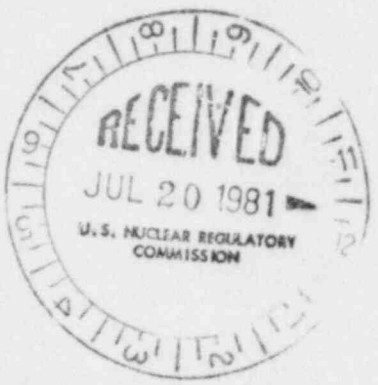
Wisconsin Electric POWER COMPANY
231 WEST MICHIGAN, MILWAUKEE, WISCONSIN 53201

July 16, 1981

Mr. Harold R Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555




Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
NRC GENERIC LETTER NO. 81-14
POINT BEACH NUCLEAR PLANT UNITS 1 AND 2

NRC Generic Letter No. 81-14 is entitled "Seismic Qualification of Auxiliary Feedwater Systems" and was issued by Mr. D. G. Eisenhut on February 10, 1981. The letter was received at Wisconsin Electric on March 18, 1981. The letter includes a detailed request for information and requires a response within 120 days of receipt by the licensee. The purpose of this letter is to provide the information requested.

The Point Beach Nuclear Plant auxiliary feedwater system (AFWS) utilizes four pumps for the two nuclear units. Each unit has its own steam driven pump and there are two electric motor-driven pumps that are shared between the two nuclear units. This arrangement provides for a reliable and adequate water supply.

The primary AFWS piping (pump suction and discharge) is seismic Class I. The secondary source of water supply to the AFWS pumps (the plant service water system) is also seismic Class I.

The Point Beach Nuclear Plant AFWS is adequately protected for a seismic event. As applicable, the AFWS has been included within the

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scope of the bulletins identified in Generic Letter No. 81-14. The attachment to this letter provides a more detailed discussion of the Point Beach Nuclear Plant AFWS If any additional information is required, please contact us.

Very truly yours,

C. W. Fay, Director
Nuclear Power Department

Attachment

Subscribed and sworn to before me
this 16th day of July, 1981

Dorothy Kleschinsky
Notary Public, State of Wisconsin

My Commission expires July 1, 1984.

Copy to: NRC Resident Inspector
Point Beach Nuclear Plant

# WISCONSIN ELECTRIC RESPONSE TO NRC'S GENERIC LETTER NO. 81-14
# SEISMIC QUALIFICATION OF AUXILIARY FEEDWATER SYSTEMS
# POINT BEACH NUCLEAR PLANT

## I. INTRODUCTION

NRC's Generic Letter No. 81-14 is entitled "Seismic Qualification of Auxiliary Feedwater Systems" and includes a detailed information request. The letter is dated February 10, 1981 and was received by Wisconsin Electric on March 18, 1981. The letter requests a licensee response within 120 days of receipt.

The generic letter contains two enclosures. The first enclosure is the identification of the information requested of all PWR licensees. The second enclosure pertains to licensees without a seismically qualified auxiliary feedwater system. The second enclosure does not apply to the Point Beach Nuclear Plant (PBNP) since both the primary and secondary AFWS piping systems are seismic Class 1.

Thus, this response is restricted to presenting the information requested by Enclosure 1 of the NRC letter.

The PBNP auxiliary feedwater system (AFWS) is discussed in Volume 3, Chapter 10 of the Final Facility Description and Safety Analysis Report (FFDSAR). PBNP has four AFWS pumps (one steam turbine driven pump for each unit and two electric motor driven pumps that are shared) that will ensure an adequate supply of feedwater. The primary water supply is provided from the condensate storage tanks and a source of backup water is provided by the plant service water system. As identified in the FFDSAR on Page 10.1-1, the piping for both of these systems, as required, was designed as Class I (seismic).

The PBNP FFDSAR contains the following flow diagrams which will aid reviewers in understanding this system:

| FFDSAR Figure No. | Subject |
|---|---|
| 10.2-1a | Steam Supply to the AFWS Turbine Pumps |
| 10.2-2a | Condensate to Condensate Storage Tanks |
| 10.2-5 | Auxiliary Feedwater System (Main diagram) |

The seismic design requirements and classifications for PBNP are presented in Appendix A (Volume 4) of the FFDSAR. The PBNP AFWS was designed, constructed, and maintained in accordance with the criteria originally applicable to PBNP and as discussed further in this response.

## II. RELATIONSHIP TO OTHER NRC TRANSMITTALS

Enclosure 1 of the NRC generic letter identifies specific previous NRC transmittals and asks if the AFWS system was included within their scope. This section summarizes the identified transmittals and their effect on the PBNP AFWS.

A. IE Bulletin 79-02, Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts

The PBNP AFWS was included within the scope of this bulletin as applicable.

B. IE Bulletin 79-04, Incorrect Weights For Swing Check Valves Manufactured by Velan Engineering Corporation

A review of PBNP AFWS was performed for this bulletin. It was determined that none of the affected valves have been installed in this system.

C. IE Bulletin 79-07, Seismic Stress Analysis of Safety-Related Piping

A review of the original analysis and computer codes utilized was performed for this bulletin. It was determined that the PBNP AFWS did not use improper load combinations in the original analysis.

D. IE Bulletin 79-14, Seismic Analysis For As-Built Safety-Related Piping Systems

The PBNP AFWS was included within the scope of this bulletin as applicable; see Section III herein.

E. IE Bulletin 80-11, Masonry Wall Design

The PBNP AFWS was included within the scope of this bulletin as applicable.

F. IE Information Notice 80-21, Anchorage And Support of Safety-Related Electrical Equipment

The PBNP AFWS was reviewed in response to this notice. The applicable instrumentation and control for the PBNP AFWS is located on instrument panels RK 25A, RK 25B, 1RK 35, and 2RK 35 which contain the instrumentation and local indication for the AFWS pumps. These four racks are bolted to the floor.

Control boards 1RK 38 and 2RK 38 (which contain the local starting capability for the AFWS pumps) are bolted to a seismically designed wall.

The power supply for the electric motor driven pumps is provided by 480 volt switchgear sections 1B03 and 2B04 which are welded to channels embedded in the concrete floor.

The power supply for motor operated valves 1-4000 and 1-4001 (water to Unit 1 steam generators A and B) comes from D14 and D12 DC distribution panels respectively, which are bolted to a seismic wall. The power for MOVs 2-4000 and 2-4001 (Unit 2 A and B respectively) also comes from DC distribution panels D14 and D12.

All of the above electrical components are located in the PBNP Control Room Building which is a seismic Class I structure.

III. PBNP AUXILIARY FEEDWATER PIPING AND IE BULLETIN 79-14

While IE Bulletin 79-14 applies to many piping systems, the AFWS system has been a part of the overall PBNP program. Accordingly, a system walkdown was performed, piping isometric drawings were created, piping analyses have been performed as required, pipe supports have been evaluated, and where necessary, support modifications have been, or are, being pursued. The piping involved has included:

- the steam supply to each nuclear unit's turbine driven pump
- the water supply from the condensate storage tanks to the four AFWS pumps (suction)
- the AFWS piping from the pumps to containment, through containment, and to the connection to the main feedwater piping inside containment.
- the secondary source of water from the service water pumps, through the header, to the connection to the AFWS pump suction piping
- the applicable portions of the main steam piping and the main feedwater piping, which include the AFWS connections.

The following piping isometric drawings were developed during the IEB 79-14 program and pertain to the AFWS system.

| | |
|---|---|
| P-103 | AFWS Pump Discharge Piping (all four pumps) |
| P-106 | Steam Supply to AFWS Pump 1-P29 |
| P-113 | Service Water to AFWS Pump Suction |
| P-117 | AFWS Pump Suction Piping (all four pumps) |
| P-118 | AFWS Suction Piping from the Condensate Storage Tanks |
| P-140 | From P-103 through Unit 1 Containment to Main Feed Piping |

| | |
|---|---|
| P-141 | From P-103 to Unit 1 Containment |
| P-142 | From P-141 to Main Feed Piping |
| P-206 | Steam Supply to AFWS Pump 2-P29 |
| P-239 | From P-241 to Main Feed Piping |
| P-240 | From P-103 to Unit 2 Containment |
| P-241 | From P-103 to Unit 2 Containment |
| P-242 | From P-240 to Main Feed Piping |

The piping shown on these drawings has been analyzed or evaluated by our consultant, Bechtel Power Corporation, who was the original Architect-Engineer for PBNP. When analyses have been deemed necessary, a gravity analysis, a thermal analysis (if the normal operating temperature is 250°F or higher), and a seismic analysis have been performed.

The seismic analysis is based upon the spectrum response curves originally developed for PBNP and the horizontal and vertical directions are considered simultaneously for these analyses. Two separate analyses are performed; one with the North-South and vertical direction combined, and one with the East-West and vertical direction combined. The loadings, accelerations, or displacements are combined using the square root of the sum of the squares technique. The highest value between the two analyses is considered as the maximum loading, acceleration, or displacement.

The loading combinations and stress limits utilized are as follows:

| Condition | Loads Combined | Stress Limit |
|---|---|---|
| Normal | SLP + SW | $S_h$ |
| Upset | SOBE + SLP + SW | 1.2 $S_h$ |
| Faulted | SSSE + SLP + SW | 1.8 $S_h$ |

Where SLP = longitudinal pressure stress
SW = gravity stress
SOBE = operating basis earthquake stress
SSSE = safe shutdown earthquake stress
$S_h$ = allowable stress from the USASI Code B31.1, 1967 Edition. The 1973 Edition with Summer 1973 Addenda is utilized for the proper application of stress intensification factors.

The piping analyses performed considered the existing pipeline as-built condition and incorporated the effect of other branch piping connections. In addition, where operators are utilized on valves, the center of gravity of the operator (and its mass) are conservatively modeled at the height of the operator above the piping centerline.

The stress limits specified are based on the FFDSAR requirements.

## IV. EQUIPMENT AND STRUCTURES

A review of the applicable FFDSAR flow diagrams shows that the only major items of equipment involved in this system are the turbine driven AFWS pumps (1-P29 and 2-P29), the electric driven pumps (P38A and P38B), and the condensate storage tanks (T24A and T24B).

### 1.0 AFWS Pumps

Both types of auxiliary feedwater pumps were procured by Bechtel Specification 6118-M-6, Revision 3, dated October 28, 1968. This specification contained the following design requirement (Paragraph 3.1.5):

> "Each pumping unit (pump, driver, coupling, and base plate) shall be designed for seismic acceleration of 0.06g horizontally and 0.04g vertically occurring simultaneously with normal operating load, including normal thermal transients, without exceeding code allowable stress. Furthermore, the equipment shall withstand a simultaneous horizontal acceleration of 0.12g and vertical of 0.08g in conjunction with the normal loads and the maximum thermal transients without loss of function of equipment or components."

The pump seismic design requirements correspond to the Class I requirements as discussed in Appendix A of the FFDSAR; Page A-9 identifies these pumps as seismic Class I components.

The AFWS pumps are located on the ground floor of the PBNP Control Building and this can be seen in FFDSAR Figures 1.2-5 and 1.2-6. The Control Building was seismically designed and is specifically discussed in the FFDSAR, Appendix A, Section 4.0, Page A-15.

### 2.0 Condensate Storage Tanks

The condensate storage tanks (T24 A and B) are identified in the FFDSAR, Appendix A, Page A-8 as being Class III for seismic design purposes (i.e., no seismic design requirements). However, these tanks were procured by Bechtel Specification 6118-M-21, Revision 0, dated October 24, 1967. The tanks were required to be designed and constructed in accordance with the ASME Code, Section VIII and the AWWA D100 Code. Further, the specification included the following seismic design requirement:

"The tank(s) shall be designed for a ground acceleration of 0.06g in any direction horizontally and 0.04g vertically occurring simultaneously, and in conjunction with other loads, without exceeding code allowable stresses."

The foregoing design requirement would allow the condensate storage tanks to be categorized as seismic Class II components per Appendix A of the PBNP FFDSAR.

Each condensate storage tank has a nominal capacity of 45,000 gallons of water. The tanks are 24 feet high, with a 20 foot inside diameter and a 1/4 inch thick carbon steel wall. The tanks are mounted on the roof of the Control Building with eight 3/4 inch diameter anchor bolts equally spaced on a 20 foot 4-1/2 inch diameter bolt circle. The tanks were fabricated by Graver Tank and Manufacturing Co. (drawing No. L-23944-4, Rev. 4).

## V. AFWS OPERATION

The turbine driven AFWS pumps are unit associated, i.e., 1-P29 is for Unit 1 and 2-P29 is for Unit 2. Each pump can supply 400 gpm (200 gpm to each steam generator) to its nuclear unit. The electric driven AFWS pumps are shared between the units and have a total capacity of 400 gpm. The electric motors are capable of being powered by the plant emergency diesel generators.

PBNP Technical Specification 15.3.4 requires a minimum of 10,000 gallons of water per operating unit in the condensate storage tanks for plant operation. In addition, this specification has requirements for the number of AFWS pumps that must be operable in order to operate one or both of the PBNP nuclear reactors.

The normal operating piping alignment for this system is to have the AFWS pump suction supplied by the condensate storage tanks. This can be realigned to the service water system by opening the following motor operated valves (MOV):

| AFWS Pump | Service Water MOV |
|---|---|
| 1-P29 | 1-MOV-4006 |
| P38A | MOV-4009 |
| P38B | MOV-4016 |
| 2-P29 | 2-MOV-4006 |

It should be noted that these service water MOVs are located in the same room as the pump each valve supplies. These are in the Control Building which is a seismically designed structure.

The normal alignment of the AFWS pump discharge piping has the applicable MOVs open (check valves are used to prevent back flow) and the electric driven feed pumps aligned to both units. Figure 10.2-5 of the FFDSAR shows this arrangement.

## VI. SUMMARY

The PBNP AFWS is considered to have been adequately seismically designed and constructed. The PBNP service water system is also seismically designed and provides a secondary source of water to the AFWS pumps.

On the basis of the information contained herein, Table 1 of Enclosure 1 to the NRC's letter would contain no entries. Accordingly, the table is not attached hereto.

NRC has previously issued a Safety Evaluation Report on the PBNP AFWS. For completeness, a copy of our April 9, 1981 response to the NRC's SER is also attached hereto.

Wisconsin Electric POWER COMPANY
231 W. MICHIGAN, P.O. BOX 2046, MILWAUKEE, WI 53201

April 9, 1981

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
REQUIREMENTS FOR AUXILIARY FEEDWATER SYSTEM
POINT BEACH NUCLEAR PLANT UNITS 1 AND 2

Your letter dated January 27, 1981, requested that we respond to those unresolved items identified in the Safety Evaluation Report (SER) for the Point Beach Nuclear Plant Units 1 and 2 auxiliary feedwater systems. The SER was enclosed with the letter. This SER presents an evaluation of Wisconsin Electric's previous responses to your inquiries regarding auxiliary feedwater system reliability. Seven items have been identified for which the NRC review is not complete.

The first of these items concerns the Commission short-term recommendation GS-1 regarding technical specifications for continued plant operation with an inoperable auxiliary feedwater (AFW) pump. Although Wisconsin Electric Power Company (the Licensee) has proposed a number of technical specification changes to further improve AFW system reliability during plant operations, your recommendation is that both operating units be shut down if one motor-driven AFW pump is inoperable for more than 72 hours. As stated in Licensee's July 8, 1980 letter, this recommendation is unduly restrictive since the single operating unit would still have two diverse means of obtaining auxiliary feedwater via the second motor-driven pump and the steam-turbine driven pump. Either of these diverse methods of providing auxiliary feedwater flow is capable of providing sufficient feedwater to permit a controlled cooldown of the plant by itself. It should be noted that it is Licensee's position that the design basis for the Point Beach Nuclear Plant is based upon the ability to safely maintain the unit in the hot shutdown condition.

We understand that your specific concern is a steam line failure in the supply to the turbine-driven AFW pump together with a single failure in the remaining motor-driven AFW pump. In the design of the Point Beach

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Nuclear Plant auxiliary feedwater system, there are remotely operated valves which would permit either isolating the turbine-driven AFW pump steam leak and thus terminating the casualty, or restricting the steam leak to one steam generator, thus supplying the turbine-driven AFW pump from the intact steam generator. These motor-operated valves are numbered 2019 and 2020 on Figure 10.2-1a in the Point Beach Nuclear Plant Final Facility Description and Safety Analysis Report. In addition, you should note that the discharge of the motor-driven AFW pumps can be cross connected via manually operated valves for enhanced reliability and versatility. Accordingly, we propose no further changes to the Technical Specification changes already forwarded for your consideration.

The second unresolved item concerns additional short-term recommendation 1. The item recommended redundant level indications and low level alarms for the AFW system primary water supply. We responded that the condensate storage tanks are normally cross connected and that the independent level indicator on each tank served as a redundant AFW primary water level indication system. Because the capability exists to operate with the condensate storage tanks split, we are proceeding with the design and installation of a second level detection and alarm system on each of the two condensate storage tanks. This system will be independent of the existing level indicators up to the common alarm on the control board. We are scheduling installation of this system by April 1982. We believe this action will resolve your concerns in this matter.

The third unresolved AFW review item concerns safety grade design for auxiliary feedwater flow indication. Licensee's plans and schedules regarding compliance in this matter are addressed in the NUREG-0737 schedule requirements letter we submitted on December 23, 1980 and are discussed further in our NUREG-0737 follow-up letter dated March 31, 1981.

The fourth item for which NRC review has not been completed is recommendation GL-3, assuring long term AFW system flow independent of AC power. It is the Staff position that Licensee has not provided sufficient information to demonstrate why bearing lube oil cooling cannot be provided by a design involving no other external plant systems. This is a significant and unjustified extension of the NRC's previous requirement for bearing lube oil cooling independent of AC. Licensee considered a number of alternatives for providing bearing lube oil cooling, including the use of the AFW system water flow. The decision for using the firewater system and rejecting use of the AFW system was based on the following observations:

1. The firewater system is extremely reliable with or without the availability of AC power. The electrical firewater pumps are supplied from the plant vital electrical power supplies. On failure of all AC or on low water pressure in the fire main, a diesel driven fire pump, provided with its own battery starting system, will cut in to maintain adequate firewater system pressure. The reliability of this system is assured through monthly Technical Specification testing and surveillance.

2. The temperature of the water supplied by the firewater system is, under all possible operating conditions, compatible with the AFW pump bearing lube oil cooling requirements.

3. Water stored in the condensate storage tank must regularly be warmed when the AFW system is used to supply the steam generators, such as during refueling. Sending 150°F water to the bearing lube oil coolers combined with the addition of pump heat during long periods of recirculation would not provide optimum bearing oil cooling.

4. Use of auxiliary feedwater system water for bearing cooling would reduce the AFW pump output available to the steam generators. Unless provisions were made to return the water to the condensate storage tanks, the total water inventory available to the steam generators from the condensate storage tanks would be reduced.

5. The additional AFW to bearing lube oil cooler supply and return piping may reduce overall system reliability.

6. Use of the firewater system results in the simplest arrangement for overall design and operation and requires a minimum amount of system modifications to implement.

Your fifth item, recommendation GL-4, requests that Licensee provide automatic protection of the AFW pumps if the AFW system water supplies are not completely protected from damage following a seismic event or a tornado. In our past responses we have expressed concerns that additional instrumentation to provide automatic switchover of the AFW pump to the alternate water source would result in decreased rather than enhanced system reliability. We also advised that the condensate storage tanks were designed to specified seismic criteria, although not as Class I water sources. The SER continues to treat this as an unresolved item. Accordingly, and reluctantly, we are presently studying the feasibility and desirability of providing automatic AFW pump trips on low suction pressure as a possible protective measure. We expect to complete this study and advise you of our conclusion and proposed modification, if any, by September 1, 1981

The sixth unresolved item in your letter concerns the safety grade design of the AFW automatic initiation signals and circuits. Your continued review of this subject is acknowledged.

The final unresolved issue concerns your repeated request that we provide an extensive listing of information to establish the bases for

the auxiliary feedwater system flow requirement. This request was originally provided with your letter dated September 21, 1979, and was based on the Staff reviews done at that time. These reviews concluded that the design bases and criteria for establishing AFW system requirements to assure adequate removal of reactor decay heat were not well defined or documented. Since that time the NRC has received, from many sources, extensive auxiliary feedwater design information and descriptions from numerous licensees regarding AFW system design and flow capabilities. A comparison between the Point Beach system description and information already available to the NRC should demonstrate that the system flow capabilities of the Point Beach AFW system fall within the bounds of other system flow requirement bases. If this is not correct, we request you identify specifically which plant transient and accident conditions have not been adequately discussed.

Very truly yours,

C. W. Fay

C. W. Fay, Director
Nuclear Power Department

Copy to: NRC Resident Inspector
Point Beach Nuclear Plant