Site-Specific BTA. Under this option, the facility can show that the actual costs of compliance are "significantly greater" than either the costs or benefits assumed by EPA. Under this option, the plant is still required to pursue "cost-effective measures."

These various options are each associated with differing requirements relative to the CDS. Under Option 1(a), no CDS is required, while under some of the other options, relatively extensive field and design work may be required along with submittal of up to several documents.

1.2 PIC Schedule

Under a Compliance Schedule in the current WPDES permit, this PIC is required to be submitted to WDNR by December 31, 2004. Under the provisions of the Rule, WDNR has 60 days to review and comment on the PIC. Under the same Compliance Schedule, the CDS is due for submittal to WDNR on or before December 31, 2007.

1.3 Specific Goals of this PIC

PBNP is affected by both the impingement and entrainment performance goals of the Phase II Rule.

We Energies staff have taken several measures to mitigate impingement mortality and entrainment at PBNP:

- Traveling water screens (3/8-inch mesh) are operational at the pump house with relatively low through-screen velocity. A screen wash is present and a fish return system is operational. Together, these measures are likely to reduce the mortality of at least some impinged fish.
- The CWIS is located 1,750 feet offshore in 22 feet of water. At this location the population density of both adult fish and ichthyoplankton is likely to be reduced relative to a shoreline location.
- The emergent crib CWIS was cut down so that it is approximately 8 feet tall (from the lake bottom). This was done to reduce the interaction of the CWIS with schools of fish that dwell on the surface in warmer water and birds that roosted on the structure. Such interaction had resulted in significant impingement of alewife in the past.
- The CWIS as been outfitted with an acoustic deterrence system (125 kHz) specifically designed to deter alewife. The deterrence system is deployed only during the warmer months in order to prevent ice damage to the electronic equipment. This deployment corresponds to the period during which the vast majority of impingement has historically occurred.

We Energies believes that the impingement mortality at the PBNP is likely to be reduced consistent with the goals of the Rule. The CDS proposed for impingement mortality reduction will focus on demonstrating that this performance standard is being achieved under Compliance Option #2 of the Rule.

We Energies staff believe that no technology is likely to be feasible or cost-effective at reducing entrainment to the full performance goal. This is especially important given the rigorous safety and reliability requirements of the NRC (see 40 CFR 125.94(f)). For these reasons, We Energies proposes to pursue Compliance Alternative 5 based on the cost-benefit test and will collect data to support the estimation of monetized benefits of entrainment reduction.

1.4 Review of Document Organization

Discussion of existing and potential additional technologies and measures to mitigate impingement mortality and entrainment are presented in Section 2. The nature of historical studies and the resulting data are summarized in Section 3. The potential utility of these data to support the CDS are also discussed. Section 4 presents a review of relevant agency consultations. We Energies' proposed compliance strategy is summarized in Section 5. Section 6 presents the proposed sampling workplan.

2.0 TECHNOLOGIES, OPERATIONAL AND RESTORATION MEASURES

This section will review current and potential future technologies, operational, and restoration measures relative to their potential to cost-effectively meet the performance standards of the Rule.

2.1 In-place Technologies

This section describes the current CWIS as well as its apparent performance relative to the performance goals of the Rule.

A concise summary of PBNP, its CWIS, and the available data is provided in Table 2-1. The findings described in this table are presented in more detail below.

2.1.1 Review of Technologies and Operational Measures

Once-through cooling water is withdrawn from Lake Michigan through an intake crib located 1,750 feet offshore in about 22 feet of water. The CWIS consists of two annular rings of steel piles driven into the lake bed, 110 feet outside diameter, with the annulus filled with limestone blocks. Water is drawn through the limestone blocks and concrete encased 30-inch corrugated galvanized steel pipes. Water flows from the intake to the pump house through two 14-foot diameter, corrugated, galvanized, structural steel plate pipes buried beneath the lake bed. CWIS design capacity is 1,008 MGD. Water passes through vertical bar racks (3/8-inch by 4-inch, with 2 ¼-inch spacing on center) in the forebay and eight traveling bar screens (3/8-inch mesh, 11 feet wide) at the pump house. The traveling screens use an 80 psi screen wash which is sent to a filter basket. Fish and debris return is via a 24-inch pipe to the Unit 2 discharge flume, 80 feet away. During the winter season, warm water can be recirculated to the crib in order to minimize build up of ice.

Prior to 2001, the CWIS crib emerged from the water. For this reason, water was drawn into the crib from the entire water column. This design was re-evaluated approximately four years ago due to episodes of cormorant impingement. In addition, at certain times of the year, alewife were attracted to the thermal plume emanating from PBNP. Occasionally, this plume, which floats on the lake surface, would encounter the emergent CWIS resulting in significant impingement events. In 2001, such an event caused forced plant outages. To address both issues, the emergent crib was cut down so that it is approximately 8 feet tall (from the lake bottom).

The resulting crib contains three concrete conduits through its wall and continues to draw water through the blocks of the wall. The top of the crib is now covered by a "super-plastic" grating designed to exclude debris from the crib. Velocities in the vicinity of the crib during operation have been measured. Velocities as high as 2.0 ft/sec have been measured but most velocities are far lower than that. Based on these measurements, it has been estimated that approximately one-half of the intake flow occurs through the cap with the other half through the walls of the crib.

In addition to changing the configuration of the crib, the CWIS has been outfitted with an acoustic deterrence system intended to reduce impingement of alewife. The sound frequency (125 kHz) has been shown to be very effective at deterring alewife, but may be less so for other species.

The reconfigured CWIS has been in place for approximately two years including two seasons in which alewife potentially interact with the thermal plume. Observations by plant staff support the effectiveness of the changes at reducing alewife impingement. In particular, there has been no significant alewife impingement event that has forced a power generation outage.

No specific measures have been taken to reduce entrainment at PBNP. Despite this, based on patterns of ichthyoplankton density observed in several locations in Lake Michigan, there is likely to be a benefit associated with the location of the CWIS in an offshore location. Quantification of this benefit is not possible based on existing data; therefore, existing data will not likely support a demonstration of the Rule's entrainment performance goal.

2.1.2 Restoration Measures

No restoration measure has been performed to date.

2.1.3 Performance Estimates

Estimates of performance relative to the Rule's goals are contained in Table 2-2. The following paragraphs provide discussion of how these performances were estimated.

Available data include intake monitoring studies conducted by Wisconsin Electric Power Company in 1976 at the request of WDNR. These studies concluded, and WDNR concurred, that the adverse environmental impacts (AEI) from impingement and entrainment from the facility was insignificant. During the 1975 to 1976 study, the rates of impingement at the plant were greatly dominated by alewife (i.e., 84.5% of impinged fish). While it is widely reported that alewife stocks have declined in recent years, data collected in 2004 from We Energies' Port Washington Power Plant (PWPP) indicate that alewife still greatly dominate the numbers of impinged fish. It is likely that the changes to the CWIS have greatly mitigated the rates of alewife impingement.

Entrainment was also characterized in 49 sampling events during the 1975 to 1976 study. Densities of ichthyoplankton sampled near the intake crib were not significantly different than those observed at an up-current reference location at the same water depth. Densities of ichthyoplankton were lower in the intake flow than in either ambient sample set. Michaud (1981) found that the PBNP had the lowest density of entrained organisms of the three We Energies Lake Michigan plants. This difference is likely attributable to the nature and location of the PBNP's CWIS relative to the onshore structures at the other two plants.

Following the reconfiguration of the CWIS, We Energies has made anecdotal observations of the effectiveness of the retrofits relative to the alewife impingement. In

Table 2-2, We Energies has developed a screening assessment of the effectiveness of each of the various measures or technology. While these estimates are approximate, we believe that they are reasonable assessments of performance. A major goal of the CDS will be to confirm these estimates.

2.2 Potential Technologies

A summary of general technologies and operational measures available to address impingement mortality and entrainment are presented in Table 2-3. This table presents the technology, estimated effectiveness in addressing impingement mortality and entrainment, estimated technology cost, and notes on why or why not the technology was retained for further feasibility analysis. Appendix A provides a more in-depth analysis of each technology and operational measure considered in Table 2-3. A specific discussion of those technologies that we considered most promising for PBNP is provided in Section 2.2.1. A specific discussion on operational measures is provided in Section 2.2.2.

2.2.1 Review of Technologies

The following criteria are used to assess the technologies and operational measures presented in Table 2-3:

- Technical feasibility and reliability;
- Effectiveness in meeting the Rule's performance goals;
- Costs relative to EPA estimate developed as part of the Rule-making;
- Potential for other adverse effects; and
- Compatible with NRC regulations and 40 CFR 125.94(f).

Site-specific technologies considered for PBNP included:

- Traveling screen modifications;
- Fixed screen devices;
- New intake location; and
- Fish diversion and avoidance.

These technologies could further reduce the level of impingement mortality if the current off-shore structure and associated acoustic deterrent system is found to not be capable of achieving the performance standard. Fine mesh screens can reduce entrainment; however, some species that would be entrained and subsequently survive may not survive impingement on fine mesh screens.

Traveling Screen Modifications

Course Mesh Screens: The eight 10-foot wide coarse mesh traveling screens are located at the end of the intake tunnel in an enclosed area with limited overhead access and a trash rack just upstream of the screens. Therefore, a major modification to the intake screens (dual flow, angled, or inclined) to reduce through screen velocity or improve impingement mortality performance may pose significant engineering challenges and possible major modifications to the intake pump house that contains the existing traveling screens. Assuming that such screens could be installed with minor intake structure modifications, the cost for either was estimated to be $3M. The dual flow screen option that was considered would, by design, reduce the through screen velocity to 0.5 ft/s. To achieve this velocity, the existing flow through screens would be replaced with eight new 12-ft dual flow, 3/8-inch mesh screens in the existing structure. Either option (dual flow coarse mesh or angled/inclined) would not reduce entrainment. Ristroph screens (for reduction of impingement mortality only) are feasible and would require the addition of screen baskets and low pressure wash. The design of the fish return will be critical to ensure survival of the fish being returned. The cost of these modifications (screen modifications, low pressure wash, and new fish return system) is estimated to be $4M.

Fine Mesh Screens: Replacement of existing coarse mesh screens with fine mesh will increase the through screen velocity by nearly 50% because of the smaller open area with fine mesh. Another factor to consider is that the through screen velocity should be no more than 0.5 ft/s to minimize mortality of impinged species. Based on a calculated through screen velocity of 1.2 ft/s under current design conditions, the screen area for fine mesh screens would have to be increased by a factor of 3.2 to provide the appropriate through screen velocity for survival of impinged larvae. As stated above, major modifications to the intake structure would be needed to accommodate the increased screen area. Therefore, fine mesh screens are rejected on an economic basis. Capital cost for the required screens (not including major intake modifications) is estimated to be $9M.

<u>Fixed Screening Devices</u>

Installation of a fixed screen in the water body can, under certain conditions, provide effective reduction in both impingement and entrainment. However, at PBNP, where there is not a continuous sweeping velocity in the water body, performance of fixed screens is limited. In such cases, the slot size will have to be large enough to avoid clogging by smaller impinged species, zebra mussels, and algae. As a result, this technology will be effective for impingement mortality reduction only.

Wedgewire screens with a 3/8-inch slot size could be considered for PBNP. For a through screen velocity of 0.5 ft/s, at design flow rate, a possible configuration would include 22, 84-inch T-screens on the current intake structure. Assuming that the wedgewire screen could be installed without major challenges, the cost of this alternative is estimated to be $7M. This estimate excludes construction and material costs associated with additional piping to connect the new CWIS to the forebay. Given that the existing CWIS is expected to meet the impingement mortality reduction performance standard, this additional expenditure is not deemed to be worthwhile.

A barrier net could be installed around the existing offshore intake structure, which could provide further reduction in impingement mortality. A net set up in the open water would be subject to considerable wave action, which would provide sweeping of aquatic life across the net surface. With a 400-ft long by 20-ft deep net, the through-net velocity would be less than 0.3 ft/s. Estimated capital cost for the barrier net is $1.5M. As noted earlier, the barrier net would only address impingement mortality performance standard that We Energies staff believe is currently achieved at PBNP.

An aquatic filter barrier (i.e., Gunderboom) would not be feasible at this location. At a water depth of 20 feet, the length of the Gunderboom would be approximately 8,800 feet. This size fabric barrier would not be feasible in this setting. If the Gunderboom were installed encircling the offshore intake, it would form a circle 2,800 feet in diameter. In addition, the fabric could not withstand the severe conditions that occur throughout the year. Estimated capital cost for this option is $19M, assuming no additional structures to protect the fabric. Such structures would likely be necessary given the exposed nature of the intake.

The existing offshore intake is similar to the modified porous dike / leaky dam considered for PWPP, with pipes through the wall. Using the concept that Alden developed for PWPP, a 1,900-foot circular dike could be constructed around the existing offshore intake. Although the dike may provide impingement benefits, entrainment reduction is uncertain. Estimated capital cost for this option is $9M. Because of the high costs and uncertain performance, this technology was not considered BTA for this site.

Offshore Intake Structure

The existing offshore intake may meet the entrainment reduction requirements. However, the water at the intake is relatively shallow, and the intake may have to be extended much farther out into the lake to achieve the entrainment reductions needed. Assuming a 1,600 ft extension of the intake (pipe laid on bottom) and installation of a new intake structure with velocity cap, the estimated cost is $34M.

Fish Diversion and Avoidance Devices

Louvers and bar racks can be effective with a consistent, uni-directional sweeping flow such as what may exist in an onshore intake channel; however, in a lake setting, the critical flow requirement cannot be met; therefore, this technology is likely to be ineffective.

Installation of a velocity cap on the existing intake could reduce impingement mortality. Estimated cost is $2M. Again, such a technology is not likely to be any more effective than the current measures for impingement mortality reduction.

The existing intake structure has an acoustic deterrent system optimized for effectiveness on alewife. Given the numerical dominance of alewife among impinged fish, additional systems targeted at other species are not likely to be cost-effective.

2.2.2 Review of Operational Measures

Two operational measures are considered as feasible at PBNP: more frequent rotation of the traveling water screens in order to reduce impingement mortality, and flow reduction.

More Frequent Rotation of the Traveling Water Screens

During seasons in which impingement is more common (i.e., spring and summer) more frequent rotation of the traveling screens may reduce impingement mortality by decreasing the time that impinged fish spend on the screen. Given the importance of alewife among impinged fish and their high sensitivity to handling, such an operational practice may not be very effective. While this is likely to only marginally increase the performance of the CWIS, it will be evaluated following collection of updated impingement data.

Flow Reduction
Variable speed pumps are typically most feasible during winter months when the intake water is coldest. At PBNP during the winter, the circulating water flow rate is cut back and a portion of the cooling water discharge is recirculated to ensure ice-free conditions. During the winter, however, the potential for impingement and entrainment is very low compared to the late spring and summer months. During the warmer months, reduced condenser flow would require the plant to be de-rated (loss of reliable electrical capacity) because of increased back-pressure caused by the higher temperatures that occur during reduced flow. Such a constraint would be very costly (due to the cost of buying replacement power) and may be inconsistent with the plant operating license. Consequently, the intake flow reduction that variable speed pumps would offer is not applicable to this station. If variable speed drives were installed, the estimated cost is $4M.

Evaporative cooling towers and dry cooling are much more costly than EPA's estimate for compliance and, therefore, will not be considered further.

2.2.3 Review of Restoration Measures

Restoration can be a very cost-effective measure for mitigating loses of aquatic organisms. Successful restoration measures are also strongly dependent on the species of concern and the local ecological conditions. Finally, it may be difficult to estimate how restoration provides for mitigation of specific impacts. For these reasons, building a compliance strategy on restoration is not planned. ENSR does recommend that opportunities for restoration be evaluated if technology and operational measures alone do not lead to a cost-effective approach to 316(b) compliance at PBNP.

Possible restoration methods generally include:

- Fish restocking programs;
- Installation of fish diversion devices;
- Habitat creation;
- Habitat restoration; and
- Habitat enhancement.

Specific restoration methods that We Energies might potentially be interested in include:

- Underwriting WDNR's existing fish stocking program in Manitowoc and/or Kewaunee counties; and
- Enhancing fish habitat in nearby creeks that are tributaries to Lake Michigan.

As part of the CDS, these measures will be evaluated for their ability to serve as cost-effective measures included as part of the site-specific BTA.

2.2.4 Estimate of Technologies' Costs and Effectiveness

Costs for technologies and operational measures have been presented in Sections 2.2.1 and 2.2.2. Additionally, the costs are also presented in Table 2-3 along with estimated effectiveness of the technologies and operational measures.

2.2.5 EPA's Appraisal of Technologies

As part of the Rule making process, EPA developed an estimate of the cost of compliance with the Phase II Rule at each of the affected plants. These data are provided for PBNP, with some slight modification to their presentation, as Appendix C.

EPA lists the design flow for PBNP as 975,261 gpm. EPA has assumed that 1.75 mm cylindrical wedgewire screens located along the shore line would be sufficient to achieve the Rule's performance goals. The total capital cost of this system is estimated at $23,279,870. Net revenue losses associated with construction were assumed to be $52,842,026. The total annualized cost of the additional technology is estimated to be $7,871,964. A pilot study involving $2,351,844 is anticipated.

In the final Rule, EPA does not present facility-specific estimates of the benefit of compliance to area fisheries. Instead, EPA requires that the benefits of potential technologies and measures should be estimated based on likely technology effectiveness and those benefits expressed as a monetized value using procedures defined in the Rule. The monetized value will be compared to the costs of the potential technology or measure. Under the Rule, if the costs are "significantly greater" than the estimated benefits, a site-specific BTA can be issued. Given that We Energies believes that no entrainment technology is likely to be cost-effective at PBNP, it plans to pursue Compliance Approach #5 based on updated estimates of entrainment at the station.

2.3 Selection of Proposed Technologies, Operational and Restoration Measures

Based on our review of the technologies available and the circumstances at the PBNP we conclude none of the technologies described above should be further investigated. This recommendation is based on the fact that the existing CWIS likely meets the impingement mortality performance standard. No technology to minimize entrainment (except closed cycle cooling, which is significantly more expensive than EPA's cost estimate) has been demonstrated to be either reliable or effective for this site. As importantly, the technologies intended to mitigate entrainment suffer from potential clogging issues raising the potential for forced shut-down and NRC concerns regarding safety (see 40 CFR 125.94(f)).

ENSR INTERNATIONAL

Table 2-1: Point Beach Station
We Energies
Summary of Facility CWIS and Overall Information Collection Strategy

NPDES Permit No. WI-000095-7

WPDES Permit Application Dates	Current WPDES Permit Expires 6/30/09 includes Compliance Schedule for PIC by 12/31/04 with CDS by 12/31/07.
Setting	Lake Michigan
Capacity Factor	>15%, base load facility
Performance Goals	Impingement Mortality; Entrainment
Summary of CWIS	Intake design flow 1008 MGD; Offshore intake crib located 1750 feet offshore in 22 feet of water; crib is approximately 12 feet tall. Crib lowered from emergent condition in order to minimize interaction with fish attracted to thermal plume. 110-ft dia donut-shaped leaky dam w/ 3 concrete conduits located on the lake floor. The top of the donut is covered by 12" by 2" grate of "super plastic" to repel zebra mussels. Approximately 50/50 split in flow through top and side walls. Velocities in vicinity of structure indicate hot-spots of up to 2 ft/s, generally lower. Accoustic deterence system optimized to affect alewife deployed May to October. Trash rack. 3/8-inch traveling screens, debris return sluiceway, w/ debris basket. Bottom slope is very gradual making access to deep water very expensive.
Number of Units	2
Relationship to Baseline Condition	Intake crib is 1750 feet offshore in 22 feet of water. Crib reconfigured in order to avoid impacts to fish attracted to thermal plume. Velocities in vicinity of the crib are relatively low. Accoustic deterrence system optimized for alewife deployed May to October. Average velocity at traveling water screens is 0.79 ft/s. Fish return system has positive effect.
Availability of Historical Data	**Biological Data:** Most recent study is 1975-76 survey of I&E and ichthyoplankton density. 1981 data review suggests offshore crib offers some protection for both impingement and entrainment. Informal assessment of changes in alewife impingement in 2004. **Alternatives Assessment:** Wisconsin Electric, 1976. Alden (2000)
Applicability of Historic Data	Fisheries populations may have changed but several references at other stations suggesting that the overall trends likely to remain relevant. Recent assessment of alewife promising but not fully quantiative.
US EPA Compliance Cost and Technology Estimates	EPA concludes that passive 1.75 mm cylindrical wedgewire could be added along shoreline. Estimated cost is $23.3MM for capital and $7.9 MM/yr total annualized costs. High cost associated with lost generation time.
Outline of Compliance Strategy	Some combination of Options 2 and 5 (cost-benefit). Use existing and newly-collected data to show effectiveness of CWIS relative to IM. Evaluate alternatives relative to effectiveness, costs, and feasibility with focus on E. Note difficulty with 1.75 mm fine mesh screens in shallow water (US EPA-assumed technology). Rely on cost-benefit tests. Consider data collection program to quantify current performance (support of cost-benefit test).
Approach to Estimating Calculation Baseline; Comprehensive Demonstration Study	**Quantify Rates of Impingement.** Strategy for showing impingement mortality protection may rely on literature and less formal assessment of alewife impingement. Data on emergent crib do not fully support calculation of performance goals (see Michaud, 1981 - alewife impingement/flow at PB ~ 52% of OCPP, 17% of PWPP). Very likely improved with reconfiguration. **Quantify rates of entrainment rates to support cost-benefit test.**

Table 2-2: Point Beach
Estimated CWIS Performance
Relative to Calculation Baseline
Performance Does Not Consider Committed Reductions in Capacity Factor - Relatively Unlikely at PBNF

Performance Goal: 80 to 95% Reduction in Impingement Mortality (IM)
60 to 90% Reduction in Entrainment (E)

IM - Difference from Baseline	Estimated Reduction in IM (%)	Basis	Notes
Offshore CWIS	~60	Uncertain - likely some benefit associated with lower densities of alewife. Benefits derived by lowering crib height and making it submerged, minimizing its interaction with the thermal plume.	Some benefit indicated by Michaud (1981) - Potentially subject to further analysis in CDS. Plant operation staff indicate that impingement has decreased since crib height was reduced.
Low Through-Screen Velocity at Traveling Screen	~30	Strong swimmers should be able to avoid; especially non-alewife species.	Very uncertain estimate
Acoustic Deterrence	~50	Estimate based on vendor performance and approximate historic importance of alewife impingement.	99.3% of alewife and total fish were impinged during May through October in 1976. Discounted here due to decline of alewife stocks.
Total IM Protection	**86%**	**Uncertain**	

E - Difference from Baseline	Estimated Reduction in E (%)	Basis	Notes
Offshore CWIS	?	Uncertain - likely some benefit associated with lower densities of ichthyoplankton.	Michaud (1981) (Table 14) provides assessement relative to other stations (60% reduction relative to Oak Creek, 14% reduction relative to Port Washington), 1976 finds gnerally lower densities in entrained water than in ambient samples.
Total E Protection	**?**	**Unknown**	

Table 2-3:
Assessment of Mitigation Measures
Point Beach

BTA Alternative	Cost (Capital) $M	Costs Significantly Greater than US EPA Estimate?	IM Benefits/ Effectiveness	E Benefits/ Effectiveness	Retained?	Basis of Decision
Traveling Screen Modifications						
Modified traveling screens (dual flow)	3	No	through-screen velocity <0.5 fps, meets alternative 1(b)	0	No	Existing conditions (limited space) preclude installation of new screens without major reconstruction of intake structure.
Modified traveling screens (Ristroph Screens)	4	No	> 80% with frequency rotation, low pressure wash, and fish return.	0	No	Existing conditions (limited space) preclude installation of new screens without major reconstruction of intake structure. Costs affected by need to install low-pressure wash and optimize fish return
Fine Mesh Screens on traveling screen system.	9	Yes	assuming ristroph modifications included > 80% with frequency rotation, low pressure wash, and fish return.	Maybe high but only with frequent rotation, low pressure wash, and return system.	No	Existing conditions (limited space) preclude installation of new screens without major reconstruction of intake structure. Costs significantly greater than US EPA's. US EPA's costs likely neglect need to reengineer screen due to reduced open area, low pressure wash, and return system. Good potential for ichthyoplankton mortality associated with impingement. Clogging with algae and debris is likely. Uncommon technology with unknown risks.
Angled or modular inclined screens	3	No	May meet standard for certain species	none	no	Existing conditions (limited space) preclude installation of new screens without major reconstruction of intake structure. Stable water elevation needed. Uncertain performance for species.
Fixed Screening Devices						
Wedgewire Screens	7	No	> 80% if through screen velocity is low.	Unlikely effective unless site in area with low ichthyoplankton density.	No	9.5 mm mesh to avoid fouling Ice, debris, boat traffic require deployment in deep water affecting cost. Slot size must be relatively large (i.e., 9.5 mm) in order to avoid clogging.
Barrier Net	1.5	No	> 80%	0	No	Seasonal deployment. Impractical due to difficulty in deploying around intake crib. No more effective than current technology.
Aquatic Filter Barrier (e.g., Gunderboom)	19	Yes	>80% if through-fabric velocity is low.	Maybe high but only with low through-fabric velocity.	No	Seasonal deployment. Very long barrier (~7500 ft) required to meet loading specifications. Deployment in deep water around crib is major engineering challenge and expense. Resulting costs are high. Impediment to boating. Performance is uncertain given small installed base. Susceptable to storm damage. Potential for impingement of ichthyoplankton. Potential for fabric to foul. No consistent sweeping velocity
Porous Dike (1860ft)	9	no	> 80% if behavioral measures perform	Uncertain	No	Potential for clogging by ice, algae, and debris may require installation of pipes. Significant obstacle to navigation. No more effective than current technology.
New Intake Location						
Offshore Intake Structure (with velocity cap)	34	yes	?	Maybe high but only if well offshore	No	Existing offshore intake Assumes need to extend 1,650 ft further may not be far enough for adequate E reduction. Requires additional technology for IM.
Fish Diversion and Avoidance						
Diversion Devices: Louvers and Bar Racks	3	No	?	none	No	Effectiveness uncertain - no consistent sweeping velocity
Velocity cap on offshore location	2	No	possibly 90%, but uncertain	none	No	Entrainment not addressed
Behavioral Barriers: Strobe Lights, acoustic deterrent, bubbles, chains	na	na	na	na	na	currently installed
Flow Reduction						

**Table 2-3:
Assessment of Mitigation Measures
Point Beach**

BTA Alternative	Cost (Capital) $M	Costs Significantly Greater than US EPA Estimate?	IM Benefits/ Effectiveness	E Benefits/ Effectiveness	Retained?	Basis of Decision
Variable Speed Pumps	4	No	Low depending on frequency of flow reduction.	Low depending on frequency of flow reduction.	No	Effectiveness is likely to be low given nature of station operation. Full flow is required when in operation due to constaints on equipment. Potential impacts on thermal discharge. Recirculation is needed in winter to keep intake ice-free.
Evaporative Cooling Towers	61	Yes	>90%	>90%	No	Costs significantly higher than US EPA's. Reduction in station efficiency. Visual impact from vapor plume. Space constraints. Consumption of water. Cost may be significantly greater if existing condensers not rated for additional pressure. Substantial efficiency penalty.
Dry Cooling Tower	233	Yes	>90%	>90%	No	Costs significantly higher than US EPA's. Significant reduction in station efficiency. Adverse visual impact large towers. Space constraints. Adverse noise impact.
Increased Fish Production						
Restoration	0.5 - 2	Uncertain	Uncertain	Uncertain	No	Restoration measures could be effective mitigation. Regulatory status is uncertain given pending court case. WDNR may not favor.

Note: Capital costs do NOT include outage costs, O&M, or efficiency penalties

3.0 HISTORICAL STUDY REVIEW

There is considerable literature on the fisheries of the Lake Michigan, their general interaction with power generation stations that use once-through cooling, and station-specific assessments of potential impacts of cooling water withdrawal. Information on the spatial and temporal distribution of important fish species is presented in Appendix B. Several studies have also been conducted at PBNP. These are listed below with a brief summary of their scope and findings.

3.1 Historical Biological and Physical Data

Alden Research Lab. 2000. Evaluation of Alternative Intake Designs to Prevent the Entry of Cormorants. Point Beach Nuclear Plant.

Conceptual design and costs for several CWIS alternatives:

- *Remove existing rock crib.*
- *Reconfigured rock crib in 22 feet of water.*
- *Sonic fish deterrent and bird barrier on existing structure.*
- *Bar rack barrier around existing structure.*
- *Submerged intake in 30 feet of water.*

No alternative concluded to be cost effective while only cutting down the crib and relocating to 30 feet are considered to be likely to be effective at reducing bird roosting.

Great Lakes WATER Institute. 2002. Hydrodynamic Measurements at Wisconsin Electric Water Intake, Point Beach, Lake Michigan.

Conducted current measurements around the modified CWIS on 10/2 and 10/4/01

- *Local velocities as high as 2.0 ft/s in isolated area; around the rock wall, velocities generally far lower.*
- *On top of the grate, downward velocities were measured as high as 0.8 ft/s.*
- *Estimated that approximately ½ the flow enters through rock wall with the other half through the grate. This ratio will be sensitive to lake levels.*

Michaud, D.T. 2004. Evaluation of impingement rates for alewife and smelt for onshore and offshore CWIS.

Data from Spigarelli et al., normalized to CWIS intake flow, suggests that onshore intakes have 5.9X the impingement rate for alewife and 2.7X the rate for smelt, on average.

Michaud, D.T.2001. Anticipated Impacts of the Proposed Modification to the Point Beach Nuclear Plant (PBNP) Cooling Water Intake Structure on Fish Impingement and Entrainment.

Rates of impingement will likely be dominated by alewife and smelt despite decline in the populations of these species – rates should be lower than historical.

Rates of entrainment should also decline due to declines in the alewife and smelt populations.

Michaud, D.T. 1981. Wisconsin Electric's Experience with Porous Dike and Leaky Dam Intake Structures on Lake Michigan. Proceedings of the Workshop of Advanced Intake Technology. San Diego. April 1981. P.B. Dorn and J.T. Johnson. Eds.

Review of 1976 efforts at Lakeside, Point Beach, Port Washington, and Oak Creek. Presented rates of impingement and entrainment as raw data and normalized to flow.

We Energies. 2000. Industry Short Technical Questionnaire. Phase II Cooling Water Intake Structures. Questionnaire No. A-UT-0085. Point Beach Nuclear Plant.

Configuration of CWIS, basic statistics on flow. Estimated through-screen velocity.

We Energies. 2004. Email of September 1, 2004 from Jeff Novak to Dave Michaud Discussing Apparent Effectiveness of PBNP CWIS Intake Modification.

Discussion of cost and reliability of acoustic deterrence system. System has had speaker failure but there is redundancy in the system. System cost was approximately $900,000.

Has lowering the profile of the intake improved plant performance due to thermal effects? The most noticeable benefit has been better ice control.

We Energies. 2004. Email of September 20, 2004 from Dan Weber to Dave Michaud Discussing Apparent Effectiveness of PBNP CWIS Intake Modification.

Has the lowering of the system improved alewife impingement associated with the fish being attracted to the heated discharge plume? Apparently yes. The rate of alewife impingement was noticeably reduced in the two years since the retro-fit. The "alewife cloud" in the discharge was also noticeably less. Operators are convinced that a benefit has been realized.

Wisconsin Electric Power Company. 1976. Point Beach Nuclear Plant. Final Report. WPDES Intake Monitoring Studies.

88 impingement monitoring rounds – one year - at traveling screens - three screen washings (~24 hours) – 313,141 fish impinged – 84.5% alewife, 13.8% smelt.

49 entrainment monitoring rounds – April to October – dual pumps at 20% and 80% of forebay depth – 333 μm net – 9.3 million gallons sampled – 91 fish larva, 203 fertilized alewife eggs, invertebrates.

Plankton tows at intake crib and at up-coast reference station – 11 dates May to October – duplicate tows at several depths performed at night – no pronounced difference between stations, lower densities in entrainment samples.

Calculated velocities at intake crib and traveling screens.

EA concludes that I&E data are similar at Port Washington between 1976 and 2002.

Analysis of intake effects (Sec. 3).

Analysis of alternatives (Sec. 5) Focus on impingement, less discussion of entrainment.

3.2 Assessment of Data Sufficiency

Among the requirements of the CDS is the performance of a study of impingement mortality and entrainment. The results of this study may be used to assess the performance of the current CWIS as well as evaluate additional potential technologies and measures. The Rule sets out specific requirements for this study and addressing these goals is an important aspect of the PIC. The Rule anticipates that it may be possible to base the CDS completely or in part on existing data. For these reasons, Table 3-1 presents the specific data requirements for the study, reviews the relevance of available data to these requirements, and, if appropriate, proposes additional data collection.

Significant data are available on the impingement mortality and entrainment patterns at PBNP but the data were collected many years ago. These surveys were relatively comprehensive and, if they were deemed to be representative of current conditions, would meet the requirements of the Impingement Mortality and Entrainment

Characterization Study set out in the Rule. The literature on the fishery of Lake Michigan suggests that the historical data sets are likely to be generally current. Despite this, there has been a major change in the configuration of the CWIS and there is a potential that the nature and density of ichthyoplankton have changed since the last surveys.

Table 3-1:
Assessment of Data Sufficiency

Rule Citation	Requirement	Historical Data Source	Notes	Additional Data Proposed?
125.95(b)(3)(i)	Taxonomic identifications of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) that are in the vicinity of the cooling water intake structure(s) and are susceptible to impingement and entrainment.	Site-Specific; Regional Literature	Recent data available from nearby stations as well as lake-wide surveys. Historical data relevant for most dominant species.	Yes 24 hour - impingement mortality and entrainment
125.95(b)(3)(ii)	A characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) identified pursuant to paragraph (b)(3)(i) of this section, including a description of the abundance and temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in impingement mortality and entrainment.	Site-Specific; Regional Literature	Recent data available from nearby stations as well as lake-wide surveys. Historical data relevant for most dominant species.	Yes 24 hour - impingement mortality and entrainment
125.95(b)(3)(iii)	Documentation of the current impingement mortality and entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) identified pursuant to paragraph (b)(3)(i) of this section and an estimate of impingement mortality and entrainment to be used as the calculation baseline. Impingement mortality and entrainment samples to support the calculations required in Section 125.95(b)(4)(i)(C) and 125.95(b)(5)(iii) of the Rule must be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples must be documented.	Site-Specific; Regional Literature	Recent data available from nearby stations as well as lake-wide surveys. Historical data relevant for most dominant species. Changes in impingement rate with CWIS modification and acoustic deterrence not available.	Yes 24 hour - impingement mortality and entrainment

3.3 Physical and Water Quality Data

According to §125.95(b)(2)(ii), since the PBNP is located on one of the Great Lakes source waterbody flow information is not required.

4.0 AGENCY CONSULTATIONS

The Rule requirements of the contents of the PIC ask for a summary of any past or ongoing consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to this Study and a copy of written comments received as a result of such consultations. The WDNR has indicated that it is acceptable for this summary to include itemized consultations with the agencies and a summary of the contents of those consultations. WDNR staff have also indicted that it is acceptable to include materials that are available with an emphasis on recent materials. WDNR staff does not expect any sort of rigorous file search at WDNR headquarters. The following subsections present those summaries.

4.1 Section 316(b) Specific Consultations

We Energies staff have reviewed its WPDES correspondence files for pertinent documents. The most significant historical document concerning impingement and entrainment studies completed at Point Beach nuclear Plant (PBNP) was the February 8, 1978 determination rendered by DNR concerning this PBNP intake. In this letter, DNR concluded that the then existing intake did not have an adverse impact on the Lake Michigan fishery, based on a one-year study conducted by the company in 1975-1976. DNR further concluded that no modification to this intake structure was necessary.

In permits issued since this date, the impingement and entrainment issue was not re-visited at time of permit renewal. The only intake–related issue raised during the renewal periods concerned discharge of the traveling water screens. Since this wash water contains debris as well as fish, the company was required to dispose of debris retained by a basket placed in the traveling screen wash water sluiceway (this basket was outfitted with 3-inch square mesh, which allowed most impinged fish to be released back to the lake).

With respect to the actual intake structure, the company has modified it twice since the 1975-76 study. In August, 1980, four 6' by 6' concrete conduits were installed in the rock crib intake structure to alleviate winter icing concerns. Since this was deemed a maintenance project, the work was covered by the then enforceable US Army Corps of Engineers general permit. DNR concurred that no special permit was required for this work (copies attached in Appendix D).

The second modification occurred in May, 2001. The rock crib was partially dismantled to a below lake surface level elevation (+11' above lake bottom) and the resulting opening was outfitted with a coarse screen and steel plate cover. This modification was sought by the US Fish & Wildlife Service to remedy inadvertent taking of cormorants that would occasionally fall into the center of the rock enclosure and be entrained into the plant's pumphouse. Details of this proposed modification were sent to DNR in correspondence dated March 19, 2001 (attached).

In addition to these modifications, in late July 2002, the company installed a sonic deterrent system on the modified intake structure to stimulate avoidance responses from alewife, that would often congregate in the plant's discharge area during the early spring months. On occasions when the thermal discharge came close to the now-submerged intake structure, alewives present in the discharge would become entrained with the cooling water. An alewife entrainment event in late June 2001 caused an unscheduled plant shutdown. The large number of alewife pulled into the intake became impinged on, and collapsed some of, the plant's traveling water screens. Anticipated performance information regarding the sonic deterrent system was provided to DNR in correspondence dated September 4, 2002 (also attached).

As a condition of our agreement with USFWS to modify the intake, We Energies has been submitting reports on an annual basis, summarizing observations of bird and fish retained by the screen wash debris basket. Copies of the reports submitted, to date, are also attached.

4.2 Other Relevant Consultations

- Other State, Federal, Tribal agencies – See section 4.1 USFWS and WDNR consultations regarding cormorant issue and 2001 intake modification.

5.0 PROPOSED COMPLIANCE STRATEGY

The following is a brief summary of We Energies proposed approach to Phase II Rule compliance:

- We Energies will document the performance of the current CWIS as part of its pursuit of Compliance Option #2 - existing intake location / modifications meet the impingement standard. The existing data will be supplemented with newly collected data on the current rates of impingement.
- The proposed compliance option for entrainment is Compliance Option #5 - actual costs of compliance are "significantly greater" than the site-specific benefits of compliance. Current rates of entrainment will be characterized in order to assess site-specific monetized benefits.

5.1 Outline of CDS Activities

According to 40 CFR Section 125.95(b), the "Comprehensive Demonstration Study (The Study) is to characterize impingement mortality and entrainment, to describe the operation of your cooling water intake structures, and to confirm that the technologies, operational measures, and/or restoration measures you have selected and installed, or will install, at your facility meet the applicable requirements of §125.94."

As outlined in Section 125.95(b), a CDS intended to support Compliance Options #2 and #5 for a facility on the Great Lakes must include:

- Proposal for Information Collection
- Impingement Mortality and/or Entrainment Characterization Study
- Technology and compliance assessment information
  - Design and Construction Technology Plan
  - Technology Installation and Operation Plan
- Restoration Plan (if applicable)
- Information to support site-specific determination of best technology available for minimizing adverse environmental impact
  - Comprehensive Cost Evaluation Study
  - Benefits Valuation Study
  - Site-Specific Technology Plan
- Verification Monitoring Plan

5.2 Review of CDS Strategy

The CDS strategy for PBNP generally includes providing the required information and submittals so that:

- Impingement mortality compliance can be demonstrated by collecting and presenting additional data to show the impingement reduction mortality benefits inherent in the existing CWIS allowing compliance under Compliance Option #2; and

- Entrainment compliance can be demonstrated by illustrating that additional potential costs exceed the potential benefits of entrainment reduction allowing compliance under Compliance Option #5. Potential mitigation measures will be screened for feasibility and costs relative to EPA's estimates prior to consideration of their effectiveness. Potential for the NRC to express concerns regarding safety and reliability under 40 CFR 125.95(f) will be considered.

5.3 Schedule

The following is a tentative schedule for the PBNP CDS:

- PIC submittal by December 31, 2004;
- WDNR approval of PIC by March 2, 2005;
- Perform Impingement Mortality and Entrainment Characterization Study from April 1, 2005 through March 31, 2006;
- Submit draft impingement mortality and entrainment report by October, 2006;
- Submit technology and compliance assessment, including the Design and Construction Technology Plan (DCTP) and the Technology Installation and Operation Plan (TIOP) by March, 2007;
- Submit information to support the site-specific best technology available (BTA), including the Comprehensive Cost Evaluation Study (CCES), the Valuation of Monetized Benefits (VMB), and the Site-Specific Technology Plan (SSTP) by March, 2007;
- Negotiation of TIOP complete by July 2007;
- Submit Verification Monitoring Plan (VMP) by August, 2006;
- WDNR BTA determination and CDS approval by October, 2007; and
- Implementation of VMP during the subsequent WPDES permit cycle.

We Energies notes that this schedule is only approximate. The CDS is due to WDNR on December 31, 2007, allowing for some flexibility in the schedule that can be negotiated as the CDS is developed.

6.0 PROPOSED SAMPLING WORKPLAN

The Proposed Sampling Workplan, as presented below, will provide a basis for current impingement and entrainment estimates at PBNP and allow a comparison to the "baseline condition."

The general components of the Workplan and resulting report will include the follow items:

- Review of historic studies and recent work at other We Energies' facilities;
- Impingement mortality sampling and evaluation procedures, methods, and results;
- Entrainment sampling and evaluation procedures, for both in-plant and near shore locations; methods, locations, and results; and
- Ichthyoplankton sampling procedures, methods, locations, and results.

The characterization efforts outlined above, approved by WDNR and executed during the 1970s, remain good model for this field program. Notably, these methods have recently been approved and applied as part of the characterization effort at We Energies' Oak Creek/Elm Road Station as well as at the PWPP.

6.1 Impingement Sampling Plan

Impingement sampling will be performed at the traveling water screens and filter baskets located at the pump house. Sampling will occur weekly for 52 weeks (one year – 2005-2006), one day per week for a 24-hour period. Traveling water screens will be rotated and washed prior to sampling. The condition of non-forage fish species is to be noted (e.g., alive or dead; condition when examined; etc.).

The collected specimens will be identified to the lowest possible taxon. Specimens determined to be dead at least 24 hours prior to impingement will be tallied but not processed further. Collected specimens will be individually weighed and measured up to a maximum of 50 specimen per species with the remainder being counted and batch weighed. Invasive species will be identified and batch weighed. There will be flexibility in sampling procedures for exceptionally large numbers of impingement (i.e. different technique for estimate of number/biomass). Quality assurance / quality control (QA/QC) procedures will include retaining a voucher specimen of each species collected, providing for the potential for field audits by We Energies and senior contractor staff, and performing work under standard operating procedures (SOPs) that will be available to WDNR.

Data will be presented in tabular summaries presenting the number and weight of each taxon and cooling water flow during the sampling event will be recorded. Impingement results will be extrapolated to weekly, monthly, and yearly yields based on relative cooling water flow.

A report will be prepared which will describe results and how they compare with historical studies at the facility and similar results from other facilities. The report will also describe and present overall contribution of invasive and/or rare/listed species; compare results to the "calculation baseline" as defined in the Phase II Rule; describe seasonal patterns; correlate data to intake water temperature or flow; provide mass and length distribution of dominant species and include all raw data. Unusual lake or weather conditions will be recorded at the time of sampling on appropriate data collection forms. A calculation baseline will be estimated based on comparison to rates observed in the earlier (Wisconsin Electric, 1976) formal study as well as operator observations of frequency and severity of impingement events. Literature on technology effectiveness as well as vendor design data for the acoustic deterrence system will supplement the analysis.

6.2 Entrainment Sampling Plan – In-Plant

Entrainment sampling will be preformed at the screen house forebay. Sampling will occur weekly from mid-April through September 2005 – a total of 24 sampling events.

Samples will be collected using a plankton net (0.5 m diameter, 335 µm mesh) with water being provided by submersible pump(s) discharging at least 100 gpm. The pump(s) will be placed near the midpoint of the forebay area at approximately mid-depth. Sampling will be conducted for 24- continuous hours. The volume of water filtered will be recorded. Temperature measurements taken by the plant's condenser monitoring equipment will be retained for the purposes of this study.

Eggs and larvae will be picked from each sample and identified to the lowest practical taxon. The taxa will be segregated by life stage with collected larvae being individually measured up to a maximum of 20 larvae per species or taxon and life stage. If there are more than 20 larvae of a given taxon collected, 20 random specimens per life stage will be measured and the rest counted. Invasive species will be counted separately. Quality assurance / quality control (QA/QC) procedures will include retaining a voucher specimen of each species collected, providing for the potential for field audits by We Energies and senior contractor staff, and performing work under standard operating procedures (SOPs) that will be available to WDNR.

Data will be presented in tabular summaries presenting the number of each taxon collected during each 24-hr period. Results will be extrapolated to weekly, monthly and yearly yields based on the recorded CWIS flow. Raw data will be included in an appendix to the report.

A report will be prepared which will describe results and how they compare with historical studies at the facility and similar results from other facilities. The report will also describe overall contribution of invasive and/or rare/listed species; compare results to historical data on ichthyoplankton densities; describe seasonal patterns; and correlate data to intake water temperature or flow.

2.3 Entrainment Sampling Plan – In-Lake

In-lake sampling between the plant and the existing intake, as well as in a non-thermal plume impacted area will likewise be conducted from mid-April through

September, weather permitting. At least two surveys will be conducted per month, with the actual surveys separated by at least one week. The actual locations to be sampled (e.g., depth contours), as well as depth strata at each depth contour, will be specified in a scope of work that will be drafted for DNR review. Samples will be collected at night in a manner similar to that approved by DNR for the Elm Road and Port Washington studies. We Energies staff will discuss the need for daytime sampling with DNR staff for the PBNP project.

Samples will be processed per section 6.2 above. Temperature and D.O. measurements will be taken at each depth contour, at each depth strata sampled.

These results will be included with the same report described under 6.2 above.

APPENDIX A

TECHNOLOGY REVIEW

General Technology Overview

This section reviews several potential mitigation strategies including those intended to reduce impingement mortality and entrainment. The nature of the technology is briefly reviewed and its approximate costs[1] are presented. The effectiveness under the conditions at the We Energies stations is discussed and factors affecting performance, reliability, and other environmental issues are reviewed. In addition to CWIS technologies, facility operation and restoration measures are considered.

The following list of CWIS alternatives have been evaluated in this screening assessment:

- Alternative 1 - Traveling Screen Modifications
  - 1a - Dual Flow Screens (Impingement)
  - 1b - Ristroph Screens (Impingement)
  - 1c - Fine Mesh Screens (Impingement and Entrainment)
  - 1d - Angled and modular inclined screens (Impingement)

- Alternative 2 – Fixed Screening Devices
  - 2a - Wedgewire Screens (Impingement and possibly entrainment)
  - 2b - Perforated Pipes (Impingement)
  - 2c – Barrier Net (Impingement)
  - 2d – Aquatic Filter Barrier (Impingement and Entrainment)
  - 2e – Porous Dike / Leaky Dam (Impingement and Entrainment)

- Alternative 3 - Offshore Intake (Impingement and Entrainment)

- Alternative 4 – Fish Diversion and Avoidance
  - 4a – Louvers and Bar Racks (Impingement)
  - 4b – Velocity Cap (Impingement)
  - 4c – Strobe lights, acoustic deterrent, bubbles, chains (Impingement)

- Alternative 5 – Flow Reduction

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[1] This report presents estimates of costs in two contexts: the costs of executing the CDS and the capital costs of potential mitigation measures. The estimates should be considered approximate and final costs may vary by as much as factor of three or more. Cost estimates for mitigation measures do not account for facility down-time associated with construction. These costs could be estimated with input from We Energies and included in the final CDS document.

- 5a - Variable Speed Pumps (Impingement and Entrainment)
- 5b - Evaporative Cooling Towers (Impingement and Entrainment)
- 5c - Dry Cooling (Impingement and Entrainment)

- Alternative 6 – Restoration (Impingement and Entrainment)

Table A-1 provides a brief review of ENSR's findings relative to the various technologies. The findings are supported by a more detailed evaluation below.

Alternative 1 - Traveling Screen Modifications with Fish Removal and Return System

- *1a - Dual Flow Screens*

Description:
With dual-flow, single-exit screen, incoming water is filtered with both the upward and downward moving parts of the screen, and the water flows toward the pump from the interior through the open side of the screen. The screen faces are oriented parallel to the direction of flow. If space is available, the screen length can be extended outward such that the area of the screens can be greater than the area of a conventional flow-through screen in the same location. Therefore, the dual-flow design has the potential to reduce through-screen velocity compared to flow-through (single entry, single exit) design.

The dual-flow design also provides an advantage of eliminating the potential for debris that is stuck on the screen to be dislodged in the downstream side of the screen. This feature has an added benefit of lower wash water pressure requirements.

Technical Feasibility and Reliability:
For retrofit applications, the space available to install may be limited by the existing structure (trash racks upstream and pump vault downstream) and water body constraints (navigation). Such limitations may limit the ability to increase screen surface area, thereby limiting the ability to reduce through screen velocity.

Flow patterns with a dual flow screen are also uncertain. Depending on the proximity of other screens and structures, the full screen area may not be effectively used, and through screen velocities on parts of the screen may be substantially higher than design, thereby reducing the potential to reduce impingement.

Dual flow screen are commercially available and have been in use for years.
For the site-specific evaluations, the dual flow screens with conventional mesh are assumed to provide adequate screen area to reduce through-screen velocity to 0.5 feet per second (ft/s). Otherwise, there would be no advantage to changing from a flow-through screen to a dual flow screen. In some cases, the required screen area may result in the need for additional new intake structures to accommodate the screens.

Cost Considerations:
The cost of dual flow screens is expected to be up to 20% higher than comparable through flow screens.

Effectiveness:
Dual flow screens have the potential to reduce through screen velocities and therefore impingement mortality, with the addition of an appropriate fish handling and return system. However, space constraints may limit effective application of this technology.

Potential for Other Adverse Effects:
An intake structure that is reconstructed to accommodate a larger dual flow screen may interfere with navigation.

Overall Assessment of Alternative:
Installation of dual-flow screens could result in a reduction of impingement mortality but would not reduce entrainment. Site-specific constraints may limit effectiveness of this technology to reduce through-screen velocity.

- *1b - Ristroph Screens*

Description:
This alternative would involve modification of the traveling screens so that fish, which are impinged on the screens, could be removed and returned to the source water body with minimal stress and mortality.

A range of measures could be pursued to optimize fish handling and return. This might include more frequent rotation of the screens, re-fitting the fish buckets, institution of low-pressure wash, and rerouting of the fish return to a more suitable location. A complete refurbishment might consist of the following measures: A low-pressure spray would be used for fish removal prior to the high- pressure debris removal spray wash. Fish would be washed off into fish buckets – i.e. water-filled lifting buckets designed such that they will hold approximately 2 inches of water once they have cleared the surface of the water during the normal rotation of the traveling screens. The fish bucket would be designed to hold the fish in water until the screen reaches the point where the fish are washed by the low pressure spray onto a sluiceway. The modified traveling screens would be operated continuously during periods when fish are being impinged. Removed fish would be returned to the source water body by sluiceway to a location removed at least 100 feet from the intake structure such that the potential for re-impingement would be minimized. All surfaces of the fish handling and return system would be smooth to minimize abrasion damage to organisms.

Technical Feasibility and Reliability:
The technology proposed for this alternative is well known and has been implemented for numerous power plants. However, a separate collection and piping system may need to be constructed to provide a separate return path for fish to the river or lake. This piping system would have to be constructed within the existing power plant footprint which could present engineering, construction, and logistics problems. Routine maintenance, primarily consisting of inspection and cleaning of the fish handing and return system, would be required but not expected to be extensive. Maintaining the system during icing conditions is likely to be complicated. The modified fish troughs extend farther out from the screens than conventional troughs. Therefore, space limitations may affect the cost and feasibility of installation.

Cost Considerations:
The retrofit of a fish removal and return system should consider complete replacement of the existing traveling screens. Installation of an effective fish return system can be complex and expensive. Operation and maintenance activities include frequent, if not continuous, screen operation and power costs for screen and water spray operation.

Effectiveness:
Modified screens and fish handling and return systems have been used to minimize impingement mortality at a wide number of facilities throughout the United States. Studies have demonstrated survival of impinged fish over a wide range. Survival rates of 70-80% are typically achieved for some species. It is notable that alewife, a very common species in the Great Lakes, suffer from high mortality at traveling screens.

Potential for Other Adverse Effects:
No adverse effects are expected from this alternative.

Overall Assessment of Alternative:
Modification to traveling screens would likely result in a reduction of impingement mortality and would not reduce entrainment.

- *Fine Mesh Traveling Screens*

Description:
Typical vertical traveling screens, with mesh sizes ranging from 1/8-inch to ¾-inch, are not designed to screen ichthyoplankton or eggs from the intake water. This alternative would involve replacement of the existing traveling screens with fine mesh screens having a mesh spacing as small as one millimeter. This mesh spacing would result in a reduction of entrainment of fish eggs and larvae. In addition, an intake approach velocity of 0.5 ft/s or less would be necessary to minimize physical damage to plankton that would be impinged on the fine mesh screens.

Because of flow area for a screen with one-mm (about 1/32-inch) mesh is approximately two thirds that of a 3/8-inch mesh, the screen area would have to be increased by nearly 50% to maintain the same through-screen velocity. For most stations, the screen area would have to be further increased to maintain a 0.5 ft/s velocity to reduce mortality of impinged fish or shellfish. In most cases, the area around the existing pump house/screen house structure is not sufficient to allow for the increased number of fine mesh screens without substantial modification to the facilities. The screens would be operated continuously to prevent excessive accumulation of debris and organisms.

The fine mesh screen structure would include curtain walls to protect against floating debris, bar racks to prevent submerged debris from damaging the fine mesh screens, and a screen wash and marine biota removal and open sluice biota return system (similar to that described for the Ristroph screen).

Technical Feasibility/Reliability:
The technology and construction techniques required for this option have been used at a limited number of power plants, often with limited reliability. At two power stations, Millstone and Brayton Point, the fine mesh screens were replaced with standard screen mesh after clogging incidents. In northern climates, the additional problem of ice

formation may be encountered. Based on the available information, it is concluded that there is a relatively high potential for fouling of the intake screens and that extensive maintenance would likely be required.

In conclusion, because of the potentially large increase in screen area required, site-specific conditions may preclude the installation of a modified intake structure of sufficient size.

Cost Considerations:
The capital cost of the fine mesh screen alternative should include any necessary modifications to the intake structure, as well as construction of an effective fish return system to handle the more sensitive species or life stages of fish and shellfish. Operation and maintenance costs include one maintenance episode (6 days) each year, replacement parts, system monitoring by station staff (10 hours per week), and power costs.

Effectiveness:
Fine mesh screens, with a low pressure wash and return system, have not been demonstrated to result in consistent effectiveness in reducing mortality at early life stages. This is a significant concern because organisms that are entrained and discharged may have a far greater chance of survival than if such organisms are impinged and subsequently washed back to the receiving water. Therefore, even though entrainment reductions of 50% to over 90% have been achieved at number of power stations using fine mesh screens, compliance with the impingement mortality performance standard could be in jeopardy. Because the calculation baseline levels of entrained organisms are typically far greater than the levels of impinged organisms, the reduction in impingement mortality will likely need to be nearly 100% for the early life stages to meet the 80-95% performance standard.

Potential for Other Adverse Effects:
The major potential adverse effect associated with the technology is the potential unreliability of the cooling water flow associated with clogging events.

Overall Assessment of Alternative:
Fine mesh screens can meet performance requirements for entrainment, but impose a relatively high potential for operational issues associated with screen clogging. Mortality of ichthyoplankton removed from the screens is likely to be high. The cost of the screen panels, as well as the cost of a revamped intake structure to accommodate the additional screen area required, is extremely high. Space limitations may preclude the installation of adequate screen area.

- *Angled and Modular Inclined Screens*

Description:
Angled and inclined screens use standard flow-through traveling screens set at an angle to the incoming flow. With these screens, the angle causes the fish to move toward the end of the screen, where a bypass facility returns the fish to the water body.

Technical Feasibility/Reliability
Angled screens have been used at Brayton Point. The installation requires considerably more space than conventional screens. Retrofit applications would likely require

substantial modifications to the existing intake structure. The fish handling and return system requires independently induced flow, adding to the complexity of the system.

Cost Considerations:
Retrofit of angled or inclined screens should include the need to revamp the intake structure, as well as the installation of an effective fish return system.

Effectiveness:
Brayton Point has had mixed results with both diversion and latent survival, depending on fish species. EPA reports survival efficiency ranging from 0.1% for bay anchovy to 97% for tautog. The difference in effectiveness between angled screens and conventional screens with fish return is not evident.

Potential for Other Adverse Effects:
The bypass flow can be substantial, resulting in additional operating costs.

Overall Assessment of Alternative:
Angled or inclined screens are in limited use. Although they appear to be effective in reducing impingement mortality, it is not clear whether their performance differs from a conventional screen. Because there is no apparent advantage, angled or inclined screens are not considered further in this analysis.

Alternative 2 – Fixed Screening Devices

- *2a – Wedgewire Screens*

Description:
Wedgewire screen is constructed of wire of triangular cross section such that the surface of the screen is smooth while the screen openings widen inwards. Fine mesh screens have slot spacing of less than 9.5 mm (3/8 inch) and are typically less than 3 mm. Slot size for coarse mesh screens is 9.5 mm or greater. The cylindrical screen design has been used at several power station applications. However, most of these applications have been for closed-cycle cooling systems.

A typical installation would include an array of tee shaped cylindrical screens. If one-mm slot size were required, a station with a 500 mgd cooling water flow would require approximately 15 7-foot diameter by 23-foot long screens. The screens would be placed in the intake water body at a depth such that it would not present a hazard to navigation.

The screens would be cleaned periodically with an automatic compressed air system when located near shore. A large plenum structure would be added to the front of the intake structure to distribute the flow from the intake array. The existing intake structure would remain intact and functional. It could be used as a backup to the wedgewire screen system. The plenum structure would have openings that would allow flow to pass in case of screen clogging. Alternatively, wedgewire screen must be sized to minimize clogging and is subject to periodic manual cleaning.

For far-offshore applications, a compressed air cleaning system is not practical. Under such conditions, the reliability of fine mesh screens is uncertain, and only coarse mesh wedgewire screens should be considered.

Technical Feasibility/Reliability:
Wedgewire screens have been widely used for hydropower diversion structures. The cylindrical screen structures have been used successfully for many years for water withdrawals up to 100,000 gpm. Withdrawals of larger quantities are rare. The wedgewire cylindrical screens have been implemented at only two relatively large power plants with once-through cooling systems: Campbell Unit 3 on Lake Michigan, and Eddystone Unit 1 on the Delaware River. The high number of wedgewire screens required for many plants is higher than has been previously used and likely poses impractical logistical issues associated with placement in the bay or river.

The long-term reliability of the wedgewire screens of the one-millimeter size is unknown. Although some vendors have proposed construction materials which would prevent mussel or other biological growth on the screens, the requirements for biofouling control are uncertain and could be substantial. The automatic backflushing would reduce screen fouling from both biological growth and suspended particulate matter. However, to be effective for screen cleaning, this system requires an ambient current to transport the removed particles from the vicinity of the screens. In waters with minimal current, debris accumulation may be excessive and backwashing ineffective. Small or negligible currents in the intake water body could make wedgewire screens impractical, especially fine-mesh screens.

In addition, if the screens were to be located at a distance from the shore, considerable length of large diameter piping would be necessary to connect the screens to the existing cooling water system. Installation of such a system will result in significant cost as well as potential disruption of the site and the waterbody.

Cost:
The cost for the wedgewire screen alternative should consider the distance offshore, needed piping, and air-burst cleaning system. Operation and maintenance costs include two maintenance dives (6 days each) each year, replacement parts, and system monitoring by facility staff (10 hours per week).

Effectiveness:
Wedgewire screens have been demonstrated to essentially eliminate impingement and, for smaller slot sizes, reduce larval entrainment. The 1-mm slot size has been demonstrated to reduce entrainment by over 80 percent at some facilities. However, achievement of such results is dependent on the presence of relatively high ambient currents that can sweep the plankton along and past the screens.

Potential for Other Adverse Effects:
The primary adverse effect associated with this alternative is the potential for obstruction to navigation caused by multiple submerged structures in the waterbody near the plant. In addition, the presence of rock rip-rap around a large number of screen structures can result in a "reef effect," causing the fish population density to increase in the vicinity of the screen structure. This phenomenon is more likely in cases where there is very little spawning habitat near the intake location.

Overall Assessment of Alternative:
Wedgewire screens have the potential for clogging and interference with navigation. Without adequate sweeping velocity, a small enough slot size to reduce entrainment is not recommended. The cost of this alternative is high and is strongly dependent on the

number of screens needed and the length of new pipeline construction needed to interconnect all of the screens and to build a common tunnel to the shoreline.

- *2b – Perforated Pipes*

Description:
With perforated pipes, water is drawn through perforations or slots in a pipe located in the waterbody. EPA included this technology in its discussion of intake technologies. However, perforated pipes have been used only in small water withdrawal applications. It is also subject to clogging and fouling. It is also similar in principal to wedgewire screens. Therefore, this technology alternative will not be discussed further in this document.

- *2c - Barrier Nets*

Barrier nets are wide-mesh nets that are placed in front of the intake structure entrance. The nets are sized to prevent the fish to pass through, and low velocities are maintained at the net to allow affected fish to swim away. Barrier nets would be mounted on a frame that would allow ease of cleaning or replacement.

Technical Feasibility and Reliability:
Barrier net systems involve technologies that are in widespread use especially in freshwater systems. Construction techniques that would be used for these systems are commonplace. Maintenance requirements include routine cleaning of debris and/or net replacement. Deployment is limited to spring-to-fall because of the potential for winter damage from icing and storms. Finally, placement of a barrier net at the intake has the potential to adversely affect boat traffic.

Cost Considerations:
For typical plower plants, the estimated capital cost for installation of barrier nets is $0.5M to $1.5M. The estimated operation and maintenance cost is approximately $50,000 per year for freshwater deployments. Operation and maintenance costs include monthly changeout and annual deployment and removal.

Effectiveness:
Barrier nets have been shown to be effective for impingement reduction at a number of facilities. Greater than 90% reduction in impingement has been realized at a number of facilities. However, they are not effective in deterring fish eggs and larvae, or other planktonic organisms. There is the potential for clogging with debris; hence a routine cleaning operation is essential. Adequate area to allow low through net velocity (<0.5 ft/s, often <0.1 fps) is important to prevent clogging and collapse.

Potential for Other Adverse Effects:
This alternative could pose limitations on navigation in the vicinity of the intake.

Overall Assessment of Alternative:
There have been a number of positive experiences with barrier nets for reduction in impingement, and the cost is very low compared to other technologies. Barrier nets will not address entrainment, routine cleaning is essential, and removal during the winter is necessary to avoid serious damage to the nets.

- *2d - Aquatic Filter Barrier System*

Description:
Aquatic filter barrier systems are designed to completely enclose an existing intake structure and essentially filter the water drawn through the fabric to the intake structure. The best known manufacturer of aquatic filter fabric systems for power plant intake applications is Gunderboom. The Gunderboom system is a double panel, full water depth fabric curtain suspended from flotation billets at the water surface and secured in place by an anchoring system. The system includes mooring lines, ballast chain, anchoring system and an automated compressed air cleaning system. Automatic alarms and monitors may be installed in an appropriate control room to monitor the fabric alignment and system operation.

The standard design hydraulic loading rate of the Gunderboom fabric is 3-5 gpm per square foot with a generally recommended maximum range of 10-12 gpm per square foot. At the recommended design hydraulic loading and an assumed water depth of 15 feet, a length of fabric of more than one mile would be required for a 500 mgd cooling water flow. Therefore at a minimum, this alternative would require that a large area around the intake structure be encompassed by the fabric.

Technical Feasibility/Reliability:
The technology and construction techniques required for this option have been fully implemented only at the Lovett Power Plant in New York State. Clogging of the Gunderboom is a routine maintenance issue. The length of fabric required would encompass a large area around an intake structure. Aquatic filter barriers are not likely to withstand the icing conditions encountered in the Great Lakes region. A Gunderboom would require seasonal deployment, increasing the operation and maintenance costs.

Cost Considerations:
The estimated capital cost of the Gunderboom alternative is high compared to other near-shore technologies. The operation and maintenance costs include the mobilization and installation/demobilization and removal of the system each year. They also include regular underwater inspections of the filter curtain each month and one thorough underwater inspection each year.

Effectiveness:
Aquatic filter barriers have been demonstrated to be effective in substantially reducing larvae entrainment and fish impingement losses at power station intakes on the Hudson River. As a result, the New York State DEC is a strong advocate of this technology for entrainment and impingement reduction. However, clogging and ambient conditions can increase the risk of fabric failure, rendering the system ineffective.

Potential for Other Adverse Effects:
Because this aquatic filter barrier application would require closing off much of the waterbody near the plant, navigation could be restricted. The potential for aquatic organisms to be impinged in the fabric is a concern.

Overall Assessment of Alternative:
Based on the logistical and potential navigation issues associated with the extensive area of the waterbody that would be encompassed by the aquatic filter fabric, and

operational issues associated with potential clogging of the fabric, it is not likely that this alternative would be practical in any once-through application with large flow rates.

- *2e - Porous Dams/Leaky Dikes*

Description:
Porous dams, also known as leaky dams or leaky dikes, are filters constructed of stones surrounding the cooling water intake. The core of the dike is composed of gravel or stone which allows water to be drawn through it. The exterior of the dike is armored with larger rocks. The dam serves as a behavioral and physical barrier to aquatic organisms. The reduced flow rate across the full face of the dam greatly reduces impingement, however, "hot spots" of high velocity may be present in local areas of high porosity, and its effectiveness in screening fish eggs and larvae is not well established.

Technical Feasibility and Reliability:
Because of its size, a porous dam constructed around an intake structure may not be practical in waterbodies of limited size, because of potential impacts to navigation.

Cost Considerations:
Because of its large size, a large part of the capital cost of a porous dam is materials (stone and gravel). Operation and maintenance would include routine maintenance and potentially heavy cleaning or dredging every five years.

Effectiveness:
If the surface area is sufficiently large, the porous dam intake structure could result in a lower impingement rate, but may not decrease the entrainment rate. The porous dam would decrease impingement due to low intake velocity across the dam face and the physical barrier created by the stones used in the dam. The dam structure would need to be located such that its construction does not impact known spawning beds. The presence of the stone could create spawning areas where there were none and could actually serve to increase entrainment. Alternatively, potential spawning areas near the traveling water screen might be closed to spawning fish.

Potential for Other Adverse Effects:
Significant biofouling could be expected due to *Cladophora*, aquatic weeds (e.g., watermilfoil), and zebra mussel. Biofouling of the porous dam would reduce plant cooling water intake rate. Frazil ice formation should be expected in the winter months and the dam itself would be subject to structural damage from surface ice. The size of the porous dam is large, and its construction has the potential to damage fish spawning areas. In smaller waterbodies, a dam of sufficient size to effectively reduce intake velocity could impede shipping and boating.

Overall Assessment of Alternative:
A porous dam will likely be effective for reduction in impingement if designed for low intake velocity. Entrainment performance is uncertain. Reliability of water flow is uncertain because of the potential for fouling and icing.

Alternative 3 - Submerged Offshore Intake Structure

Description:
An offshore intake structure alternative would consist of a structure with velocity cap (or other technology such as wooden cribs or wedgewire screens), and a single pipeline into the station. The size of the structures would be designed to achieve a nominal intake velocity of 0.5 ft/s. The velocity cap on the structure provides horizontal flow that reduces the potential for fish impingement. The intake structures would be located in the water body at a water depth of at least 20 feet. The intake pipeline would be placed by either trenching or tunneling.

Technical Feasibility/Reliability:
The technology and construction techniques required for installation of submerged intake structures are well known and understood. Submerged intakes have been constructed at several facilities and have been shown to be reliable in the long term. Considerations for designing and constructing the alternative include (1) the depth to bedrock and the associated pipeline placement method to be used (e.g. tunneling versus dredging/trenching), (2) the length of pipeline needed to reach sufficient depth, (3) prevention of ice formation on the intake structure or installation of a system to control ice, (4) zebra mussel control, and (5) the need to avoid obstruction of navigable waters. Another technical consideration for the offshore intake structure alternative is that the intake water could have a reduced temperature which would potentially improve power plant performance.

Cost Considerations:
The estimated capital cost of submerged offshore intake is highly dependent on the length of new pipeline needed. One 6-day dive per year for maintenance.

Effectiveness:
The offshore intake structures could result in a lower impingement rate if designed with low intake velocity and velocity cap. Suitable placement of the intake off-shore may reduce the density of eggs and larvae subject to entrainment relative to an on-shore location. The intake structure construction could impact spawning beds. The presence of the intake structure and associated anchor stone and rip-rap could create new spawning areas that did not previously exist and could actually act to increase entrainment.

Overall Assessment of Alternative:
The submerged offshore intake has the potential for reducing impingement and entrainment, if the intake can be located where the density of eggs and larvae is low. Cost is high, and will depend on the required distance offshore. However, potentially cooler intake water temperature may improve power plant performance.

Alternative 4 – Fish Diversion and Avoidance

- *4a – Louvers and Angled Bar Racks*

Description:

Diversion devices are physical structures intended to guide fish away from and out of the intake flow. Examples of such devices include angled bar racks and louvers, which are made of a series of evenly spaced, vertical slats placed across a channel at an angle leading to a bypass area. The louvers create localized turbulence that the fish detect and avoid. The louver systems have been tested at hydroelectric facilities on rivers.
Typically, angled bar racks and louvers would be in semicircular fashion around a shoreline intake or placed across the mouth of an intake canal. Louvers would be constructed of material compatible with the environment (for example, polyethylene slats for louvers and nylon for nets), and would be mounted on a stainless steel frame, approximately 12 inches apart.

Technical Feasibility/Reliability:
The louver systems involve technologies that are in widespread use. Construction techniques that would be used for these systems are commonplace. Maintenance requirements could be potentially extensive. Divers will likely be required to routinely clean and/or replace the bar racks or louvers. The potential for damage and clogging from ice and debris is real. Finally, placement of a louver at the intake has the potential to adversely affect boat traffic.

Cost Considerations:
The capital cost for installation of louvers should include consideration for debris loading and damage. Operation and maintenance costs include two 6-day dives per year to clean and maintain the louvers.

Potential Effectiveness:
These diversion devices are not effective in deterring fish eggs and larvae, or other planktonic organisms. Louvers have been tested only in rivers with a substantial current velocity along the bank. They are most effective in diverting migratory fish from intakes in confined river channels, and therefore would be less effective in lakeside applications.

Potential for Other Adverse Effects:
This alternative could pose limitations on navigation in the vicinity of the intake.

Overall Assessment of Alternative:
Louvers/bar racks can effectively reduce impingement of some species of fish, but would not be effective for reducing entrainment. This technology would be effective only with an ambient current, and would not be effective in a lake setting. This alternative has relatively high probability of clogging associated with ice, debris, and biological growth and in some settings could impact navigation.

- *4b – Velocity Caps (installed on existing offshore intake)*

Description:
A velocity cap is a cover placed on a vertical inlet of an offshore intake structure. The cover results in a horizontal flow to the intake, and may reduce impingement because fish tend to avoid rapid changes in horizontal flow. Intake velocities of 0.5 to 1.5 ft/s are common.

Technical Feasibility/Reliability:

Installation of a velocity cap on an existing offshore intake may be limited because of water depth and potential interference with navigation. For some applications, a velocity cap may require routine inspection and maintenance to remove accumulated debris.

Cost Considerations:
Costs of installation of a velocity cap on an existing offshore intake should consider intake modifications and materials of construction.

Potential Effectiveness:
Although velocity caps in new offshore intakes have been shown to result in reduced impingement, it is uncertain whether the reported reductions are due to the velocity caps or the new offshore locations. Velocity caps should be designed to minimize intake velocity through the intake structure openings; a maximum intake velocity of 0.5 feet per second should be considered to meet the Phase II intake velocity threshold. In some cases, additional measures (e.g. intake screen improvements, deterrent systems) may be needed to meet impingement performance goals. Velocity caps have no impact on entrainment, although the off-shore location may result in lower entrainment levels compared to an on-shore calculation baseline intake configuration.

Potential for Other Adverse Effects:
The addition of a velocity cap to an existing intake may interfere with navigation.

Overall Assessment of Alternative:
Velocity caps may reduce impingement, but have no effect on entrainment. If the maximum intake velocity is 0.5 feet per second, the Phase II velocity threshold in Compliance Option 1(ii) would be met. As noted above, the offshore location may result in compliance with the entrainment reduction standard.

- *4c - Sound and Light Barriers*

General Description:
Behavioral barriers are intended to cause fish to actively avoid entry into the intake flow. Examples include sound barriers, light barriers, air bubble curtains, chains and cables, and electrical barriers. They are often implemented in combination with other devices such as physical barriers (e.g. fish nets). The potential behavioral barriers are briefly described below.

Sound barriers consist of devices located at the intake structure, which create sound that repels the fish. Three types of underwater sound have been tested for this application: low-frequency infra-wave sound, low-frequency sound generated by pneumatic/mechanical devices, and transducer-generated sound covering a wide range of frequencies. Low frequency, high-intensity devices have been shown to be effective. High frequency (125 kHz) devices have been reported to be effective in the Great Lakes. Pneumatic impact devices, "poppers", and "hammers" are examples of devices that have been effective in reducing impingement of some fish such as alewife at power plant intakes. There is some concern that pressure waves from pneumatic devices may be harmful to nearby organisms. In most cases, the use of high-intensity, multi-frequency sound has not been effective in repelling a wide range of fish species from intakes due to the diversity of species and sizes of species in the receiving water.

Light barriers consist of a series of underwater lamps that emit a constant or intermittent (strobe) beam of light. The effectiveness of light barriers as a deterrent has been variable, and even contradictory, in many studies. In some studies fish have been attracted to light while in others they have been repelled. Constant light has been more effective than strobe light in guiding young salmon whereas strobe light has been effective in repelling alewife and gizzard shad. Filtered mercury vapor light has been found to attract certain species of fish away from strobe lights in field studies in Europe. At the Nanticoke Generating Station on Lake Ontario, smelt, shad, white bass and shiner have been successfully guided away from intake trash racks using mercury vapor light. However, evidence of consistently reliable effectiveness for a wide range of fish species does not exist.

Air bubble curtains or screens consist of a series of diffuser pipes mounted on the base of the intake structure. The diffusers create a continuous, dense curtain of bubbles, which can repel fish. Generally, the air bubble screens have not been successful. They are not effective at night and in turbid water. In one case, at Indian Point Generating Station on the Hudson River, the air bubble screen actually attracted fish at night.

Chains or cables can be hung vertically from the top of the intake structure to form a physical, visible barrier to fish. The results of studies of this behavioral barrier have been contradictory. The effectiveness of chain barriers is dependent on flow velocity, turbidity and illumination. Debris buildup on hanging chains can disrupt hydraulic flow patterns at the intake.

Electrical barriers consist of a series of electrodes at either side of the intake structure. These barriers have had limited success and can present a safety threat.

Technical Feasibility/Reliability:
All of the behavioral barrier systems are technically feasible and reliable from the perspective of construction, operation, and maintenance. The behavioral barrier systems that have been implemented with the greatest frequency are sound and light barrier type systems. Each of these potential alternatives would consist of a metal support structure constructed at the front of the intake, sound or light emitting devices mounted on the supports, a power supply, controllers, power cables and mounting hardware. The construction and technology used for these alternatives have been regularly applied. To ensure long-term reliability of these systems, ongoing maintenance will be required. Maintenance of the systems would include cleaning and replacement of light bulbs (for light barrier systems) and prevention of corrosion of the supporting structure.

Cost:
The estimated capital cost of behavioral barriers (e.g. a strobe light barrier system) is generally lower than other technologies. Operation and maintenance costs include items such as the replacement of strobe lights each year using divers, and 10 hours per week of on-site monitoring by station staff. Costs for other behavioral barrier systems would be similar.

Effectiveness:
Because these barriers rely on the ability of the organism to respond to a stimulus, they are not effective in protecting fish eggs and larvae, or other planktonic organisms. In addition, the effectiveness of these barriers varies among species and across age

groups within species. These barriers are most effective when a single species of fish of the same size and age is to be protected. Many the behavioral barriers have not been field-tested so their effectiveness has been extrapolated from laboratory studies. None of these devices has been demonstrated to be consistently reliable in obtaining an avoidance response from a wide range of fish species. Therefore, installation of behavioral barriers would not result in reduction of entrainment, and a reduction in impingement is possible but uncertain.

Potential for Other Adverse Effects:
A potential adverse effect of the behavioral barrier alternative is a slight potential for increased attraction of fish to the intake structure. Also, any structure installed near the intake has the potential to disrupt navigation.

Overall Assessment of Alternative:
Behavioral barrier technology will not reduce entrainment However, the technology may effectively divert specific fish species and therefore could be a component of an overall impingement mortality reduction strategy.

Alternative 5 - Flow Reduction

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- *5a - Variable Speed Pumps*

Description:
Variable speed cooling water intake pumps are potentially useful for reducing cooling water flow and the associated entrainment and impingement during peak periods of biological activity. The decrease in cooling water flow results in an increase in plant condenser delta T (temperature increase through the condenser) and discharge temperature. Therefore, variable speed pumps are most appropriate during cold water periods of the year (winter and spring) in temperate climates where an increase in discharge temperature will not cause a significant increase in biological effects or cause discharge temperatures in excess of maximum acceptable levels.

For other facilities, this alternative was considered with the assumption that variable speed pumps would be installed to decrease the cooling water flow by 25% during periods of potentially high entrainment and impingement. This alternative would require replacement of existing single speed drives with adjustable speed drives (ASD) on the circulating water pumps. An on-line condenser tube cleaning system is included in this alternative to alleviate tube fouling which could potentially occur because of lower water flow rates.

Technical Feasibility and Reliability:
The replacement of the existing single speed drives with ASDs is a technically feasible and reliable alternative. However, under full power production conditions using the existing condensers for the units, this alternative, specifically the 25% reduction in flow, could reduce the reliability and efficiency of the entire system. Specifically, the reduction in flow through the condensers could cause operational difficulties (i.e condenser tube fouling), cause decreased thermal efficiency in the turbines, limit or reduce maximum power production, require condenser replacement, and alter the thermal plume effects at the discharge.

Cost:

The estimated capital cost of the variable speed pump alternative is $0.5M per cooling water pump. This capital cost assumes that replacement of the existing condensers would not be required. Operation and maintenance costs are difficult to estimate without input from the individual stations regarding thermal efficiency as well as market rates. It should be noted that costs associated with loss of thermal efficiency are likely to be partially offset by the gain in not operating the pumps at full capacity. This cost assumes that the plant could be operated at full capacity during reduced cooling water flow.

Effectiveness:
The use of variable speed pumps to decrease the flow of cooling water through the intake would effectively reduce the entrainment and impingement in the system; however, the resulting increase in temperature in the discharge could increase thermal plume effects. The alternative would amount to a relatively small reduction in flow – and corresponding reduction in impingement and entrainment effects – of approximately 25% for the entire plant during periods of time when the ASDs are in operation. Since the ASDs would not be used during the entire year, the overall reduction in impingement and entrainment would be substantially less than 25%.

Potential for Other Adverse Effects:
As noted above, reduction in cooling water flow during normal station output would result in an increased discharge delta T value which could, in turn, cause altered thermal plume effects.

Overall Assessment of Alternative:
By itself, this alternative will not likely achieve performance goals for impingement and entrainment reduction. However, it may be considered as one component of an overall compliance strategy.

- *5b – Capacity Factor Reduction*

Description:
A power plant can reduce impingement and entrainment by reducing cooling water requirements through reduced capacity factor of the facility. This approach would require a commitment on the part of the facility to limit cooling water flow to a level below the design flow rate. Unless a very low capacity factor is intended, this approach will likely be used in conjunction with other technologies to meet performance goals.

There is the potential that regulatory agencies will limit the applicability of this approach for facilities with historically low capacity factor. Although the calculation baseline is based on design capacity, the commitment to set a capacity factor limit by a facility with historically low capacity factor may be viewed as an inappropriate approach to meeting the performance goals.

Technical Feasibility and Reliability:
Reduced water flow rate will limit the power production rate based on thermodynamics as well as the thermal discharge limits for the facility.

Cost Considerations:
Reduction on capacity of a facility will have very large financial impact on the ability of a facility to generate revenue. The capital cost to implement this approach could involve

installation of equipment to limit operations; however, recordkeeping may be all that would be required to demonstrate the flow reduction achieved.

Effectiveness:
A capacity factor reduction and resulting reduced flow rate should at least reduce impingement and entrainment in proportion to flow reduction. Seasonal differences in density of aquatic life would need to be considered to determine the overall annual reductions in impingement and entrainment from the calculation baseline.

Potential for Other Adverse Effects:
This approach reduces power generation capacity, which would have to be made up elsewhere.

Overall Assessment of Alternative:
If acceptable to the regulating agencies, this alternative may be an important component of a compliance strategy.

- *5c - Mechanical Draft Cooling Tower*

Description:
The existing cooling water systems use river or lake water pumped through a steam condenser and discharged back to the source water body. These systems are generally referred to as open cycle or once-through cooling system because the water simply passes through the condenser (no recirculation) where heat is transferred from the steam to the cooling water prior to discharge. Closed cycle systems recirculate the cooling water in a closed piping system. The heated water from the condenser is cooled down in each cycle using evaporative cooling. This cooled water is then recirculated to the condenser to cool and condense the steam from the turbine. In the mechanical draft-cooling tower, fans are used to circulate air that flows against the heated water sprayed inside the tower. Cooled water is collected in the tower basin and returned to the condenser. Water must be introduced into the system at regular intervals to make up for losses due to blowdown and evaporation. The closed cycle evaporative cooling systems require a water withdrawal rate that is about 3 to 5% of the amount of water required in once-through cooling systems.

The makeup water flow for a mechanical draft-cooling tower is typically less than 5 percent of the flow required for once-through cooling. The makeup flow would be pumped to the circulating water system from the current intake structure. Blowdown would be discharged from the tower basin to the discharge canal.

Technical Feasibility and Reliability:
The technology proposed for this alternative is well known and has been implemented for similar power plants. However, this alternative requires substantial open space, consumes a substantial amount of electricity, and reduces the thermal efficiency of the system. In addition, the ability of the existing condensers to handle the higher pressures associated with the recirculating system is uncertain and could have a large effect on the costs for this alternative.

Costs:
The capital cost of the mechanical cooling tower alternative is very high. Operation and maintenance costs are typically estimated to be in the millions of dollars per year,

primarily due to additional fan and pump power demands and water treatment requirements. Finally, the increased temperature of cooling water in the steam condensers will results in both efficiency and capacity loss for the generating units. During the hottest summertime conditions when electricity demand is highest, the efficiency and capacity losses could be as high as 10%. This results in the need to purchase replacement power at a premium because a public utility has an obligation to serve its customers and will be required to bear that expense.

Effectiveness:
The mechanical draft cooling tower alternative would effectively reduce both impingement and entrainment in proportion to the flow reduction, typically 95% or more. This technology meets both the impingement mortality reduction and entrainment reduction performance standards set by the 316(b) Phase II rule for existing facilities.

Other Potential Adverse Effects:
The primary adverse effects for the mechanical draft cooling tower alternative are associated with increased water vapor content in the immediate area of the cooling towers. This will result in a visible plume for some periods and has the potential to result in fogging and icing impacts. To reduce the potential for these effects, a plume abatement system would be employed. Because cooling tower drift cannot be eliminated completely, the tower would be located as far as possible from electrical equipment, off-site receptors, and sensitive vegetation. Space limitations may make it difficult to locate the cooling towers to minimize these effects. A cooling tower also imposes noise and aesthetic impacts. Another significant environmental effect is that the decrease in efficiency means that more fuel is burned per unit of electrical energy output. Therefore, a plant with cooling towers will have more emissions than a plant utilizing an open cycle system. The increase in emissions will be proportional to the decrease in plant efficiency. Depending on the wide ranging weather conditions in Wisconsin, the negative effect on efficiency could be anywhere from 1% to 10%.

Overall Assessment of Alternative:
A cooling tower alternative would be effective for reduction of both entrainment and impingement mortality; however, due to the very high costs and limited space available for construction, this alternative is not considered as a part of the compliance strategy.

- *5d – Dry Cooling*

Description:
With a dry cooling system air is used as a heat sink to condense steam in the system. Cooling water is essentially eliminated. However, a dry cooling system requires a large cooling surface, many cooling fans, and a more sophisticated steam ducting system, which would require extensive modifications to an existing facility. In addition, an annual average thermal efficiency penalty of 2% to 5% is likely for the power plant. During the hottest summertime conditions when electricity demand is highest, the efficiency and capacity losses could be well over 10%. Because of these high costs, dry cooling is not considered a part of the compliance strategy for any existing facility.

Alternative 6 - Restoration

Description:

The Phase II rule allows the use of mitigation strategies for enhancing fish and aquatic biota populations to offset impingement and entrainment losses. These strategies typically involve habitat restoration methodologies, particularly the creation and improvement of important habitat types that support marine biota, as well as spawning and nursery areas. Alternatively, ENSR is aware of several fish-stocking efforts in the southern United States that are viewed as successful by all parties involved. Ideally, the restoration activity should result in mitigating the types of species that are affected by entrainment and impingement at the plant and result in quantifiable benefits near the station. Alternatively, the rule allows for "out-of-kind" restoration, which might be simpler to institute and monitor.

For this alternative, various habitat restoration strategies considered for the We Energies facilities include:

- Fish Stocking – this option is expected to be effective and is generally supported by WDNR.
- Shoreline wetland creation – not expected to be effective
- Offshore artificial habitat creation – not expected to have a noticeable effect
- Habitat restoration on nearby tributaries – expected to be very effective, and is supported by WDNR
- Dam removal – if there are nearby opportunities .

The restoration process would involve the following activities: (1) evaluation of entrainment and impingement data to assess target species and associated habitat restoration strategies, (2) reconnaissance surveys of the affected water bodies to assess potential areas for habitat creation and/or improvement, (3) selection of the most appropriate restoration strategies and areas for restoration, (4) determination of the species that would benefit for each habitat restoration strategy, (5) evaluation of the extent of restored habitat needed to offset entrainment and impingement losses, (6) implementation of selected restoration strategies, and 7) coordination with relevant resource agencies (e.g., state environmental agency, US Fish and Wildlife) to gain approval.

ENSR recommends that any restoration measure be developed in close coordination with the resource agencies. In fact, a We Energies subsidy of existing or planned agency programs may greatly simplify the implementation and monitoring of such efforts. Restoration may also involve significant planning, public outreach, permitting in its own right. On the other hand, some types of programs may result in a high-profile, positive contribution by We Energies. Thus, ENSR tentatively endorses restoration only because no other cost-effective mitigation measure for entrainment is available and the agencies may be reluctant to rely on site-specific BTA alone. For these reasons, we believe further assessment of restoration is likely to be useful to We Energies.

<u>Technical Feasibility/Reliability:</u>

Each of the potential restoration methods has been used with success in a number of applications. Each of the restoration methods would require an assessment of whether any conditions in the water bodies would preclude long-term success. The potential for court-remanding of the restoration measures should be considered.

Cost Considerations:
The capital cost of this alternative is expected to range from $200,000 to $5,000,000 depending on the number and type of restoration efforts selected. Annual costs associated with monitoring (assumed to continue for ten years) range from $40,000 to $125,000.

Effectiveness:
There is little existing quantitative information on using increases in biological production at habitat areas to offset impingement and entrainment losses. However, restored habitat areas have been demonstrated to result in an increase in biota and spawning. Alternatively, a well-designed stocking program may be able to provide a more direct replacement of important species on an adult-equivalency basis.

Other Adverse Effects:
There are no likely adverse effects of the restoration alternative.

Overall Assessment of Alternative:
This alternative is technically feasible, has relatively low costs, and is likely to be effective (though at this point it is difficult to quantify the degree of mitigation that would be obtained). The alternative would also provide an overall environmental benefit to the affected water bodies.

Table A-1:
Preliminary Assessment of Mitigation Measures

BTA Alternative	Cost (Capital plus O&M)[1]	Power plant efficiency impact[2]	Construction and Operation Issues[2]: Station Outage with Construction	Navigation Effects	Potential Clogging	Potential Adverse Environmental Effects[2]	IM Benefits/ Effectiveness	E Benefits/ Effectiveness
Traveling Screen Modifications								
Modified traveling screens (dual flow)	$$-$$$	0	**	0	0	0	IM reduction if through screen velocity is reduced.	None if standard screen mesh is used.
Modified traveling screens (Ristroph Screens)	$$ - $$$	0	**	0	0	0	Effective IM reduction for many species. May not be effective for alewife and smelt	None, if std. mesh size.
Fine Mesh Screens on traveling screen system.	$$ - $$$$	0	**	0	**	0	Effective with adequate fish handling system	Potential entrainment reduction, but survivability uncertain even with fish handling system. Return of ichthyoplankton outside discharge canal may be required.
Angled and modular inclined screens	$$ - $$$	0	**	0	*	0	Potential impingement reduction for some species given effective fish return	none
Fixed Screening Devices								
Wedgewire Screens	$$ - $$$	0	**	**	**	*	Effective impingement reduction if through screen velocity is appropriate.	Potential for E reduction may depend on slot size, crossflow current, productivity of surrounding area.
Perforated Pipes	$$	0	*	0	*	0	some benefit possible because of absence of a confined channel in which fish can become trapped.	none
Barrier Net	$-$$	0	0	**	*	0	High if properly installed and winter-time impingement is low.	None
Aquatic Filter Barrier (e.g., Gunderboom)	$$$	0	0	**	**	*	I reduction for all species	E reduction for all species
Porous Dike / Leaky Dam	$$-$$$	0	*	*	**	*	High if through-dike velocities are low and/or behavior measures to minimize.	Variable depending on presence of pipes.
New Intake location								
Offshore Intake Structure	$$$ - $$$$$	Potential improvement (cooler water) if off-shore	**	**	0	*	Potential reduction for some species, depending on population density differences	Potential reduction for some species, depending on population density differences

ENSR

Table A-1:
Preliminary Assessment of Mitigation Measures

BTA Alternative	Cost (Capital plus O&M)[1]	Power plant efficiency impact[2]	Construction and Operation Issues[2]: Station Outage with Construction	Construction and Operation Issues[2]: Navigation Effects	Construction and Operation Issues[2]: Potential Clogging	Potential Adverse Environmental Effects[2]	IM Benefits/ Effectiveness	E Benefits/ Effectiveness
Fish Diversion and Avoidance								
Diversion Devices: Louvers and Bar Racks	$$	0	0	*	*	0	Potential impingement reduction for some species given effective by-pass	None
Velocity cap on offshore intake	$-$$	0	0	**	0	0		
Behavioral Barriers: Strobe Lights, acoustic deterrent, bubbles, chains	$ - $$	0	0	0	0	0 or *	Potential impingement reduction for some species	None
Flow Reduction								
Variable Speed Pumps	$$	*	*	0	0	*	I reduction proportional to flow reduction.	E reduction proportional to flow reduction, more effective during spawning period
Evaporative Cooling Towers	$$$$ - $$$$$	**	**	0	0	*	I reduction for all species	E reduction for all species
Dry Cooling Tower	$$$$$	**	**	0	0	*	I reduction for all species	E reduction for all species
Increased Fish Population								
Restoration	$ - $$	0	0	0	0	0	Requires site-specific analysis	Requires site-specific analysis

Notes:

1. Typical Costs
$ - Less than $1M
$$ - $1M-$10M
$$$ - $10M-$50M
$$$$ - $50M-$100M
$$$$$ - Greater than $100M

2. Adverse Effects
0 - Negliable
* - Significant
** - Potentially Severe

APPENDIX B

REVIEW OF LAKE MICHIGAN FISHERIES

To predict impacts or benefits of changes to the CWIS at PBNP, it is necessary to understand the very dynamic nature of the Lake Michigan fishery. The image of fisheries associated with "typical" inland Wisconsin lakes must be set aside because the Lake Michigan fishery is significantly different, both from a species composition and a water body size perspective from the "typical" inland lake. While members of the minnow/bluegill/bass/pike/walleye families dominate most inland lakes, exotic species including alewife, rainbow smelt (hereafter referred to as smelt) and virtually all of the trout and salmon species, dominate the Lake Michigan fishery. Most inland lakes are less than 15 square miles (about 10,000 acres) in size, whereas the surface area of Lake Michigan exceeds 22,000 square miles (14 million acres). In many respects, it functions as a fresh water ocean.

The major fish species, numerically speaking, currently present in the lake are alewife, smelt, sculpin (deepwater, slimy sculpin), bloater chub (hereafter, referred to as chubs), and yellow perch. The status of these species is monitored and reported annually by the US Fish and Wildlife Serves (USFWS) (GLFC 1999). The states of Wisconsin, Illinois, Indiana, and Michigan cooperate in monitoring/managing various aspects of the fishery, including the need to tailor trout and salmon stocking programs, in response to the abundance status of the major species noted above. For many years, the states of Michigan and Wisconsin have had active control programs in place for one exotic specie, the sea lamprey. Sea lamprey has had a dramatic negative impact on native species such as the lake trout, certain chub species, and lake whitefish (Michigan Sea Grant 1981).

The status of the fishery is the subject of an annual meeting involving state and federal fish management agencies and several university researchers. Reports from these meetings were used to prepare this overview (GLFC 2000).

While the state and federal agencies primarily focus their attention on what is occurring in the regions of the lake deeper than 50 feet, extensive utility-sponsored 316(b) studies have examined that portion of the fishery that utilize the very shallow regions. The impetus for these studies was to satisfy the requirements of sections 316(a) (thermal discharge variances) and 316(b) of the federal CWA in the early 1970s. Every power plant owner that discharged condenser cooling water provided state permitting agencies with site-specific studies to demonstrate compliance with, or to obtain a variance from, effluent limitations for the thermal component of any point source discharge (CDM/Limnetics 1976). In addition, power plants were required to estimate the number and weight of fish impinged or entrained by the CWIS. Fisheries information was used by the agencies as part of the 316(b) BTA determinations made for each power plant CWIS back in the 1970s.

The following picture of the fishery has emerged from the work by the states, USFWS, and the utility companies.

- Compared to inland lakes, few species inhabit the very shallow (<50ft) region of Lake Michigan on a continuous basis (CDM/Limnetics 1976). The exception appears to be members of the sucker family, based on 5-years of study near the PBNP (WEPCo 1977).

- By contrast, most species, including alewife, smelt, yellow perch, and all of the trout and salmon, exhibit well defined movements from deeper regions of the lake to the shallow shore line areas to spawn, feed, or in response to the annual seasonal temperature changes (Michigan Sea Grant 1981). The length of time spent by these species in the shallower regions of the lake is highly variable from year to year, as are the apparent species densities occupying specific areas of the near-shore region. This conclusion is based primarily on the results of extensive 316(b) studies, including several that were quite intensive in effort and were conducted for five or more years. In particular, studies conducted near the Point Beach (WEPCo 1977), D.C. Cook (Tesar, et al 1985), and Zion Nuclear plants (LaJeone 1978) provide valuable insights as to what species typically migrate into and out of the shallow shoreline region and which species spawn and rear young in this zone. Spigarelli et al. (1981) found that the rates of impingement and entrainment of alewife, smelt, and yellow perch were highly variable in time and space due to spawning and seasonal habitat selection. They also find correlations between impingement and entrainment rates and "location, intake type and position, and volume of water flow." Impacts of once-through cooling at all lake facilities to the biomass of these three species were calculated to be modest.

- The most abundant species in the lake have exhibited remarkable changes over the past 30 years in response to resource agency management practices. For example, in response to the extremely abundant nature of the alewife, the states initiated a Pacific salmon stocking program in the mid-1960's in an attempt to biologically control the exotic alewife and to establish a sport fishery. The lake ecosystem responded in an equally dramatic fashion. Species that were thought to be suppressed by the alewife, principally chubs and yellow perch responded dramatically (Smith 1970). By the 1980's both chubs and perch were very abundant relative to the previous 20 years (GLFC 1999). However, both of these species again declined quite dramatically during the 1990's. The invasion of yet another exotic, the zebra mussel, has been identified as a potential candidate collaborator in this latest dramatic change that has occurred in the fishery.

- By contrast, the other major species, smelt, and sculpin, have exhibited less dramatic fluctuations in abundances (GLFC 1999).

- State and federal agencies have had to reduce trout and salmon stocking in recent years to conserve the volatile forage base, comprised principally of alewife and smelt. However, sculpin and to a lessor extent young chubs, are also consumed by trout and salmon (Eck and Wells 1986).

- Other common, but less abundant species such as spottail shiner, trout perch, Johnny darter, and stickleback represent summer inhabitants of near-shore waters (Tesar et al 1985). These species have not been considered important food items for the trout and salmon.

- Species such as the commercially important lake whitefish and round whitefish are only numerically abundant in the northern and northeast areas of the lake (CDM/Limnetics 1976). These species tend to be abundant near underwater reef complexes, especially those associated with limestone outcroppings.
- Bloater chubs are principally deep-water inhabitants, but their young do occasionally invade shallower waters as temperatures permit (e.g., during summer upwelling events) (Tesar et al, 1985).

The rates of fish impingement as well as the density of ichthyoplankton in nearshore have been consistently observed to have a strong seasonal component. In fact, it is common practice to sample ichthyoplankton during the months of April through September due to the consistent observation of very low densities in other months of the year. While winter-time impingement is generally significantly reduced from that of warmer months, it is common practice to sample impingement on a year-round basis.

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APPENDIX C

EPA COST ESTIMATE

Appendix C:

US EPA-Estimated Compliance Costs based on the Model Facility Approach for the Section 316(b) Phase II Final Rule

Source: Appendices A and B of the Final Rule in the Federal Register, July 9, 2004.

Column 1 Facility Name	Column 2 Facility ID	Column 3 Intake ID	Column 4 EPA Assumed Design Intake Flow, gpm (X_{epa})	Column 4a EPA Assumed Design Intake Flow, MGD (X_{epa})	Column 5 Capital Cost	Column 6 Baseline O&M Annual Cost	Column 7 Post Construction O&M Annual Cost	Column 8 Annualized Capital + Net O&M Using EPA Design Intake Flow[2] (Y_{epa})	Column 9 Net Revenue Losses from Net Construction Downtime	Column 10 Pilot Study Costs	Column 11 Annualized Downtime and Pilot Study Costs[2,4]	Total Annualized Costs (Columns 8 + 11)	Column 12 Performance Standards on which EPA Cost Estimates are Based	Column 13 EPA Modeled Technology[5]	Column 14 Design Flow Adjustment Slope (m)[1]
Point Beach Nuclear	AUT0085		975,261	1,404	$23,279,870	$341,127	$452,608	$3,426,011	$52,842,026	$2,351,844	$4,445,953	$7,871,964	I&E	4	2.5787

[1] The design flow adjustment slope (m) represents the slope that corresponds to the particular facility using the technology in column 3.
[2] Discount rate = 7%.
[3] Amortization period for capital costs = 10 years.
[4] Amortization period of downtime and pilot study costs = 30 years.
[5] EPA Technology Codes:
4. Addition of passive fine-mesh screen system (cylindrical wedgewire) near shoreline with mesh width of 1.75 mm.

APPENDIX D

AGENCY CONSULTATION DOCUMENTATION

D. Michaud

NMC
Committed to Nuclear Excellence

Point Beach Nuclear Plant
Operated by Nuclear Management Company, LLC

NPL 2004-0010

January 15, 2004

Edward C. Spoon
Special Agent
U. S. Fish & Wildlife Service
Green Bay Field Office
1015 Challenger.Ct.
Green Bay, WI 54311-8331

Point Beach Nuclear Plant
Fish and Bird Report for Period January 1, 2003 through December 31, 2003

Dear Mr. Spoon:

Wisconsin Electric Power Company, doing business as We Energies (We Energies) and Nuclear Management Company, LLC (NMC), hereby submit the enclosed report in satisfaction of the terms set forth in the letter dated June 6, 2001 from the U.S. Attorney, Eastern District of Wisconsin, U.S. Department of Justice to Susan H. Martin, Wisconsin Electric Power Company. This report contains a record of the birds and fish removed and recovered from the fish basket associated with the traveling water screen screen-wash system of the cooling water intake at Point Beach Nuclear Plant (PBNP) for the period of January 1, 2003 to December 31, 2003.

We wish to note that in 2003, the electronic data logs used to record information on birds recovered in the traveling water screen screen-wash system did not include identification of the individual bird species. The NMC staff is revising the data logs for 2004 to record that information.

In addition, as in the 2002 Fish and Bird Report submitted January 14, 2003, we would again note that although inspection for smaller fish (smaller than six inches) was completed consistent with paragraph two of the June 2001 letter, fish smaller than six inches cannot typically be recovered from the traveling water screen screen-wash system because they pass through the screen. When recovered in larger numbers, as was the case in June and July of 2003, the number of alewife was counted without the aggregate weight determined.

With submission of the enclosed information, We Energies has completed the third year of the five-year record keeping and reporting obligations as set forth in the June 2001 letter.

If you have any further questions, please contact the undersigned.

A.J. Cayia
Site Vice President

Enclosure

cc: Matthew V. Richmond, Assistant U.S. Attorney
Susan H. Martin, Counsel – We Energies

bcc: A. J. Cayia	J. W. Connolly	J. E. Knorr
J. H. McCarthy	D. Michaud	L. A. Schofield
File	E. J. Weinkam III	

POINT BEACH NUCLEAR PLANT 2003 FISH AND BIRD REPORT

MIGRATORY BIRDS AND FISH > 6"

	MIGRATORY BIRDS		TROUT > 6"					SALMON > 6"					GAME & FOOD > 6"								ROUGH > 6"					
2003	Identifiable Birds*	Unidentifiable Birds*	Brown Trout	Lake Trout	Rainbow Trout	Nonspecific Trout	TOTAL	Chinook Salmon	Coho Salmon	King Salmon	Nonspecific Salmon	TOTAL	Bluegill	Burbot/Lawyer	Catfish	Perch	Small Mouth Bass	White Fish	Nonspecific G & F	TOTAL	Carp	Freshwater Drum/Sheepshead	Sucker	Nonspecific Rough	TOTAL	Unknown Fish > 6"
JAN	3	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	10	10	0	0	0	2	2	1
FEB	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	3	3	0
MAR	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	0	1	1	1
APR	3	1	0	0	0	1	1	0	0	0	2	2	0	0	4	0	0	84	7	95	0	614	0	4	618	8
MAY	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	1	1	14	16	4
JUN	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	6	8	0	0	1	1	2	1
JUL	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	4	1	5	0
AUG	1	0	0	0	1	0	1	1	0	0	0	1	0	8	0	1	0	0	0	9	0	0	40	0	40	0
SEP	0	0	1	4	0	0	5	0	2	0	1	3	0	6	0	0	0	0	0	6	0	0	7	0	7	0
OCT	0	0	0	2	0	1	3	0	0	0	0	0	0	2	0	0	0	0	0	2	1	0	1	0	2	0
NOV	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	1	0	1	0	0	9	0	9	3
DEC	3	0	1	0	4	0	5	0	1	0	0	1	0	5	1	0	0	13	2	21	1	1	10	1	13	1
TOTAL:	16	1	2	6	5	6	19	2	3	0	7	12	0	23	5	2	0	98	33	161	2	616	73	27	718	19

*Identifiable birds recovered on 1/20/03 (3), 2/22/03 (3), 4/29/2003 (3), 5/9/2003 (1), 5/12/2002 (2), 8/26/03 (1), and 12/22/2003 (3). Unidentifiable bird recovered on 4/5/03.

POINT BEACH NUCLEAR PLANT 2003 FISH AND BIRD REPORT

FORAGE AND SMALLER FISH

START DATE	END DATE	Forage > 6"	Alewife < 6"	Nonspecific Fish < 6"
JUN 1	JUN 7	0	0	1
JUN 8	JUN 14	0	0	14
JUN 15	JUN 21	0	111	0
JUN 22	JUN 28	0	0	0
JUN 29	JUL 5	0	0	0
JUL 6	JUL 12	0	8	0
JUL 13	JUL 19	0	44	0
JUL 20	JUL 26	0	0	0
JUL 27	AUG 2	0	29	0
SEP 29	OCT 4	0	0	0
OCT 5	OCT 11	0	0	0
OCT 12	OCT 18	0	0	0
OCT 19	OCT 25	0	0	0
OCT 26	NOV 1	0	0	0
NOV 2	NOV 8	0	0	0
NOV 9	NOV 15	1	0	0
NOV 16	NOV 22	0	0	0
NOV 23	NOV 30	0	0	0

TOTAL:	1	192	15

Commorents - Current

NMC
Committed to Nuclear Excellence

Nuclear Management Company, LLC
Point Beach Nuclear Plant
6610 Nuclear Road
Two Rivers, WI 54241

COPY

NPL 2003-0014

January 14, 2003

Edward C. Spoon
Special Agent
U. S. Fish & Wildlife Service
Green Bay Field Office
1015 Challenger Ct.
Green Bay, WI 54311-8331

Re: Point Beach Nuclear Plant
Fish and Bird Report for Period January 1, 2002 through December 31, 2002

Dear Mr. Spoon:

Wisconsin Electric Power Co., d/b/a We Energies (We Energies) and Nuclear Management Company, LLC (NMC) hereby submit the enclosed report in satisfaction of the terms set forth in the letter dated June 6, 2001 from the U.S. Attorney, Eastern District of Wisconsin, U.S. Department of Justice to Susan H. Martin, Wisconsin Electric Power Company. This report contains a record of the birds and fish removed and recovered from the fish basket associated with the traveling water screen screen-wash system of the cooling water intake at Point Beach Nuclear Plant (PBNP) for the period January 1, 2002 to December 31, 2002. These records were kept and are submitted consistent with the terms agreed to in the June 2001 letter.

Similar to the 2001 Fish and Bird Report submitted January 14, 2002, we would again note that although inspection was done for smaller fish (smaller than six inches) consistent with paragraph two of the June 2001 letter, fish smaller than six inches cannot typically be recovered from the traveling water screen screen-wash system because they pass through the screen. Fish smaller than six inches were recorded and are being reported by number rather than by aggregate weight due to the minimal number of fish recorded.

On August 27, 2002, Fred Cayia, Dave Michaud, and Susan Martin, met with the FWS and the Assistant U.S. Attorney to discuss issues related to the PBNP reporting requirements. At that meeting, we stated that We Energies and NMC would continue to perform its record keeping as performed during 2001, unless the U.S. Department of Justice of U.S. Fish & Wildlife Service provided additional information. To date, we have received no further information.

With submission of the enclosed information, We Energies continues to satisfy the record keeping and reporting obligations for 2002 as set forth in the June 2001 letter.

If you have any further questions, please contact the undersigned.

Very truly yours,

A. J. Cayia
Site Vice President

Enclosure

cc: Matthew V. Richmond, Assistant U.S. Attorney
Susan H. Martin, Counsel – We Energies

Point Beach Nuclear Plant
NPL 2003-0014
January 14, 2003

MIGRATORY BIRDS

2002	Cormorants	Gulls
JAN	0	0
FEB	0	1*
MAR	0	0
APR	0	1*
MAY	0	2*
JUN	0	0
JUL	0	10*
AUG	0	0
SEP	0	0
OCT	0	0
NOV	0	0
DEC	0	0
TOTAL	0	14

TROUT > 6"

2002	Brown Trout	Lake Trout	Rainbow Trout	Nonspecific Trout	TOTAL
JAN	0	0	0	1	1
FEB	0	0	0	1	1
MAR	0	0	0	0	0
APR	0	0	0	1	1
MAY	0	0	3	0	3
JUN	0	0	0	0	0
JUL	0	0	0	1	1
AUG	0	0	0	0	0
SEP	0	0	0	0	0
OCT	0	1	0	0	1
NOV	0	0	0	0	0
DEC	0	0	0	14	14
TOTAL	0	1	3	18	22

SALMON > 6"

2002	Chinook Salmon	Coho Salmon	King Salmon	Nonspecific Salmon	TOTAL
JAN	0	0	0	1	1
FEB	0	0	0	1	1
MAR	0	0	0	13	13
APR	0	0	0	1	1
MAY	0	0	0	0	0
JUN	0	0	0	1	1
JUL	0	0	0	0	0
AUG	0	0	0	1	1
SEP	0	0	0	0	0
OCT	0	0	0	0	0
NOV	0	0	0	2	2
DEC	0	0	0	5	5
TOTAL	0	0	0	25	25

GAME & FOOD > 6"

2002	Bluegill	Burbot/Lawyer	Catfish	Perch	Small Mouth Bass	White Fish	Nonspecific G & F	TOTAL
JAN	0	0	0	0	0	0	2	2
FEB	0	0	1	0	0	0	9	10
MAR	0	1	0	0	0	0	5	6
APR	0	0	0	0	0	2	2	4
MAY	0	0	0	0	0	0	1	1
JUN	0	0	0	0	0	1	2	3
JUL	0	4	0	0	0	0	0	4
AUG	0	9	3	0	0	0	1	13
SEP	0	1	0	0	0	0	0	1
OCT	0	0	0	0	0	0	3	3
NOV	0	0	0	0	0	0	3	3
DEC	0	0	0	0	0	0	25	25
TOTAL	0	15	4	0	0	3	53	75

ROUGH > 6"

2002	Carp	Crappie	Sheephead	Sucker	Trash	Nonspecific Rough	TOTAL	Unknown Fish > 6"
JAN	0	0	0	1	0	5	6	16
FEB	0	0	0	3	0	6	9	2
MAR	2	0	0	0	0	3	5	1
APR	0	0	0	0	0	6	6	0
MAY	0	0	0	0	0	2	2	1
JUN	0	0	0	1	0	3	4	0
JUL	0	0	0	16	0	4	20	1
AUG	1	0	0	11	0	1	13	0
SEP	0	0	0	1	0	11	12	0
OCT	0	0	0	7	0	4	11	1
NOV	0	0	0	0	0	1	1	0
DEC	0	0	0	0	0	3	3	0
TOTAL	3	0	0	40	0	49	92	22

OTHER**

2002	Forage > 6"	Alewife < 6"	Nonspecific Fish < 6"	TOTAL
JAN	0	0	0	0
FEB	0	0	0	0
MAR	0	0	1	1
APR	0	0	1	1
MAY	0	0	0	0
JUN	0	0	0	0
JUL	3	3	4	10
AUG	0	0	0	0
SEP	0	0	0	0
OCT	0	0	0	0
NOV	0	0	4	4
DEC	0	0	2	2
TOTAL	3	3	12	18

*The gulls were recovered on 2/24/02, 4/20/02, 5/10/02 (2), 7/11/02, 7/12/02 (2), 7/13/02, 7/18/02, 7/19/02 (4), and 7/22/02.

**Fish smaller than six inches cannot typically be recovered from the traveling water screen screen-wash system because they pass through the screen.

Wisconsin Electric
A WISCONSIN ENERGY COMPANY

Point Beach Nuclear Plant
6610 Nuclear Rd.
Two Rivers, WI 54241
Phone 920 755-2321

NPL 2002-0014

January 14, 2002

Edward C. Spoon
Special Agent
U.S. Fish & Wildlife Service
Green Bay Field Office

Dear Mr. Spoon:

Re: Point Beach Nuclear Plant
Fish and Bird Report for Period June 1, 2001 through December 31, 2001

Wisconsin Electric Power Company ("WEPCO") and Nuclear Management Company, LLC ("NMC") submit the enclosed report in satisfaction of the terms set forth in the letter dated June 6, 2001 from the U.S. Attorney, Eastern District of Wisconsin, U.S. Department of Justice to Susan H. Martin, Wisconsin Electric Power Company. This report contains a record of the birds and fish removed and recovered from the fish basket associated with the traveling water screen screen-wash system of the cooling water intake at Point Beach Nuclear Plant for the period June 1, 2001 to December 31, 2001. These records were kept and are submitted consistent with the terms agreed to in the June 2001 letter.

We would note that although inspection was done for smaller fish (smaller than six inches) consistent with paragraph two of the June 2001 letter, with the exception of the previously reported intrusions of alewives on June 28, July 3, and July 7, 2001, fish smaller than six inches have not been recovered from the traveling water screen screen-wash system during this time period.

With submission of the enclosed information, WEPCO has satisfied the record keeping and reporting obligations for 2001 set forth in the June 2001 letter.

If you have any further questions, please contact the undersigned.

Very truly yours,

A.J. Cayia
Site Director
Kewaunee/Point Beach Nuclear

Susan H. Martin
Counsel
Wisconsin Electric Power Company

Enclosure

cc: Matthew V. Richmond, Assistant U.S. Attorney
Dave Michaud, Wisconsin Electric Power Company

Point Beach Nuclear Plant
NPL 2002-0014
January 14, 2002

Migratory Birds: | **Fish larger than six (6) inches removed and recovered from the fish basket:**

PBF-2107, Screen Wash System Fish and Bird Log data: 6/1/01 through 12/31/01	Migratory Birds		GAME & FOOD								ROUGH							SALMON					TROUT				
	Cormorants	Seagulls	Bluegill (G&F)	Burbot/Lawyer	Catfish	Perch	Small Mouth Bass	White Fish	Nonspecific Game & Food	TOTAL	Carp	Crappie	Sheephead	Sucker	Trash	Nonspecific Rough	TOTAL	Chinook Salmon	Coho Salmon	King Salmon	Nonspecific Salmon	TOTAL	Brown Trout	Lake Trout	Rainbow Trout	TOTAL	Unidentified Fish
JUNE TOTALS:	0	0	0	2	1	0	0	0	0	3	0	0	0	3	4	0	7	0	0	0	0	0	0	1	0	1	0
JULY TOTALS:	0	0	0	3	0	0	1	0	0	4	1	2	0	12	28	0	43	1	0	1	0	2	0	0	0	0	1
AUGUST TOTALS:	0	2*	0	17	0	1	0	0	0	18	1	0	1	24	0	0	26	0	0	0	0	0	0	2	0	2	0
SEPTEMBER TOTALS:	0	0	0	1	0	0	0	0	0	1	0	0	0	3	0	0	3	0	0	0	1	1	0	2	0	2	2
OCTOBER TOTALS:	0	0	1	0	0	0	0	3	13	17	1	0	0	26	0	0	27	2	0	0	2	4	0	9	1	10	10
NOVEMBER TOTALS:	0	0	0	2	0	0	0	2	1	5	0	1	0	9	0	0	10	0	1	0	5	6	1	0	1	2	5
DECEMBER TOTALS:	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	9	9	0	0	0	2	2	0	0	0	0	3

* Seagulls were removed and recovered on August 2, 2001 and August 16, 2001.

we energies

231 W. Michigan St.
Milwaukee, WI 53290-0001
www.we-energies.com

September 4, 2002

Mr. Lee Liebenstein
Wisconsin Department of Natural Resources
101 South Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Information Regarding Sonic Deterrent System for Point Beach Nuclear Plant

Dear Mr. Liebenstein: Lee

Per our phone conversation of August 29, 2002, I am enclosing copies of the following:

- The executive summary and sections 1.0-4.1 of BAE's proposal for sonic deterrent system for Point Beach Nuclear Plant;
- Section on sound systems from Chapter 5, EPRI Report TR-114013, dated December,1999, entitled: Fish Protection at Cooling Water Intakes;
- Paper by Ross et al.,1993, describing the system designed for the James A FitzPatrick Nuclear Power Plant (Lake Ontario) and supporting studies of system performance assessment.

Items 2 & 3 were shared with the DOJ and the US FWS during our meeting with them on August 27th. The other item was not shared with them, since they did not request additional information on the sonic deterrent system that was recently installed at PBNP this past July. As I mentioned during my phone conversation with you, the full benefit of this deterrent system has yet to be realized since it was installed after the peak abundance period for alewife in the near-shore zone of western Lake Michigan (normally, late-May through early July, depending on water temperatures). Also, due to harsh environmental factors normally encountered in these waters during the late-autumn through late spring period, the sonic deterrent system (valued at over $860,000) will be removed this fall and will be reinstalled next spring before the arrival of alewife.

Please call me at 414-221-2187 if you have any questions regarding this system.

Sincerely,

David T. Michaud

David T. Michaud
Principal Environmental Scientist

cc: Susan Martin, We Energies (w/o attachments)
Fred Cayia, NMC (w/o attachments)

Wisconsin Electric
A WISCONSIN ENERGY COMPANY

Wisconsin Electric
231 W. Michigan
P.O. Box 2046
Milwaukee, WI 53201-2046
Phone 414 221-2345

March 19, 2001

Mr. Lee Liebenstein
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707-7921

**SUBJECT: POINT BEACH NUCLEAR PLANT
COOLING WATER INTAKE STRUCTURE MODIFICATION**

Dear Mr. Liebenstein:

As discussed, Wisconsin Electric is planning to modify the cooling water intake structure at Point Beach Nuclear Plant. The intake structure was approved in 1978 in accordance with what is now Section 283.31(6), Wisconsin Statutes. For your information, enclosed are the following documents regarding the intake structure and the planned modification of that structure:

- a copy of the approval letter from DNR to Wisconsin Electric dated February 8, 1978;
- a copy of the intake structure modification plans; and
- a paper discussing the anticipated impacts of the proposed modification on fish impingement and entrainment.

The modification work is currently planned to start April 9, 2001. I will call you in a few days to answer any questions you might have. In the meantime, if you wish to contact me, I can be reached at (414) 221-3235. You may also contact Dave Michaud at (414) 221-2187 with questions regarding this project.

Sincerely,

Elizabeth Hellman

Elizabeth Hellman
Environmental Project Strategist

Enclosures

cc: Mr. Paul Luebke, DNR – Madison Office*
Mr. Jeffrey J. Haack, DNR - Northeast Regional Office
Mr. Matthew V. Richmond, Esq., U.S. Department of Justice

bcc: ED File: 1.8.2.7 | S. Martin | J. Novak-PBNP
F. Cayia - PBNP | D. Michaud | R. Sternkopf

*Without enclosures

ANTICIPATED IMPACTS OF THE PROPOSED MODIFICATION TO THE POINT BEACH NUCLEAR PLANT (PBNP) COOLING WATER INTAKE STRUCTURE ON FISH IMPINGEMENT AND ENTRAINMENT

THE CENTRAL ISSUE

In 1978, the Wisconsin Department of Natural Resources (WDNR) determined "that the location and operation of this intake structure to have minimal environmental impact" and that no modifications were required to address impingement and entrainment of fish life forms. The WDNR based their conclusions on the results of a one-year study (March, 1975-February, 1976) which found that:

- Entrainment of icthyoplankton was confined principally to three highly reproductive species; alewife, smelt and sculpin;
- Alewife and smelt comprised 98 percent of the estimated annual impingement, by weight.
- Impingement of trout and salmon totaled 56 fish where; by contrast, sport fishermen caught over 2000 trout and salmon at the plant's fishing pier in 1973.
- "The entrapment impact of the intake structure on the Lake Michigan biological population is clearly insignificant".

The proposed modifications to the structure detailed elsewhere in this filing would ostensibly remove "physical barriers" (e.g., a substantial amount of the existing semi-permeable rock crib) to fish impingement. The modifications would have no discernable impact on entrainment of free-drifting organisms such as fish eggs and larvae, since the original structure studied in the mid-1970s offered no impediment to entrainment. The purpose of this evaluation is to determine the environmental risks, such as fish impingement, associated with the proposed intake structure modification.

HISTORY OF INTAKE-RELATED STUDIES AT PBNP

In 1975, as a condition of the then effective WPDES permit for PBNP, the company was required by WDNR to conduct a one-year study to determine annual impingement and entrainment rates for the plant. Study details were negotiated with the WDNR. Ultimately, the company adopted a once every four day fish impingement monitoring program (12-month duration) as well as a once every four days monitoring program for fish entrainment (7-month duration). Tables 1-3 summarize the results of this study. The general findings were that the plant impinged slightly more than one million fish (actual estimate: 1,056,724) which weighed a collective 96,903 lbs. Alewife and smelt alone totaled 94,534 lbs. Very few sport fish were impinged. It should also be noted that no attempt was made to distinguish between living, previously dead and dying (from natural causes) alewife during the once every four days monitoring efforts in spite of the fact that the plant's intake entrained such fish. Dead and dying alewife continue to be present in very large numbers every year in the near shore area of Lake Michigan during the late spring spawning migration period.

While the WPDES permit system allows WDNR to revisit previously issued 316(b) decisions, no such formal requests were ever made of the plant. However, in 1988, owners of all power plants situated along the western shore of Lake Michigan, including PBNP, were requested (not ordered) by WDNR, Bureau of Fisheries, to provide revised estimates of annual alewife impingement losses. The Bureau made this request in response to declines in the lake-wide abundance of this species, which had become the principal forage food for the burgeoning trout and salmon fishery. The Bureau was in the process of drafting new and restrictive commercial fishing regulations for this species and decided it was prudent to determine contemporary impingement losses for this species in order to place the commercial and industrial "harvests" in proper context. In correspondence dated August 12, 1988, the company responded to this request. Based on then available trawl index abundance data provided by the USFWS for western Lake Michigan index stations, the company estimated that PBNP impinged an estimated 33,600 lbs of alewife in 1987 This contrasts with the more than 92,000 lbs impinged in 1975-76. Since this period, alewife biomass in the Lake has remained relatively stable at this new lower level. USFWS data for smelt indicates that smelt biomass in the Lake has declined slightly, as well.

ANTICIPATED IMPACT OF THE PROPOSED MODIFICATIONS ON FISH IMPINGEMENT AND ENTRAINMENT

The proposed modifications to the PBNP cooling water intake structure entail removal of most of the now-present stone material, exposing the plant's two intake pipe openings. The area above the two flanged pipe openings will be fitted with a coarse grate structure to prohibit entainment of equipment-damaging large debris. The grate will not likely block the passage of small fish that may be in the immediate vicinity of the pipe's openings. However, based on recent fish behavioral studies, there may be some fish avoidance of grate-induced disturbances in the flow field surrounding the flanged openings. The basis for this hypothesis is bolstered by the results of a one-year study conducted at the Kewaunee Nuclear Plant (KNP) in 1975-76, coincident with the study conducted at PBNP. The KNP is located a mere five miles north of the PBNP in 15 feet of water. The cooling water intake structure for KNP is, in essence, a cluster of three open , 22 ft. diameter flanged pipes affixed to the end of a 10 ft. diameter pipe. The openings to these flanged pipes are protected with coarse grating material, similar (but in fact larger) in opening to that proposed for use at the modified PBNP intake structure. Impingement and entrainment estimates were developed for the KNP intake structure, as well. According to this study, the KNP cooling water system impinged an estimated 215,100 fish, which weighed an estimated 13,662 lbs. Alewife and smelt comprised nearly 92 percent by number; 85 percent by weight of the total. Impingement of trout and salmon totaled an estimated 344 individuals, which weighed an estimated 310 lbs. The authors of the report noted that in the case of the trout and salmon totals, the numbers were less that those collected and sacrificed (690) during the eight field surveys conducted as part of this study.

Since the cooling water requirements for PBNP and KNP are distinctly different (a maximum flow rate of 750,000 gpm for PBNP vs. a maximum flow rate of 412,000 gpm for KNP), it is necessary to "normalize" the impingement rate estimates to permit more meaningful comparisons. The normalized data for monthly smelt and alewife impingement data for both plants are provided in Table 4. As can be seen, the normalized data for smelt and alewife impingement rates (expressed as numbers per million gallons) are, for the most part, very similar. One could conclude that, on the basis of these studies conducted during a period of high lake-wide abundance for both species, the PBNP historic intake structure offered little additional protection with respect to fish impingement than that provided by an open pipe.

The WDNR concluded that, in the context of the mid-1970s, the impacts on the Lake Michigan fishery associated with the location and operation of the two intake structures were inconsequential. The questions for those charged with making a decision as to the likely impact of the proposed modified intake structure for PBNP are as follows:

- what has changed since the 1970s that could necessitate a change in a 316(b) determination for the modified intake system?
- are the proposed modifications likely to lead to adverse consequences for the Lake's present fishery?

There is no argument that the Lake Michigan fishery has changed dramatically since the mid-1970's. As was stated earlier, the alewife population has receded to a level approximately 25% of its former abundance. Most of this reduction occurred in the early 1980's as a result of substantial winter kill coupled with intense predation by increased numbers of stocked salmonid fish species. The states surrounding Lake Michigan have since adjusted their annual stocking practices to balance the predator / prey relationship.

In response to the decline in alewife abundance and to their negative impacts on species that shared similar lake habitat, native Lake Michigan species such as the bloater chub and yellow perch rebounded. While the bloater chub has replaced the alewife as the most abundant planktivore in the lake, yellow perch abundance first increased substantially and then has declined precipitously since the early 1990's. The cause for this more recent decline is the subject of rather intense state and federal research.

Both yellow perch and bloater chub were present in the 1970's when the intake studies were conducted. Few of either were impinged. Given the demersal nature of the bloater chub, few of these species would likely be subject to impingement by the modified intake. Since yellow perch numbers are again reduced to levels common in the 1970's (or even lower), it is not likely that this species would be preferentially impinged by a modified intake structure.

Studies at both plants showed that impingement risk was somewhat proportional to fish abundance in the vicinities of both plants. For example, impingement of smelt and alewife, the then two most abundant species it the lake, was greater than for any other species or groups of species. However, it is no secret that the thermal discharges for both plants seasonally attract large numbers of trout and salmon to the vicinities of the intake structures. Yet, the studies clearly indicate that impingement losses of these two groups was inconsequential, in fact, dwarfed by sport fishing activity and even the catch associated with environmental assessment monitoring efforts.

Therefore, we predict that fish impingement rates associated with the modified PBNP intake structure would likely be again dominated by smelt and alewife. However, due to declines in the abundance of both these species relative to population levels present in the 1970's, the absolute impingement losses should be proportionately lower, perhaps on the level predicted in the 1988 exercise.

With respect to the anticipated impacts that the modified structure may have on entrainment rates, we anticipate that the impacts would be no different that what would be determined for an unmodified intake structure, since the historic structure offered no protection for entrainment. From an absolute loss standpoint, total entrainment of fish eggs and larvae should be lower than what was determined in 1975 reflecting the declines in the spawning adult alewife and smelt populations that have taken place.

Table 1. Species comprising groups in Table 2.

TROUT

Rainbow Trout
Atlantic Salmon
Brown Trout
Tiger Trout
Brook Trout
Lake Trout

SALMON

Chinook Salmon
Coho Salmon

GAME AND FOOD FISHES

Channel Catfish
Black Bullhead
Lake Whitefish
Round Whitefish
Bluegill Sunfish
Largemouth Bass
Northern Pike
Bloater
Yellow Perch

ROUGH FISHES

Carp
White Sucker
Longnose Sucker

FORAGE FISHES

Trout Perch
9-Spine Stickleback
Deepwater Sculpin
Slimy Sculpin
Longnose Dace
Lake Chub
Spottail Shiner
Emerald Shiner
Brook Stickleback
Gizzard Shad
Mud Minnow
Fathead Minnow
Other Minnow

Table 2 Monthly/ Annual Estimate of Fish Impingement at Point Beach Nuclear Plant March 1975- February 1976

	Mar-75		Apr-75		May-75		Jun-75		Jul-75		Aug-75		Sep-75	
Species Group	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
Smelt	80	6.7	832	80.5	768	55.3	2,387	116.3	8,734	117.5	7,285	86.8	7,447	82.2
Alewife	0	0.0	22	2.0	83,408	6,319.4	464,807	32,901.5	348,463	64,605.5	83,443	6,334.7	6,727	354.4
Trout	30	126.0	35	53.3	35	124.4	36	246.4	27	147.8	38	186.3	26	143.2
Salmon	0	0.0	0	0.0	4	0.2	8	5.2	0	0.0	0	0.0	4	0.7
Games & Food	3	5.7	75	36.4	26	11.0	15	9.6	58	20.9	44	15.4	210	29.2
Rough	0	0.0	0	0.0	4	6.5	8	5.0	23	16.3	25	22.2	90	57.7
Forage	0	0.0	493	25.1	615	31.0	608	30.6	676	34.0	278	14.6	690	38.9
Total	113	138.4	1,457	197.3	84,860	6,547.9	467,869	33,314.6	357,981	64,942.0	91,113	6,660.0	15,194	706.3

	Oct-75		Nov-75		Dec-75		Jan-76		Feb-76		Total	
Species Group	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
Smelt	122,962	1,235.9	12,758	174.6	5,756	87.8	6,283	125.4	2,510	103.7	161,389	2,145
Alewife	37,727	463.3	63,588	647.9	13	1.1	16	1.2	0	0.0	886,394	92,390
Trout	50	346.5	46	156.6	34	31.8	55	137.1	4	29.4	452	1,711
Salmon	4	0.2	0	0.0	0	0.0	0	0.0	0	0.0	16	5
Games & Food	244	18.0	116	12.9	132	19.3	32	3.4	4	2.6	979	190
Rough	19	11.7	8	4.0	21	7.5	13	5.2	0	0.0	209	126
Forage	3,419	96.1	728	33.9	330	24.4	192	21.9	35	1.8	7,285	336
Total	164,425	2,171.7	77,244	1,029.9	6,286	171.9	6,591	294.2	2,553	137.5	1,056,724	96,903

Table 3. Monthly/ Annual Estimates of Entrainment for Point Beach Nuclear Plant

Life Form / Benthic Organism		April-May	June	July	August	September	October	Total
Fish Larvae								
	Alewife	0	0	23,772	188,128	168,456	0	416,311
	Sculpin	0	0	208,843	119,092	0	0	349,517
	Smelt	0	0	0	616,163	230,362	346,321	1,272,080
	Other	59,833	0	0	0	0	0	44,617
	Total	59,833	0	232,615	923,383	398,818	346,321	2,082,525
Fish Eggs								
	Alewife	0	293,060	2,638,730	1,442,980	0	0	4,661,410
	Sculpin	0	0	0	0	0	0	0
	Smelt	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0
	Total	0	293,060	2,638,730	1,442,980	0	0	4,661,410
Pontoporeia		1,713,140	1,031,180	4,224,030	4,052,080	1,127,890	1,305,450	13,851,400
Mysis		1,998,840	175,331	4,677,850	2,909,720	145,571	65,057	10,180,200

Table 4. Comparison of Normalized 1975-76 Impingement Rates[1] at PBNP and KNP For Alewife and Smelt

	Alewife		Smelt	
Month	PBNP	KNP	PBNP	KNP
April			0.029	0.805
May	2.463	2.811	0.023	0.051
June	14.507	12.258	0.075	0.225
July	10.169	6.153	0.255	0.190
August	2.665	5.294	0.233	0.178
September	0.202	2.506	0.224	0.318
October	1.104	3.310	3.599	0.559
November	2.290	6.456	0.459	1.073
December			0.361	0.255
January			0.356	1.032

[1] Rates expressed as number per million gallons of cooling water flow.

DEPARTMENT OF THE ARMY
ST PAUL DISTRICT. CORPS OF ENGINEERS
1135 U S POST OFFICE & CUSTOM HOUSE
ST PAUL. MINNESOTA 55101

REPLY TO
ATTENTION OF:
NCSCO-RF(80-NO1029-29)

15 July 1980

Wisconsin Electric Power Company
231 West Michigan
Milwaukee, Wisconsin 53201

Re: Rehabilitation of an intake crib
Lake Michigan, sec. 24, T. 21 N.,
R. 24 E., Manitowoc County.

Dear Sirs:

We have reviewed the information provided us concerning the above referenced project. The work you propose at the location stated above is authorized by an existing nationwide Department of the Army permit, provided the work is accomplished in compliance with the inclosed conditions and management practices.

This determination covers only the project referenced above. If the design, location, or purpose of the work is changed, you should contact us to make sure the work would not result in a violation of Federal law. Our telephone number is 612-725-7558.

It is your responsibility to insure that the work complies with the terms of this letter and the inclosures. PLEASE NOTE THAT THIS CONFIRMATION LETTER DOES NOT ELIMINATE THE NEED FOR STATE, LOCAL OR OTHER AUTHORIZATIONS.

If you have any questions, please call Donna Tucker at (612) 725-7804.

Sincerely,

WILLIAM D. PARSONS
for Chief, Regulatory Functions Branch
Construction-Operations Division

2 Incl
As stated

Determination: 322.4(c)

Map Number: 91

CONDITIONS AND MANAGEMENT PRACTICES OF NATIONWIDE PERMITS TO MINIMIZE THE ADVERSE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL ON THE AQUATIC ENVIRONMENT

CONDITIONS:

(1) That the discharge will not destroy a threatened or endangered species as identified under the Endangered Species Act, or endanger the critical habitat of such species;

(2) That the discharge will consist of suitable material free from toxic pollutants in other than trace quantities;

(3) That the fill created by the discharge will be properly maintained to prevent erosion and other non-point sources of pollution;

(4) That the discharge will not occur in a component of the National Wild and Scenic Rivers System or in a component of a State wild and scenic river system;

MANAGEMENT PRACTICES:

(1) Discharges of dredged or fill material into waters of the United States should be avoided or minimized through the use of other practical alternatives;

(2) Discharges in spawning areas during spawning seasons should be avoided;

(3) Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected high flows or cause the relocation of the waters (unless the primary purpose of the fill is to impound waters);

(4) If the discharge creates an impoundment water, adverse impacts on the aquatic system caused by the accelerated passage of water and/or the restriction of its flow, should be minimized;

(5) Discharges in wetlands areas should be avoided;

(6) Heavy equipment working in wetlands should be placed on mats;

(7) Discharges into breeding and nesting areas for migratory waterfowl should be avoided; and

(8) All temporary fills should be removed in their entirety.

Incl 1

This Determination is in accordance with CFR Title 33,

☐ 323.4-3(a)(3) which authorizes minor road crossing fills including all attendant features both temporary and permanent that are part of a single and complete crossing of a nontidal waterbody, provided that the crossing is culverted or bridged to prevent the restriction of expected high flows and provided further that discharges into any wetlands adjacent to the waterbody do not extend beyond 100 feet on either side of the ordinary high watermark of that waterbody. A "minor road crossing fill" is defined as a crossing that involves the discharge of less than 200 cubic yards of fill material below the plane of ordinary high water. However, discharges which will occur in the proximity of a public water supply intake or in areas of concentrated shellfish production; and discharges which will disrupt the movement of aquatic life which exists in the waterbody are not authorized by this nationwide permit. The crossing you propose may require a permit from the U.S. Coast Guard. You should contact the Coast Guard at:

Commander (OC)
Second Coast Guard District
1430 Olive Street
St. Louis, Missouri 63136
(314) 425-4607

Commander (OC)
Ninth Coast Guard District
1240 East Ninth Street
Cleveland, Ohio 44199
(216) 522-3992

☐ 323.4-3(a)(5) authorizes the repair, rehabilitation or replacement of any previously authorized, currently serviceable fill, or of any currently serviceable fill discharged prior to the requirement for authorization; provided such repair, rehabilitation or replacement does not result in a deviation from the specifications of the original work, and further provided that the fill to be maintained has not been put to uses differing from uses specified for it in any permit authorizing its original construction. However, discharges which will occur in the proximity of a public water supply intake or in areas of concentrated shellfish production; and discharges which will disrupt the movement of aquatic life which exists in the waterbody are not authorized by this nationwide permit.

☒ 322.4(c) which authorizes repair, rehabilitation or replacement of any previously authorized, currently serviceable, structure or of any currently serviceable structure constructed prior to the requirement for authorization provided such repair, rehabilitation or replacement does not result in a deviation from the plans of the original structure, and further provided that the structure to be maintained has not been put to uses differing from uses specified for it in any permit authorizing its original construction.

☐ 322.4(g) which authorizes structures or work completed before 18 December 1968 or in waterbodies over which the District Engineer has not asserted jurisdiction provided there is no interference with navigation.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

February 8, 1978

IN REPLY REFER TO: 3203

Mr. Nichols A. Ricci
Senior Vice President
Wisconsin Electric Power Company
231 West Michigan Street
Milwaukee, Wisconsin 53201

Dear Mr. Ricci:

Based upon your review of our Cooling Water Intake Structure Final Report for the Point Beach Nuclear Power Plant, Manitowoc County, we have determined the location and operation of this intake structure to have minimal environmental impact. Therefore, it is the Department's determination that no modifications of your cooling water intake structure are required for compliance with Section 147.02(6), Wisconsin Statutes.

The Department has based their conclusion upon the following factors:

1. Total entrainment at Point Beach seems to be insignificant based upon the findings of the March 1975-February 1976 study program. Entrainment of icthyoplankton was confined principally to three highly reproductive species; alewife, smelt and sculpin.

2. Alewife and smelt comprised 98 percent of the estimated annual impingement by weight. Impingement of trout and salmon at Point Beach represents a loss to the creel of about 56 salmonids annually. In 1973, 2000 salmonids were caught from the fishing platform located over the Unit 1 discharge. The entrapment impact of the intake structure on Lake Michigan biological populations is clearly insignificant.

Although there is a discussion of circulating water reduction in the report, the Department would encourage you to once again investigate this possibility at times of the year when power penalties would not be incurred. Pumpage reductions are an extremely effective way of minimizing entrainment, and to a lesser extent, impingement.

The Environmental Protection Agency, Region V, has stated: " A soon to be published book by Marcy, Coutant, et al. builds a strong case for reducing water usage and increasing Delta T's in many cases. A detailed methodology for evaluating the environmental trade-offs associated with the various plant operating modes is provided in this book. EPA believes that the recommendations and methodology outlined should be employed by all utilities, particularly those on the Great Lakes and on large rivers, in evaluating whether the strategy outlined is appropriate at any of their stations." The Department concurs with EPA's approach.

If you have any questions about this determination, please feel free to contact Mr. Lee Liebenstein of the Water Quality Evaluation Section at (608)266-8117.

Sincerely,
Division of Environmental Standards

Thomas A. Kroehn
Administrator

cc: James Addis - Bureau of Fish Management - 6
Paul Schultz - LMD - Plymouth
Howard Druckenmiller - BEI - 2
Lee Kernen - Green Bay Area Office
Permit File - 11

6.8.4 Point Beach ...

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Box 3600
Green Bay, Wisconsin 54303

Anthony S. Earl
Secretary

June 25, 1980

IN REPLY REFER TO: 3500

Point Beach NPP - Manitowoc

Mr. Sol Burstein
Executive Vice President
Wisconsin Electric Power Company
231 West Michigan
Milwaukee, Wisconsin 53201

Dear Mr. Burstein:

Since the proposed modification of the Point Beach Nuclear Plant intake pipes will occur inside the existing intake structure, no permits will be required from this agency. If any work will be done outside the existing intake crib permits <u>may</u> be required.

If you require additional information, please contact me.

Sincerely,

Ronald L. Fassbender
Water Management Coordinator

RLF:ip

cc: Larry Larson WRZ/5

Copies to Messrs. McNeer
Ricci / Boucher
Naske / Finke
Fay

THIS IS 100% RECYCLED PAPER