

August 21, 2007

Mr. Dennis L. Koehl
Site Vice President
Point Beach Nuclear Plant
Nuclear Management Company, LLC
6590 Nuclear Road
Two Rivers, WI 54241-9516

SUBJECT: POINT BEACH NUCLEAR PLANT NRC SPECIAL INSPECTION REPORT
05000266/2007008 AND 05000301/2007008

Dear Mr. Koehl:

On June 28, 2007, the NRC completed a Special Inspection at your Point Beach Nuclear Plant to evaluate the facts and circumstances surrounding the turbine outboard bearing high temperatures associated with the Unit 1 Turbine-Driven Auxiliary Feedwater Pump (1P-29), and the subsequent Technical Specification required shutdown on June 14, 2007. The enclosed report documents the inspection findings, which were discussed on July 12, 2007, with you and members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed plant personnel.

Based on the risk and deterministic criteria specified in Management Directive 8.3, "NRC Incident Investigation Program," and Inspection Procedure 71153, "Event Followup," and due to the equipment performance problems which occurred, a Special Inspection was initiated in accordance with Inspection Procedure 93812, "Special Inspection." The Special Inspection evaluated the facts and circumstances surrounding the event, as well as the actions taken by your staff in response to the unexpected equipment condition. The inspection focus areas are detailed in the Special Inspection Charter (Attachment 4).

Based on the results of this special inspection, six inspector-identified and self-revealed findings of very low safety significance (Green) were identified. Five of those findings were determined to involve violations of NRC requirements. However, because of the very low safety significance and because they are entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A.1 of the NRC Enforcement Policy.

At the conclusion of the inspection, several questions remained regarding the past operability, availability and reliability of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump 1P-29 following the maintenance performed in the Spring 2007 Refueling Outage. The outcome of these questions will directly affect the significance characterization of the performance deficiency associated with post-maintenance testing and any further enforcement action taken by the NRC. Therefore, an Unresolved Item was opened to monitor your resolution of the operability, availability and reliability questions pertaining to the turbine-driven auxiliary feedwater pump following the Spring 2007 Refueling Outage. There are no current safety concerns based on the actions you and your staff have taken, which are briefly described below.

These immediate remedial corrective actions primarily included, but were not limited to: troubleshooting, maintenance, and repair of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump 1P-29 with vendor representatives; successful, adequate post-maintenance testing of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump 1P-29; and extent of condition evaluations associated with the Unit 2 Turbine-Driven Auxiliary Feedwater Pump 2P-29. At the conclusion of the inspection, your staff continued working to complete the root cause evaluations for the issues identified during this event and indicated that several other long term actions would be implemented upon completion of the root cause evaluations.

The inspection team concluded, as did your staff, that the performance deficiencies identified reflect a declining trend in the area of human performance at the Point Beach Nuclear Plant. We understand that you and your staff have developed immediate corrective actions to address this adverse trend, and we will continue to monitor those actions as part of our routine inspections.

If you contest any finding or NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the Resident Inspector at the Point Beach Nuclear Plant.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records System (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Cynthia D. Pederson, Director
Division of Reactor Projects

Docket Nos. 50-266; 50-301
License Nos. DPR-24; DPR-27

Enclosure: Inspection Report 05000266/2007008; 05000301/2007008
w/Attachments: 1. Supplemental Information
2. Timeline of Events Unit 1
3. Timeline of Events Unit 2
4. Special Inspection Charter

cc w/encl: F. Kuester, President and Chief
Executive Officer, We Generation
D. Cooper, Senior Vice President and Chief
Nuclear Officer
J. McCarthy, Site Director of Operations
D. Weaver, Nuclear Asset Manager
Plant Manager
Regulatory Affairs Manager
Training Manager
Site Assessment Manager
Site Engineering Director
Emergency Planning Manager
J. Rogoff, Vice President, Counsel & Secretary
K. Duveneck, Town Chairman
Town of Two Creeks
Chairperson
Public Service Commission of Wisconsin
J. Kitsembel, Electric Division
Public Service Commission of Wisconsin
State Liaison Officer

D. Koehl

-3-

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SUBJECT: POINT BEACH NUCLEAR PLANT NRC SPECIAL INSPECTION REPORT
05000266/2007008 AND 05000301/2007008

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-266; 50-301

License Nos: DPR-24; DPR-27

Report No: 05000266/2007008;
05000301/2007008

Licensee: Nuclear Management Company, LLC

Facility: Point Beach Nuclear Plant, Unit 1

Location: Two Rivers, Wisconsin

Dates: June 18, 2007, through June 28, 2007

Inspectors: R. Krsek, Senior Resident Inspector
G. Gibbs, Resident Inspector
J. Giessner, Resident Inspector, Palisades

Approved By: J. Cameron, Chief
Branch 5
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000266/2007008 and 05000301/2007008; 06/18/2007 - 06/28/2007; Point Beach Nuclear Plant, Units 1 and 2; Special Inspection to Review Circumstances Surrounding the High Outboard Bearing Temperature Indications of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump 1P-29.

This report covers a 10-day period of Special Inspection by NRC resident inspectors. The inspection identified six Green findings and one Unresolved Item. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be "Green" or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

A. Inspector-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

- Green: The inspectors identified a finding involving a non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very low safety significance (Green) for the licensee's failure to identify and implement prompt corrective actions for the conditions which caused outboard bearing high temperature alarms during the Unit 1 Turbine-Driven Auxiliary Feedwater (TDAFW) pump post-maintenance test (PMT) performed on May 1, 2007; the Unit 1 TDAFW pump PMT performed on May 6, 2007; and the Unit 2 TDAFW pump PMT performed on November 17, 2006. The licensee performed troubleshooting and repair of the Unit 1 TDAFW pump and confirmed operability of the Unit 2 TDAFW pump with needed compensatory actions. The licensee entered the issue into their corrective action program and took immediate corrective actions. At the end of the inspection period, the licensee continued to evaluate the causes and corrective actions to address this finding.

The finding was more than minor because it could reasonably be viewed as a precursor to a significant event. Specifically, the failure to identify and investigate the cause of the high bearing temperature alarms could potentially result in failure of the TDAFW pumps. Additionally, the finding is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Failure to identify and promptly correct the conditions which caused the high bearing temperature alarms was a condition adverse to quality and was a corrective action program issue that was determined to be a licensee performance deficiency of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of problem identification and resolution for the failure to implement a corrective action

program with a low threshold for identifying issues completely, accurately and in a timely manner commensurate with their safety significance (P.1(a)). (4OA3.2.b.1)

- Green: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately assess operability of the Unit 1 TDAFW pump in accordance with plant procedures. The inspectors identified that the licensee failed to implement procedural requirements regarding the immediate assessment of operability on June 9, 2007, for the Unit 1 TDAFW pump turbine outboard bearing high temperatures. The licensee took corrective actions, which included re-performing testing to evaluate bearing stabilization temperatures and briefing of the operations crews on this issue. The licensee entered the issue into their corrective action program and took immediate corrective actions. At the end of the inspection period, the licensee continued to evaluate the causes and corrective actions to address this finding.

The finding was more than minor because, if left uncorrected, the failure to properly assess operability would result in the TDAFW pump being degraded, and possibly inoperable for more than the allowed outage time in accordance with Technical Specifications with no action being taken. The finding is of very low safety significance since the inadequate operability determination did not result in exceeding the allowed outage time of Technical Specifications before action was taken. The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to demonstrate that nuclear safety was an overriding priority. Specifically, the licensee failed to make safety-significant or risk-significant decisions using a systematic process for operability determinations, especially when faced with uncertain or unexpected plant conditions, to ensure safety was maintained (H.1(a)). (4OA3.2.b.2)

- Green: The inspectors identified a finding of very low safety significance and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to ensure that procedures associated with the maintenance of the TDAFW turbines were appropriate to the circumstances. Specifically, the licensee's maintenance overhaul procedure did not address the following significant issues: 1) specify acceptance criteria and as-left requirements for thrust bearing axial clearance; 2) specify instructions to ensure the proper setting and critical dimensions for the proper pump to turbine coupling stretch; 3) establish the correct turbine to wheel nozzle lap setting; and 4) specify proper placement of insulation on the turbine. The licensee entered the issue into their corrective action program and took immediate corrective actions. At the end of the inspection period, the licensee continued to evaluate the causes and corrective actions to address this finding.

The finding was more than minor because, if left uncorrected, the issue would have become a more significant safety concern. In addition, it affected the Mitigating Systems attributes of equipment performance availability and

reliability, and maintenance procedure quality, as well as the Mitigating Systems cornerstone objective of ensuring the reliability of systems. The inspectors determined this programmatic finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)). (4OA3.3.b.1)

- Green: The inspectors identified a finding of very low significance (Green) with no associated violation for the failure to provide appropriate training for maintenance personnel performing overhauls on the TDAFW pump turbines. Specifically, while maintenance personnel received training on some of the individual components associated with a turbine, the mechanic-electrician (mechanical) training program did not require specialty task training for turbine overhauls. In addition, this was contrary to standard industry guidelines for training and qualification of maintenance personnel. The licensee entered the issue into their corrective action program and took immediate corrective actions. At the end of the inspection period, the licensee continued to evaluate the causes and corrective actions to address this finding.

The finding was more than minor because, if left uncorrected, the issue would have become a more significant safety concern. In addition, it affected the Mitigating Systems attributes of equipment performance availability and reliability, and to pre-event human error, as well as the Mitigating Systems cornerstone objective of ensuring the reliability of systems. The inspectors determined this programmatic finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to assure that training of personnel was adequate to assure nuclear safety (H.2(b)). (4OA3.3.b.2)

- Green: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately implement an oil analysis program for the TDAFW pump. The inspectors identified that the licensee failed to implement sampling guidelines using industry standards or provide an adequate justification for not performing the samples at reasonable intervals. The licensee entered the issue into their corrective action program and took immediate corrective actions. At the end of the inspection period, the licensee continued to evaluate the causes and corrective actions to address this finding.

The finding was more than minor because, if left uncorrected, the failure to have an adequate procedure for lubrication would result in the TDAFW pump being degraded without the knowledge of the licensee. The inspectors determined the finding did not result in an actual loss of safety function of a system or train of equipment; therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee did not ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)). (4OA3.5.b.1)

- Green: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately quarantine a component for subsequent causal analysis. The inspectors identified that the licensee failed to implement procedural controls to quarantine degraded components during troubleshooting and maintenance activities which resulted in the loss of evidence for causal analysis. The licensee entered the issue into their corrective action program, implemented interim quarantine controls, and issued a new Procedure, NP 1.1.17 "Quarantine of Areas, Equipment, and Records."

The finding was more than minor because, if left uncorrected, the failure to properly quarantine items would become a more significant safety concern, since the failure to do so could impede the identification of causes for conditions adverse to quality and prevent the implementation of appropriate corrective actions. The inspectors determined the finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee did not ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)). (4OA3.7.b.1)

B. Licensee-Identified Violations

No findings of significance were identified.

REPORT DETAILS

Summary of Plant Event

On June 9, 2007, the Unit 1 Turbine-Driven Auxiliary Feedwater (TDAFW) Pump 1P-29 was run in accordance with Quarterly Inservice Test (IST) Procedure IT-8A. During this test, the TDAFW pump turbine outboard bearing reached a temperature of 233 degrees Fahrenheit (°F), which was 8°F over the bearing high alarm setpoint of 225°F (temperatures over 250°F required the pump to be shut down). A condition report was written indicating the temperature was increasing when the pump was secured from the IST; however, no immediate actions were taken to address the anomalous bearing temperature indication, which had not stabilized at the time the pump was secured. On June 11, licensee personnel reviewed the data from the June 9 IST and raised the concern that the pump did not appear to reach an equilibrium temperature, as evidenced by the continuing rate of increase. Based on these questions, the licensee re-performed IST IT-8A on June 12. During the test, the turbine outboard bearing temperature reached 249.5°F and the operators aborted the test, shut down the TDAFW pump, and declared the pump inoperable. As a result of an initial investigation, the licensee determined that the turbine outboard bearing was contacting the turbine shaft and oil analyses indicated the oil was subjected to thermal stress and contained moderate wear debris.

Over the next 72 hours, the licensee attempted to identify the cause and repair the TDAFW pump. The licensee identified turbine bearing upper housing alignment issues, a potential radiative heat issue from the turbine casing insulation towards the outboard bearing, and potential turbine bearing clearance issues. However, the licensee was not able to identify the cause and repair the Unit 1 TDAFW pump within the allowed outage time of 72 hours in Technical Specification (TS) 3.7.5 and began a Unit 1 shutdown at approximately 6:30 p.m. on June 14, 2007, due to the inoperable TDAFW Pump 1P-29.

The TDAFW pump recently had a 10-year overhaul performed in April 2007, during the Unit 1 Refueling Outage. During post-maintenance testing (PMT) in the refueling outage, the licensee identified issues with the TDAFW pump turbine outboard bearing losing excessive oil, due to an inappropriately dimensioned bearing installed as part of the overhaul. The licensee corrected that particular issue prior to the startup from the refueling outage; however, the post-maintenance testing performed was not adequate in that the TDAFW pump was not run long enough to allow the bearing temperatures to stabilize, as discussed in Section 4OA3.6.b.1 of this report. Therefore, this degraded condition existed since Unit 1 entered Mode 3 on May 3, 2007.

Based on the probabilistic risk and deterministic criteria specified in Management Directive 8.3, "NRC Incident Investigation Program," and Inspection Procedure 71153, "Event Followup," and due to the equipment performance problems which occurred, a Special Inspection was initiated in accordance with Inspection Procedure 93812, "Special Inspection."

The inspection focus areas included the following charter items:

- Establish the sequence of events related to the maintenance and testing of the Unit 1 TDAFW pump, including a historical timeline;

- Monitor and assess the licensee's response to the indications of increasing turbine outboard bearing temperatures, including the operability determination, maintenance, and testing;
- Monitor and assess the licensee's determination of the causes for the anomalous conditions associated with the Unit 1 TDAFW pump, to the extent practicable;
- Monitor and assess the corrective actions associated with the restoration of the Unit 1 TDAFW pump;
- Assess the licensee's extent of condition evaluation associated with the Unit 1 TDAFW pump;
- Evaluate the licensee's post-maintenance and routine testing of the TDAFW pump;
- Assess the licensee's program and procedures for quarantining and equipment failure analysis of individual failed systems and components; and
- Assess the impact and safety significance of the increased turbine outboard bearing temperatures on the Unit 1 TDAFW pump.

The last charter item listed above will continue to be assessed via Unresolved Item (URI) URI 05000266/2007008-06, documented in Section 4OA3.6.b.1 of this report for the post-maintenance testing performance deficiencies.

4. OTHER ACTIVITIES (OA)

4OA3 Special Inspection (93812)

.1 Establish the Sequence of Events Related to the Maintenance and Testing of the Turbine-Driven Auxiliary Feedwater Pump

a. Inspection Scope

The inspectors reviewed control room logs, plant parameter recordings, historical inservice tests, corrective action documents, maintenance work order and work request history, and engineering design changes and conducted interviews to determine the relevant sequence of events associated with the maintenance and testing of the TDAFW pumps. The inspectors also reviewed work request history and corrective action program documents to evaluate the licensee's response to previous indications of high bearing temperatures.

b. Findings and Observations

Sequence of Events Timeline

A detailed timeline of the relevant sequence of events related to the Unit 1 and Unit 2 TDAFW pumps is included in Attachments 2 and 3 of this Report, respectively. Findings associated with the performance deficiencies identified in the sequence of events are addressed in the remaining sections of this report.

The timeline of events demonstrated that both the Unit 1 and Unit 2 TDAFW pump turbine outboard bearings have historically exhibited high temperatures, in excess of 200°F. However, the Unit 1 TDAFW Pump 1P-29 timeline highlighted that since the

Spring 2007 overhaul, the outboard bearing temperature was uncharacteristically high, leading to the conclusion that the maintenance overhaul introduced new conditions which resulted in very high temperatures observed on June 9 and 12, 2007.

.2 Monitor and Assess the Licensee's Response to the Indications of Increasing Turbine Outboard Bearing Temperatures, Including the Operability Determination, Maintenance, and Testing

a. Inspection Scope

The inspectors evaluated the licensee's identification and initial response to this event. This evaluation included the following aspects: a review of the licensee's identification of the degraded condition on June 9, 2007, and subsequent response; a review of the licensee's assessment of previous high temperature indications; a review of the licensee's actions during the refueling outage with respect to maintenance and testing of the TDAFW pump; the licensee's response following the June 12, 2007, TDAFW pump run; and the licensee's organizational response following the TS required shutdown on June 14, 2007. The inspectors attended plant meetings, interviewed plant personnel and reviewed the plant's TSs, operator logs, maintenance procedures, work orders and corrective action program documents.

b. Findings and Observations

b.1 Failure to Identify and Correct Previous Indications of the High Outboard Bearing Temperatures

Introduction: The inspectors identified a finding involving a non-cited violation (NCV) of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," having very low safety significance (Green) for the licensee's failure to identify and implement prompt corrective actions for the conditions which caused outboard bearing high temperature alarms during the Unit 1 Turbine-Driven Auxiliary Feedwater (TDAFW) pump post-maintenance test (PMT) performed on May 1, 2007; the Unit 1 TDAFW pump PMT performed on May 6, 2007; and the Unit 2 TDAFW pump PMT performed on November 17, 2006. These PMTs were performed following the 10-year overhaul for these pump turbines.

Description: On June 12, 2007, the licensee performed a special test for the Unit 1 TDAFW pump, as a result of exceeding the alarm setpoint (225°F) during a June 9, 2007, IST of the pump, to determine whether the turbine outboard bearing temperature would stabilize below the pump trip setpoint of 250°F. The temperature of the outboard bearing reached 249.5°F during this test, and the test was stopped. The Unit 1 TDAFW pump was declared inoperable and the licensee entered the 72-hour action statement per Technical Specification Action Condition (TSAC) 3.7.5.B. Attempts to repair the Unit 1 TDAFW pump turbine within the 72-hour action statement were unsuccessful, and the plant was subsequently shutdown on June 15, 2007, as required by TSAC 3.7.5.D.

The June 12, 2007 test of the Unit 1 TDAFW pump was performed to address a condition report written following the performance of the quarterly IST test on June 9, 2007. During the June 9 test, the outboard bearing temperature reached 233°F and was still rising when the pump was secured. Two other recent instances of the Unit 1 TDAFW pump turbine outboard bearing temperature exceeding the alarm setpoint occurred on May 1, 2007 (247°F), during an uncoupled run of the turbine and May 6, 2007 (238°F), during the Procedure IT-8A IST of the Unit 1 TDAFW pump, both following the 10-year overhaul. However, no condition reports were written for the unexpected high temperature alarms which were received during the tests. The inspectors also identified that a condition report was not written for a previous occurrence of the Unit 2 TDAFW pump unexpectedly exceeding its outboard bearing alarm setpoint during a PMT conducted on November 17, 2006, after a 10-year overhaul performed earlier in November.

The licensee's troubleshooting and maintenance of the Unit 1 TDAFW pump turbine revealed several discrepancies introduced during the 10-year overhaul, which in the aggregate led to the high outboard bearing temperatures as discussed in Section 4OA3.3.b.1 of this report. With respect to the Unit 2 TDAFW pump turbine, IST Procedure IT-9A was performed on June 21, 2007, and identified that the Unit 2 TDAFW pump turbine outboard bearing temperature stabilized at 222°F, while running at full flow conditions. The licensee, in consultation with the turbine vendor, concluded that this as left turbine bearing temperature, although high, was acceptable for the TDAFW pump to perform its safety function. However, the licensee determined that the Unit 2 TDAFW pump was operable but degraded with compensatory measures to change bearing oil more frequently, due to water intrusion identified in an oil sample first taken on June 23, 2007, as discussed in Section 4OA3.5.b.1 of this report.

Analysis: The inspectors determined that the licensee's failure to promptly identify and correct the cause of outboard bearing alarm conditions, a condition adverse to quality, and the subsequent failure to implement prompt corrective actions was a performance deficiency that warranted a significance evaluation in accordance with Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening." The finding was more than minor because it could reasonably be viewed as a precursor to a significant event. Specifically, the failure to identify and investigate the cause of the high bearing temperature alarms could potentially result in failure of the TDAFW pump turbines. Additionally, the finding is associated with the equipment performance attribute of the Mitigating Systems Cornerstone and affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet" for the Mitigating Systems Cornerstone, the inspectors determined this programmatic finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating events. Therefore, the finding was considered to be of very low safety significance (Green). The risk assessment for the potential loss of safety function is attributed to the performance deficiencies associated with inadequate

post-maintenance testing discussed in Section 4OA3.6.b.1 as Unresolved Item (URI) 5000266/2007008-06. The primary cause of this finding was related to a cross-cutting aspect in the area of problem identification and resolution for the failure to implement a corrective action program with a low threshold for identifying issues completely, accurately and in a timely manner commensurate with their safety significance (P.1(a)).

Enforcement: 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material, and equipment and nonconformances are promptly identified and corrected. Contrary to the above, a condition adverse to quality associated with the Units 1 and 2 TDAFW pump turbine high bearing temperatures being in excess of the alarm setpoint on November 17, 2006, May, 1, 2007, and May 6, 2007, was not identified in the corrective action program and therefore no prompt corrective actions were taken to address the degraded conditions for the Units 1 and 2 TDAFW pump turbines. Because of the very low safety significance of the programmatic aspect of this corrective action finding and because the finding was entered into the licensee's corrective action program as CAP01096340, this violation is being treated as an NCV consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000266/2007008-01; 05000301/2007008-01).

The licensee took immediate corrective actions to address the issue, and at the end of the inspection period the licensee continued to evaluate the causes associated with this finding.

b.2 Failure to Appropriately Assess the Operability of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump 1P-29 on June 9, 2007

Introduction: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately assess operability in accordance with plant procedures. The inspectors identified that the licensee failed to implement procedural requirements regarding the immediate assessment of operability on June 9, 2007, for the TDAFW pump high turbine outboard bearing temperatures.

Description: On June 9, 2007, the licensee performed the Unit 1 TDAFW pump quarterly IST Procedure IT-08A. A high temperature alarm was received at 225°F on the turbine outboard bearing. Although the IST test was completed, the turbine outboard bearing temperature was still rising at 233°F. A condition report was written to document the high outboard bearing temperature alarm. Attachment E of Procedure IT-8A allowed pump operation up to 250°F, but required an engineering evaluation if the bearing temperature was in the "Alert" range, defined as 225°F to 250°F. The inspectors noted that the attachment did not have temperature stabilization criteria, and that the bearing temperatures had not stabilized.

The inspectors reviewed the alarm response procedure and noted that receipt of the alarm for the high turbine outboard bearing required notification of the system engineer; however, interviews conducted with the engineer concluded that the notification was not made. Operations personnel had declared the TDAFW pump operable after the test and documented in the immediate operability evaluation for the condition report that the

pump passed the test, "and all parameters were acceptable. No required action values were reached." The inspectors noted there was no assessment of the upward trend of turbine outboard bearing temperatures. In addition, the licensee had not assessed the condition and the TDAFW pump's capability to perform its specified safety function for the time the safety function was required, i.e. mission time. There also was no assessment of the TDAFW pump's functional capability to perform the augmented quality functions for the mission time in station blackout and potential fire scenarios. No operability recommendation (OPR) was asked for by operations department staff. On June 11, 2007, licensee personnel determined that the TDAFW pump needed to be run again to ensure that turbine bearing temperature stabilization was evaluated.

The inspectors reviewed the licensee's procedure for operability, Fleet Procedure FP-OP-OL-01, "Operability Determination." The procedure required a determination if a condition existed that could call into question the ability of a structure, system, or component (SSC) to perform its specified safety function. An example of such a condition was an item which met the definition of a degraded condition. A degraded condition, as defined in the fleet procedure, was a condition where there had been a loss of quality or functional capability. An example included in the definition was a noticeable change in parameters that were precursors to failure, for example temperature. The attachment guidance for immediate operability review also highlighted questions for performing operability determinations, which included the following: "Could the capability of a SSC to prevent or mitigate consequences of an accident as postulated in the Updated Final Safety Analysis Report (UFSAR) be reduced?" The guidance suggested that an OPR should be requested if additional engineering evaluation and justification was needed to answer those questions.

Finally, the inspectors noted that the guidelines for operability recommendations included guidance to evaluate trend data to identify a deteriorating condition and to utilize an OPR to predict the point when a SSC may become inoperable. However, based on interviews with operations personnel, the inspectors concluded that operations personnel did not utilize the procedure in assessing immediate operability for the condition report written on June 9, 2007.

The inspectors concluded the licensee had not adequately implemented the procedures for operability determinations. The licensee had not assessed the parameter of bearing temperature and rise of the temperature with respect to the specified safety functions and the time this function would be needed. Also, the licensee had not engaged engineering personnel for further evaluation on the capability of the Unit 1 TDAFW Pump 1P-29 to perform its safety function with the increase in turbine outboard bearing temperature.

Analysis: The inspectors determined that the failure to adequately perform an operability determination was a performance deficiency that warranted a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening." The finding was more than minor because, if left uncorrected, the failure to properly assess operability would result in the TDAFW pump being degraded and potentially inoperable, exceeding the allowed outage time in accordance with TSs .

The inspectors also determined that the finding impacted the human performance attribute of the Mitigating Systems Cornerstone and impacted the cornerstone objective to ensure reliability of systems that respond to initiating events. Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet for IE, MS, and B Cornerstones," the inspectors determined the finding may have resulted in a late determination of an actual loss of safety function of a system or train of equipment. The risk assessment for the potential loss of safety function is attributed to the performance deficiencies associated with inadequate post-maintenance testing discussed in Section 4OA3.6.b.1 as URI 5000266/2007008-06. This finding, for the inadequate operability assessment, did not cause the loss of safety function for greater than the allowed outage time. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to demonstrate that nuclear safety was an overriding priority. Specifically, the licensee failed to make safety-significant or risk-significant decisions using a systematic process for operability determinations, especially when faced with uncertain or unexpected plant conditions, to ensure safety is maintained (H.1(a)).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, requires, in part, that activities affecting quality be prescribed and accomplished by procedures appropriate to the circumstances. The licensee failed to implement the operability determination Procedure FP-OP-OL-01, "Operability Determination." Procedure FP-OP-OL-01 required, in part, that the licensee assess the capability of a SSC to prevent or mitigate consequences of an accident as postulated in the UFSAR. Contrary to the above, the licensee failed to adequately assess the operability of the turbine outboard bearing for the Unit 1 TDAFW pump as the turbine bearing performance degraded. Because this finding was of very low safety significance and because the finding was entered into the licensee's corrective action program as CAP01097757, this violation is being treated as a non-cited violation (NCV 0500266/2007008-02) consistent with Section VI.A of the NRC Enforcement Policy.

The licensee took immediate corrective actions to address the issue, and at the end of the inspection period the licensee continued to evaluate the causes associated with this finding.

.3 Monitor and Assess the Licensee's Determination of the Causes for the Anomalous Conditions Associated with the Unit 1 Turbine-Driven Auxiliary Feedwater Pump

a. Inspection Scope

The inspectors evaluated the licensee's determination of the causes for the increased bearing temperatures associated with the Unit 1 TDAFW turbine since the Spring 2007 Refueling Outage. The inspectors reviewed and assessed the licensee's 10-year overhaul procedure utilized during the Unit 1 TDAFW turbine overhaul as compared to vendor manuals and available industry guidance on turbine maintenance, to ascertain the adequacy of the licensee's procedures. In addition, the inspectors reviewed maintenance work packages and corrective action documents related to the 10-year

overhauls performed on the Unit 1 TDAFW turbine in 2007 and 1998. The inspectors also reviewed the maintenance training program associated specifically with turbine overhauls to assess the adequacy of training received by maintenance personnel. The inspectors interviewed engineering, operations, maintenance and onsite vendor personnel, attended licensee meetings, and reviewed relevant work package, training and corrective action program documents.

b. Findings and Observations

b.1 Inadequate Procedures Associated with the Turbine 10-year Overhaul

Introduction: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to ensure that procedures associated with the maintenance of the turbines for the TDAFW pump were appropriate to the circumstances. Specifically, the licensee's maintenance overhaul procedure did not address the following significant issues: 1) specify acceptance criteria and as-left requirements for thrust bearing axial clearance; 2) specify instructions to ensure the proper setting and critical dimensions for the proper pump to turbine coupling stretch; 3) correctly establish the turbine-to-wheel nozzle lap setting; and 4) specify proper placement of insulation on the turbine.

Discussion: As part of the Unit 1 Refueling Outage U1R30, the licensee performed a 10-year overhaul of the TDAFW Pump 1P-29 Turbine. The overhaul was not performed with the assistance of a vendor representative and included the work on the following items: the turbine shaft, governor drive gearbox, governor and governor drive coupling, pump to turbine coupling, gland seals, all bearings, and equipment realignment. The Unit 2 TDAFW Pump 2P29 Turbine had been rebuilt in the Fall 2006 Refueling Outage, with assistance from a vendor representative, and did not exhibit the same anomalous stabilized turbine outboard bearing temperature.

The inspectors reviewed the maintenance performed during the Unit 1 outage and noted that several condition reports were written due to issues encountered as part of the maintenance. During the course of the overhaul, one-half of the pump to turbine coupling was installed backwards, which was corrected during the refueling outage. The licensee determined that the overhaul procedure instructions were not adequate, in that Procedure RMP 9044-1, "Auxiliary Feedwater Pump Terry Turbine Overhaul," Revision 11, did not give adequate instructions for installation of the coupling. In addition, during uncoupled turbine testing conducted on May 1, 2007, following the overhaul, the outboard bearing housing began leaking significant amounts of bearing oil. This also was corrected, and the licensee determined that the outboard journal bearing, which was installed during the overhaul, had the incorrect chamfer dimensions creating an interference fit with the housing, when an oil drain path gap was required. Due to the interference fit, the bearing oil, which was recirculated by slinger rings only, leaked out and over the outboard journal bearing because there was no oil drain path to the sump. The licensee determined Procedure RMP 9044-1, did not provide adequate instructions for installation, since acceptance criteria for the as-left clearance of the outboard bearing oil drain path were not specified. As is discussed in Section 4OA3.6.b.1 of this report, the inadequate post-maintenance testing, performed following the 10-year

overhaul, failed to identify additional maintenance overhaul issues which were discovered following the June 14, 2007, Unit 1 shutdown due to the high outboard bearing temperatures.

Following the June 12, 2007 TDAFW Pump 1P-29 run, in which the turbine outboard bearing temperature reached 249.5°F without stabilization, the pump was declared inoperable, and the licensee commenced complex troubleshooting. The troubleshooting which occurred from June 12 through June 14, 2007, but did not identify and correct the cause of the high outboard bearing temperature; however, the licensee did identify that the installation sequence of the turbine outboard bearing cover used during the overhaul caused the bearing to become slightly askew in the housing, due to interferences with the right angle drive for the governor and bent outboard bearing cover alignment pins. In addition, the turbine insulation was found to direct radiant heat from the turbine housing directly across the outboard bearing thermocouple, and the right angle drive gearbox was discovered misaligned. Following correction of those items, the licensee performed a bearing stabilization run which was aborted after the outboard bearing temperature achieved 247.5°F during the evening of June 14, 2007, and the licensee commenced a TS required shutdown due to the fact that the TDAFW pump would not be returned to an operable status within the allowed outage time of 72 hours.

The inspectors began reviewing Procedure RMP 9044-1, Revision 11, as compared to the Electric Power Research Institute (EPRI) Technical Report (TR) 1007461, "Terry Turbine Maintenance Guide, AFW Application," to identify whether the licensee's procedure incorporated all relevant industry guidance into the maintenance procedure. The inspectors determined that for a few tasks the industry guidance was implemented, but that a majority of tasks, which included critical measurements, such as instructions detailing the specification of acceptance criteria and as-left requirements for thrust bearing axial clearance, and the installation of the turbine bearing covers, were not incorporated into the licensee's maintenance procedure. In addition, the inspectors determined that the licensee did not have any justification supporting why the industry guidance was not applicable or incorporated into the maintenance procedures.

Additional troubleshooting conducted by the licensee from June 14 through June 19, 2007, identified that the maintenance overhaul during the Refueling Outage introduced the following incorrect conditions: the thrust bearing axial clearance was left at 0.004", when the actual clearance was required to be 0.010" to 0.015"; the pump to turbine coupling shim pack stretch was discovered to be set incorrectly, 0.015" was required, and the as-found gap around the hubs was found to be significantly less than the acceptance criteria at some points; and the turbine wheel lap setting was found to be 5/64" to 7/64" too far toward the pump to coupling end, which allowed the steam nozzle in the turbine to be positioned incorrectly over the edge of the outboard side of the turbine wheel. A TDAFW pump run was conducted on June 19, 2007, and the outboard bearing temperature stabilized at approximately 230.8°F.

The licensee continued to adjust the turbine insulation over the next couple of days to reduce the outboard bearing temperature further, and, on June 23, 2007, the final PMT run of the TDAFW pump had a turbine outboard bearing stabilization temperature of

226°F. The licensee, in consultation with the turbine vendor, concluded that this as-left temperature, although high, was acceptable for the TDAFW pump to perform its safety function.

Although several overhaul maintenance issues were identified during the licensee's troubleshooting efforts, the inspectors concluded that the licensee's failure to ensure the maintenance overhaul procedure prescribed appropriate instructions for the following attributes was the most significant contributor to the increased TDAFW Pump turbine outboard temperatures: 1) specification of an acceptance criteria and as-left requirements for thrust bearing axial clearance; 2) specification of instructions to ensure the proper setting and critical dimensions for the proper pump-to-turbine coupling stretch; 3) establishment of the correct turbine-to-wheel nozzle lap setting; and 4) specification of the proper placement of insulation on the turbine.

The inspectors noted that had the licensee more thoroughly utilized the guidance contained in the EPRI Technical Manual for Terry Turbine Maintenance for TDAFW applications, the overhaul procedure would have prescribed appropriate instructions for the maintenance overhaul deficiencies identified after June 12, 2007. In addition, the licensee identified that the incorrect wheel lap setting was a direct result of an error introduced into Procedure RMP 9044-1, Revision 11, which was approved in March 2007. Following the Unit 2 TDAFW pump turbine overhaul which took place in the Fall of 2006, the licensee significantly modified Procedure RMP 9044-1, which introduced procedure errors not present during the Unit 2 turbine overhaul.

Analysis: The inspectors determined that the failure to ensure that procedures associated with the corrective and preventive maintenance of the turbine for the TDAFW pump were appropriate to the circumstances and included appropriate acceptance criteria was a licensee performance deficiency warranting a significance evaluation. The finding was more than minor because, if left uncorrected, the issue would have become a more significant safety concern. In addition, it affected the Mitigating Systems attributes of equipment performance availability and reliability, and maintenance procedure quality, as well as the Mitigating Systems cornerstone objective of ensuring the reliability of systems.

Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet" for the mitigating systems cornerstone, the inspectors determined this programmatic finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The risk assessment for the potential loss of safety function is attributed to the performance deficiencies associated with inadequate post-maintenance testing discussed in Section 4OA3.6.b.1 as URI 5000266/2007008-06. The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," requires, in part, that activities affecting quality be prescribed by documented instructions or procedures of a type appropriate to the circumstances and included appropriate quantitative or qualitative acceptance criteria to determine that the activities were satisfactorily accomplished. Contrary to this, the licensee's maintenance overhaul procedure did not: 1) specify quantitative acceptance criteria and as-left requirements for thrust bearing axial clearance; 2) specify instructions to ensure the proper setting and critical dimensions for the proper pump to turbine coupling stretch; 3) correctly establish the turbine to wheel nozzle lap setting; and 4) incorporate additional relevant industry guidance to ensure the turbine was properly assembled. Because of the very low safety significance of this finding and because the finding was entered into the licensee's corrective action program as CAP01090456, this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000266/2007008-03; 05000301/2007008-03).

The licensee took immediate corrective actions to address the issue, and at the end of the inspection period the licensee continued to evaluate the causes associated with this finding.

b.2 Inadequate Maintenance Training Associated with Turbine Overhauls

Introduction: The inspectors identified a finding of very low significance (Green) with no associated violation for the failure to provide appropriate training for maintenance personnel performing overhauls on the TDAFW pump turbines. Specifically, while maintenance personnel received training on some of the individual components associated with a turbine, the mechanic-electrician (mechanical) training program did not require specialty task training for turbine overhauls. In addition, this was contrary to standard industry guidelines for training and qualification of maintenance personnel.

Discussion: The inspectors interviewed several maintenance personnel, including maintenance management and supervision, and determined that the maintenance personnel had not received specialized training for turbine overhauls. The inspectors subsequently reviewed Training Program Description MM-TP, "Point Beach Mechanic-Electrician (Mechanical) Training Program," Revision 2, and determined that the only specialized tasks these personnel were trained on included: snubber maintenance; overhaul of charging pump varidrive; overhaul of steam generator feed pumps; replacement of reactor coolant pump seals; overhaul of traveling water screens; overhaul of emergency diesel generators; advanced machining; heating, ventilation, and air conditioning maintenance; and reactor refueling maintenance. The licensee initially stated that the philosophy, with respect to this particular maintenance activity, was that it was covered by the subtasks the mechanics were trained on, such as the installation of sliding and contact bearings, disassembly and assembly of drive couplings and performing alignments with a laser alignment device.

The inspectors inquired whether or not a task analysis was completed for the activity of performing the 10-year overhaul of the turbine, and the licensee concluded that a task analysis had not been performed. The inspectors referenced Procedure FP-T-SAT, "Analysis Phase," Revision 5, and concluded this task was difficult to perform, was critical for safe and efficient plant operation, and therefore should have been considered

for initial and continuing training. In addition, the inspectors also identified that standard industry guidance for the training and qualification of maintenance personnel discussed the need for specialized skills training for turbine overhauls and alignment. The licensee determined there was no justification for not following industry guidance, and that a previous gap analysis of the licensee's maintenance training program did not consider the specialized skills training listed within the industry guidance. The inspectors concluded that the licensee's training program did not adequately address the specialized task of performing turbine overhauls; therefore, maintenance personnel had not received adequate training on the performance of this task.

Finally, the inspectors noted during the maintenance activities, that maintenance staff had incorrectly "blue-checked" a bearing by rotating the turbine shaft in the opposite direction the turbine rotated. Engineering and other personnel present rationalized this as an acceptable practice; however, bearings were required to be checked in the direction of turbine rotation. The licensee also identified other deficient maintenance practices during the June 2007 restoration of the turbine, which may have related to training or maintenance practices, including the failure to take measurements to the correct accuracy for tolerances, and incorrect measurement of the coupling gap. In addition, the licensee also noted the incorrect use of not applicable, or "N/A," when performing maintenance procedure steps which led to minor errors, implementation of procedures with unclear prescribed instructions, and some cases of an incorrect integration of work plan activities with the maintenance procedures. The inspectors concluded these practices further corroborated the assessment that maintenance personnel had not received adequate training.

Analysis: The inspectors determined that the failure to establish appropriate training for maintenance personnel performing overhauls on the TDAFW pump turbines was a licensee performance deficiency warranting a significance evaluation. This inspector identified finding was more than minor because, if left uncorrected, the issue would have become a more significant safety concern. In addition, it affected the Mitigating Systems attributes of equipment performance availability and reliability, and to prevent human error, as well as the Mitigating Systems cornerstone objective of ensuring the reliability of systems.

Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet" for the mitigating systems cornerstone, the inspectors determined this programmatic finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The risk assessment for the potential loss of safety function is attributed to the performance deficiencies associated with inadequate post-maintenance testing discussed in Section 4OA3.6.b.1 as URI 5000266/2007008-06. The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee failed to assure that training of personnel was adequate to assure nuclear safety (H.2(b)).

Enforcement: The failure to establish appropriate training for maintenance personnel performing overhauls on the TDAFW pump turbines was not an activity subject to 10 CFR Part 50, Appendix B, nor a procedure required by license conditions or TSs. Therefore, while a performance deficiency existed, no violation of regulatory requirements occurred. This was considered a finding of very low safety significance (FIN 05000266/2007008-04; 05000301/2007008-04).

The licensee took immediate corrective actions to address the issue, and at the end of the inspection period the licensee continued to evaluate the causes associated with this finding.

.4 Monitor and Assess the Corrective Actions Associated with the Restoration of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump

a. Inspection Scope

The inspectors evaluated the licensee's troubleshooting and subsequent restoration activities to address the high outboard TDAFW pump turbine bearing temperatures. The inspectors interviewed licensee and vendor personnel, reviewed licensee troubleshooting and work plans, verified condition reports were written for issues which were identified, observed and reviewed maintenance activities, and observed portions of the return to service and post-maintenance testing.

b. Findings and Observations

No findings of significance were identified. The potential causes for the high bearing temperatures identified at the end of the inspection are discussed in Section 4OA3.3.b.1 and observations concerning the actual maintenance are contained in Section 4OA3.3.b.2 of this report.

.5 Assess the Licensee's Extent of Condition Evaluation Associated with the Unit 1 Turbine- Driven Auxiliary Feedwater Pump

a. Inspection Scope

The inspectors attended licensee meetings, interviewed plant personnel, observed maintenance and testing activities, reviewed pertinent extent of condition issues for other safety-related components, and performed system walkdowns to assess the adequacy of the licensee's corrective actions for any potential extent-of-condition issues.

The inspectors reviewed potential extent-of-condition issues, based on the facts associated with the TDAFW pumps, and subsequently focused the extent-of-condition reviews on the key areas that the inspectors identified were most vulnerable. The first area was the licensee's oil sampling and analysis program used for predictive and preventive maintenance on safety-related equipment. The second area reviewed was the potential extent-of-condition associated with inadequate post-maintenance testing of safety-related equipment.

b. Findings and Observations

b.1 Inadequate Oil Analysis Program Procedures

Introduction: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately implement an oil analysis program for the TDAFW pump. The inspectors identified that the licensee failed to implement sampling guidelines using industry standards or provide an adequate justification for not performing the samples at reasonable intervals.

Description: The inspectors noted during a review of the Unit 2 TDAFW turbine outboard bearing temperature data following the Fall 2006 10-year maintenance overhaul of the turbine, that the outboard bearing temperatures dropped over 20°F in less than one half-hour during pump testing on November 11, 2006. The inspectors inquired about the oil samples which were taken after this anomalous condition. Licensee personnel indicated that no oil samples were taken since the sampling frequency was 18 months. The inspectors were concerned about the possibility of oil contamination or future bearing degradation, because the licensee explained that the rapid decrease was likely due to the bearing "wearing in" following the maintenance. The inspectors continued to question the adequacy of the turbine outboard oil and the licensee sampled the oil on Unit 2 TDAFW pump outboard bearing housing prior to running the pump on June 21, 2007.

The oil sample indicated some particulate and observable water, as noted by a "cloudy" sample. The licensee visually estimated the concentration of water in the oil to be approximately 500 to 1,000 parts per million (ppm). The EPRI Technical Report (TR) 1007461, "Terry Turbine Maintenance Guide, AFW Application," an industry standard for this TDAFW, had a limit for operability of 5,000 ppm water. The actual concentration of water in this oil sample could not be determined because the licensee's analysis was not capable of determining such a high water content. In addition, the work order used to obtain the oil sample was not written in accordance with the licensee's standard sampling guidelines, which caused the oil sample to be used in its entirety in the inappropriate onsite analysis. Therefore, the licensee did not have additional oil to send for offsite laboratory analysis. The inspectors continued to question the licensee's onsite analysis results for prior samples, and the licensee determined that the onsite oil analysis was not capable of determining the high water content because the licensee's equipment was not adequately calibrated.

The licensee subsequently performed the Unit 2 TDAFW pump IST Procedure IT-9A with a requirement to reach bearing temperature stabilization on June 21, 2007, and obtained another turbine outboard oil sample. The licensee determined the post-run water concentration was approximately 160 ppm water, and initiated Condition Report CAP1098358. The licensee subsequently performed an OPR for determining the maximum allowed water to ensure the TDAFW pump could perform its safety function.

The turbine oil requirements listed in EPRI TR 1007461 recommended oil moisture content be sampled on a monthly basis and that acidity, viscosity and particle count be verified once per quarter. The licensee performed oil analysis once every 18 months

and did not perform acidity checks. The licensee had no trend documentation or reasonable justification for the performance of oil samples at such a long interval, which did not coincide with standard industry and vendor guidance. The licensee's lubrication analysis program, prescribed in Predictive Maintenance Manual (PDM) 2.0 states, in part, that the frequency of sampling is determined by the factors listed in the Condition Monitoring Program Procedure NP 7.3.10. Procedure NP 7.3.10 guidance on analysis frequency stated, in part, that great emphasis should be placed on trends rather than actual values. Additionally the severity of a condition must be determined by all observed symptoms and consider prior experience with similar equipment, industry standards, regulatory requirements and vendor recommendations.

The inspectors concluded that the guidance in the condition monitoring program was not adequate to ensure that the oil samples for the TDAFW pumps were reasonably evaluated, considering industry standards and vendor recommendations.

Analysis: The inspectors determined the failure to have an adequate performance monitoring program for lubrication oil for the TDAFW pumps was a performance deficiency that warranted a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening." This finding was determined to be more than minor because if left uncorrected, the failure to have an adequate procedure for lubrication would result in the TDAFW pumps being in a degraded condition without the knowledge of licensee personnel.

The inspectors also determined the finding impacted the equipment performance attribute of the Mitigating Systems Cornerstone and impacted the objective to ensure the reliability of systems that respond to initiating events. Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet for IE, MS, and B Cornerstones," the inspectors determined that the finding did not result in an actual loss of safety function of a system or train of equipment. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee did not ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, requires, in part, that activities affecting quality be prescribed and accomplished by procedures appropriate to the circumstances. The licensee's condition monitoring procedure, NP 7.3.10, included lubrication requirements and two of those components were the safety-related Unit 1 and Unit 2 TDAFW pumps. Contrary to the above, the licensee failed to prescribe adequate lubrication monitoring procedures to assess the performance of the turbine outboard bearing oil for the TDAFW pumps of both units. Because this finding was of very low safety significance and because the finding was entered into the licensee's corrective action program as CAP01099386, this violation is being treated as a non-cited violation (NCV 0500266/2007008-05; NCV 05000301/2007008-05) consistent with Section VI.A of the NRC Enforcement Policy.

The licensee took immediate corrective actions to address the issue, and at the end of the inspection period the licensee continued to evaluate the causes associated with this finding.

b.2 Review of Other Safety-Related Equipment Post-Maintenance Testing

Introduction: No findings of significance were identified. As a result of the post-maintenance testing performance deficiencies identified in Section 4OA3.6.b.1 of this report, the inspectors reviewed any potential extent of condition issues. The inspectors reviewed the licensee's post-maintenance testing procedure and use of the procedure, and reviewed post-maintenance testing performed following major maintenance to determine if issues potentially existed with other risk significant and safety-related equipment.

Discussion: The inspectors reviewed Procedure NP 10.2.7, "Post-maintenance/Return to Service Testing," and concluded that it and the associated Post-maintenance Test Matrix, PBF-9809, dated February 2004, contained adequate guidance for determining appropriate post-maintenance tests; however, the procedure did not require referencing of the test matrix if an existing procedure contained PMT requirements. As a result, the inspectors noted that there may have been an error introduced into the licensee's process when bearing temperature stabilization was no longer required by the American Society of Mechanical Engineers, Section XI Code for Inservice Testing, which was changed at Point Beach in 1998.

While the inspectors agreed that the Code no longer required bearing temperature stabilization, major maintenance performed on equipment where bearing replacement has occurred does require the assurance that the bearing was installed correctly. Post-maintenance testing for bearing replacements should then include bearing temperature stabilization to ensure a new issue was not introduced which could affect the pump or turbine's operability following bearing replacement. In fact, the inspectors noted that the licensee's post-maintenance testing matrix called for monitoring turbine bearing temperatures as part of the PMT process when turbine bearings were replaced.

The inspectors also interviewed staff responsible for determining the appropriate PMT following maintenance, which included operations, maintenance, work planning and engineering personnel. The inspectors determined that the procedure and matrix were not consistently utilized among licensee personnel to ensure the appropriate PMT was performed; licensee personnel, in some cases, solely relied on the applicable procedure being correct and did not verify that the correct PMT was specified in procedures; and that licensee personnel may not have received training on the use of the procedure and matrix. These minor issues were captured in the licensee's corrective action program and were being addressed in the causal analysis for Condition Report CAP01090456.

Finally, the inspectors reviewed major corrective and preventive maintenance performed since 2001 for a select sample of components in the Safety Injection and Emergency Diesel Generator systems, to determine whether potential operability issues existed due to inadequate post-maintenance testing. The inspectors did not identify any potential operability issues associated with these reviews.

.6 Evaluate the Licensee's Post-maintenance and Routine Testing of the Turbine-Driven Auxiliary Feedwater Pump

a. Inspection Scope

The inspectors attended licensee meetings, interviewed plant personnel, observed maintenance activities, and reviewed applicable procedures and corrective action program documents.

b. Findings and Observations

b.1 Unresolved Item (URI): Inadequate Post-Maintenance Test (PMT) Following Unit 1 TDAFW Pump Turbine Overhaul

Introduction: The inspectors identified a URI associated with the licensee's failure to conduct adequate PMT of the TDAFW pumps following a 10-year overhaul of the turbine.

Description: The licensee completed an overhaul of the Unit 1 TDAFW turbine and the associated post-maintenance testing on May 6, 2007, declaring the TDAFW pump operable following completion of the quarterly IST Procedure IT-8A. The PMT requirements for the overhaul were listed in the maintenance overhaul procedure, RMP 9044-1. The IST procedure had no specific requirements to monitor bearing temperatures for stabilization other than to perform the IST test which recorded bearing temperature data. The procedure did have a temperature limit to place the pump in the alert range and conduct an engineering evaluation when the turbine outboard bearing exceeded 225°F; and to remove the pump from service and declare the pump inoperable when the same bearing exceeded 250°F. However, as part of the PMT for the 10-year overhaul there was no requirement in either the work order, maintenance procedure or the IST procedure to ensure bearing temperatures were stabilized.

During testing on May 1, 2007, the inspectors noted that the outboard bearing temperature reached 247°F, as indicated on the chart recorders. During the PMT on May 6, 2007, some licensee personnel noted the turbine outboard bearing rising, but indicated the temperatures was "stabilizing". However, the licensee did not wait for temperature stabilization and secured the Unit 1 TDAFW. The inspectors review of chart recorders revealed that the outboard bearing temperature was at 238°F and still rising. The licensee had declared the TDAFW pump operable with no PMT assessment of the outboard bearing temperature trend and no engineering analysis or evaluation of the changes in outboard bearing temperature from prior to the overhaul.

During the Unit 1 TDAFW pump quarterly IST Procedure IT-8A performance on June 9, 2007, turbine outboard bearing temperature exceeded 225°F. The turbine outboard bearing was temperature at 233°F and still rising when the pump was secured when the test was completed. In this case, a condition report was written and a follow-up test was completed on June 12, 2007, with the goal to attain bearing temperature stabilization. The test was stopped at around 249.5°F, prior to bearing temperature stabilization, as the machine approached the 250°F limit to secure the pump. The pump was declared inoperable and the plant was subsequently shutdown to repair the TDAFW turbine.

The licensee's preliminary causal analysis indicated the turbine was improperly assembled during the overhaul in May 2007, as discussed in Section 4OA3.3.b.1 of this report. The inspectors concluded that the PMT performed following the 10-year overhaul was not adequate to detect deficiencies in the maintenance performed, and that the PMT should have detected that the bearing temperatures were rising and required evaluation prior to declaring the TDAFW operable. This is a performance deficiency that requires further assessment. This finding affected the Mitigating Systems Cornerstone objective because the TDAFW pump's safety function and augmented quality function were impacted. This finding was greater than minor, because the inadequate PMT resulted in the return to service of the TDAFW pump in a degraded condition, which impacted the Mitigating Systems Cornerstone objective of availability and reliability and the attribute of equipment performance.

The licensee is assessing the impact of bearing degradation on the availability of the Unit 1 TDAFW pump to perform the design and augmented quality functions in the plant's licensing basis in the corrective action program as CAP01090456. There is no current safety concern with either unit's TDAFW pumps, because both have been adequately tested and bearing stabilization indicated that the pumps' functionality is currently maintained for all licensing and design basis events. This issue is an Unresolved Item (URI 05000266/2007008-06) until the NRC reviews the licensee's past operability assessment.

.7 Assess the Licensee's Program and Procedures for Quarantine and Equipment Failure Analysis of Individual Failed Systems and Components

a. Inspection Scope

The inspectors attended licensee meetings, interviewed plant personnel, visited work sites and reviewed troubleshooting plans, work packages, and procedures to assess the licensee's quarantine process.

b. Findings and Observations

b.1 Failure to Prescribe an Appropriate Quarantine Process

Introduction: The inspectors identified a finding of very low safety significance (Green) and a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately quarantine a component for subsequent causal analysis. The inspectors identified that the licensee failed to establish and implement procedural controls to quarantine components during maintenance and troubleshooting activities.

Description: Following a bearing stabilization test for the Unit 1 TDAFW pump on June 12, 2007, the licensee opened the outboard bearing casing on the Unit 1 TDAFW pump to inspect the bearings. Inspection of the bearings revealed scuff marks on the journal bearing. The bearing was installed during the May 2007 10-year overhaul of the Unit 1 TDAFW pump turbine. During subsequent trouble shooting activities and with the agreement of the turbine vendor, the licensee decided to machine the bearing to improve oil flow between the bearing and the shaft, in an attempt to lower the outboard

bearing operating temperature. The outboard bearing, which was in the turbine at the completion of the 10-year overhaul, was selected for machining and reinstallation by licensee personnel. Licensee personnel did not consider that machining would remove the bearing scuff and wear marks, in addition to any other indications of potential heating, for subsequent causal and past operability analysis. The licensee failed to implement appropriate quarantine controls to establish positive control over the bearing to ensure that the as-found condition was preserved.

The inspectors reviewed the licensee's procedures that established equipment quarantine controls. These controls were contained in FP-PA-ARP-02, "NMC Augmented Incident Evaluation Procedure." This procedure required, in part, that quarantined equipment be controlled by the Shift Manager and restricted when possible, from maintenance, operations, or tampering by either: (1) taping or roping off quarantined areas and posting signs for preventing access without Shift Manager authorization, or (2) posting personnel in the accessible areas with specific instruction on applicable methods for gaining entry into the area. The incident investigation checklist included in the procedure required: identification as to whether quarantine was necessary; designation of the system, component, or area quarantined; and the dates when the quarantine was established and lifted.

Site procedure NP 5.3.3, "Incident Investigation and Post-Trip Review," required that access to quarantined areas must be approved by the Duty Shift Supervisor or his designee, with the understanding that no manipulations or physical changes could occur on the affected equipment. The procedure further required that equipment was restricted from maintenance by means similar to those specified in FP-PA-ARP-02, "NMC Augmented Incident Evaluation Procedure." Finally, the procedure required that if quarantined components or equipment must be altered or repaired for the purposes of nuclear or personnel safety, that videotapes or photographs will be taken, if possible, prior to any work commencing.

The inspectors determined the licensee did not implement these incident investigation procedures for the trouble shooting and maintenance activities for the Unit 1 TDAFW pump; hence, the quarantined controls contained within these procedures were not implemented. However, the inspectors also noted that the subject procedures were generally written to address major events, and thus the licensee's procedure did not adequately prescribe controls for preservation of individual components in the event of significant failures or equipment malfunctions. In fact, the inspectors had previously questioned the licensee regarding the lack of adequate quarantine controls for significant component level failures. Finally, the inspectors noted that following the June 12, 2007, test that confirmed the high turbine outboard bearing temperatures, the licensee was focused significantly on the return to service of the Unit 1 TDAFW pump. The licensee did not begin readily addressing the overall incident and circumstances surrounding the event until approximately June 21, 2007, when a root cause team was formed.

Following the machining of the original outboard bearing installed during the 10-year overhaul around June 14, 2007, the licensee implemented immediate corrective actions. However, the inspectors walked down a "quarantine area," and found parts missing for which the licensee could not account. The licensee subsequently established additional

quarantine controls using a locked container with controlled keys, to ensure the preservation of components. The licensee wrote Condition Report CAP01096984 identifying the deficiencies in equipment quarantine procedures, practices and controls.

Analysis: The inspectors determined the failure to establish adequate quarantine controls for the degraded Unit 1 TDAFW pump bearing was a performance deficiency that warranted a significance evaluation in accordance with IMC 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening." This finding was more than minor because, if left uncorrected, the failure to properly quarantine items would become a more significant safety concern. Specifically, the failure to quarantine would impede the identification of causes for conditions adverse to quality, and therefore prevent the implementation of appropriate corrective actions.

The inspectors determined the finding impacted the human performance attribute of the Mitigating Systems Cornerstone. Using IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," Attachment 1, "SDP Phase 1 Screening Worksheet for IE, MS, and B Cornerstones," the inspectors determined the finding was not a design qualification deficiency resulting in a loss of function per Generic Letter 91-18, did not represent an actual loss of safety function of a system or train of equipment, and was not potentially risk-significant due to a seismic, fire, flooding, or severe weather initiating event. Therefore, the finding was considered to be of very low safety significance (Green). The primary cause of this finding was related to a cross-cutting aspect in the area of human performance because the licensee did not ensure that procedures were adequate and accurate to assure nuclear safety (H.2(c)).

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, requires, in part, that activities affecting quality be prescribed and accomplished by procedures appropriate to the circumstances. Contrary to the above, the licensee failed to ensure that appropriate procedures existed with prescribed actions to assure that failed safety-related equipment was quarantined and preserved, as necessary, to support causal analysis and ensure the appropriate corrective actions were developed to correct the condition, an activity affecting quality. Consequently, the licensee failed to adequately preserve the turbine outboard bearing for the Unit 1 TDAFW pump as the bearing was machined, removing the scuff and wear markings and any possible indications of potential heating of the bearing. Because this finding was of very low safety significance and because the finding was entered into the licensee's corrective action program as CAP01096984, this violation is being treated as a non-cited violation (NCV) consistent with Section VI.A of the NRC Enforcement Policy (NCV 0500266/2007008-07; 0500301/2007008-07).

The licensee took immediate corrective actions to address the issue and has issued a new procedure, NP 1.1.17 "Quarantine of Areas, Equipment, and Records."

4OA6 Meetings

Exit Meetings

On July 12, 2007, the inspectors presented the preliminary inspection results to Mr. D. Koehl and members of his staff, who acknowledged the findings. The licensee

acknowledged the information presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENTS: 1) SUPPLEMENTAL INFORMATION
 2) TIMELINE OF EVENTS UNIT 1
 3) TIMELINE OF EVENTS UNIT 2
 4) SPECIAL INSPECTION TEAM CHARTER

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

R. Amundson, General Supervisor Operations Training
C. Butcher, Site Engineering Director
G. Corell, Radiation Protection and Chemistry Manager
F. Flentje, Licensing Supervisor
R. Harrsch, Operations Manager
L. Hawki, Containment System Engineering Supervisor
F. Hennessy, Program Engineering Supervisor
C. Jilek, Maintenance Rule Coordinator
T. Kendall, Engineering Senior Technical Advisor
D. Koehl, Site Vice-President
K. Locke, Regulatory Assurance
J. McCarthy, Director of Site Operations
G. Packard, Plant Manager
L. Peterson, Design Engineer Manager
M. Ray, Regulatory Affairs Manager
J. Schleif, Assistant Operations Manager
J. Schweitzer, Manager of Projects
G. Sherwood, Engineering Programs Manager
C. Sizemore, Training Manager
B. Vandervelde, Maintenance Manager
P. Wild, Design Engineering Projects Supervisor

Nuclear Regulatory Commission

J. Cushing, Point Beach Project Manager, NRR
P. Milano, Point Beach Project Manager, NRR
J. Cameron, Chief, Reactor Projects, Branch 5
S. West, Deputy Director, Division of Reactor Projects
J. Caldwell, Regional Administrator

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

0500266/2007008-06	URI	Inadequate Post-Maintenance Testing of the Turbine-Driven Auxiliary Feedwater Pumps Following Major Maintenance (Section 4OA3.6.b.1)
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Opened and Closed

0500266/2007008-01 0500301/2007008-01	NCV	Failure to Identify and Correct Previous Indications of High Bearing Temperatures (Section 4OA3.2.b.1)
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0500266/2007008-02	NCV	Failure to Appropriately Assess the Operability of the Unit 1 Turbine-Driven Auxiliary Feedwater Pump on June 9, 2007 (Section 4OA3.2.b.2)
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0500266/2007008-03 0500301/2007008-03	NCV	Failure to Have Procedures Appropriate to the Circumstances for Turbine Overhauls (Section 4OA3.3.b.1)
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0500266/2007008-04 0500301/2007008-04	FIN	Failure to Have Specific Formal Training for Maintenance Craft on Turbine Overhauls (Section 4OA3.3.b.2)
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0500266/2007008-05 0500301/2007008-05	NCV	Failure to Have Procedures Appropriate to the Circumstances for the Analysis and Sampling of Safety-Related Turbine and Pump Oil (Section 4OA3.5.b.1)
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0500266/2007008-07 0500301/2007008-07	NCV	Failure to Implement a Quarantining Process (Section 4OA3.7.b.1)
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Discussed

None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

Corrective Action Program Documents

CA020977; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; May 6, 1998
CA020978; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; May 6, 1998
CA020979; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; October 25, 1998
CA020980; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; December 11, 1998
CAP01096736; 1P-29 Turbine-Driven Auxiliary Feed Pump Failed Post-maintenance Test; June 14, 2007
CAP01096955; NRC Event Notification for Unit 1 TS Required Shutdown - 1P-29 TDAFW Pump Failed Required Testing
CAP01096984; Quarantined Items Being used or Modified - PBNP Equipment Quarantine Processes May Need Improvement; June 15, 2007
CAP01097185; Differences Noted Between RMP 9044-1 and EPRI Guide; June 17, 2007
CAP01097208; During the Re-assembly Process on the Inboard Bearing on 1P-29-T, the Thermal Couple Leads were Pinched in the Bearing Cap; June 18, 2007
CAP01097246; RMP 9044-1 Approved for Issue with Format Errors; June 18, 2007
CAP01097287; Evaluation of Event Response Procedures; June 18, 2007
CAP01097317; Sequence Used for Installation of the Governor Drive Gearbox to the Turbine Locked Out the Axial End Play; June 18, 2007
CAP01097382; Security Door was Found Open Upon Arrival by a Security Officer; June 19, 2007
CAP01097385; IMS-5916 Lifted for Approximately One Second and Reseated; June 19, 2007
CAP01097459; PBF-1104 Overtime Authorization Approval Misplaced; June 19, 2007
CAP01097478; Volume Control Tank Low pressure Bistable Failure; June 19, 2007
CAP01097496; System Eng Not Notified of 1P-29 Bearing Temp Alarms; June 19, 2007
CAP01097575; 2007 AFW Inspection - Investigate 1P-29 Testing Options; June 19, 2007
CAP01097595; STP East Blower Room too Hot; 122 Degrees F.; June 19, 2007
CAP01097623; 1P-29T Auxiliary Feedwater Pump Turbine - Troubleshooting Coupling Stretch; June 19, 2007
CAP01097631; IP-29T Auxiliary Feedwater Pump Turbine - Troubleshooting Bearing Tolerance; June 19, 2007
CAP01097638; IP-29T Auxiliary Feedwater Pump Turbine - Troubleshooting - Dowel Pin Use; June 19, 2007
CAP01097640; IP-29T Auxiliary Feedwater Pump Turbine - Troubleshooting - Insulation Gap; June 19, 2007
CAP01097644; Planning KPI Yellow for Weeks 0730/0731; June 19, 2007
CAP01097660; IP-29T Auxiliary Feedwater Pump Turbine - Troubleshooting - Bearing Damage; June 19, 2007

CAP01097674; IP-29T Auxiliary Feedwater Pump Turbine - Troubleshooting - Adapter Gasket; June 19, 2007
 CAP01097725; Common Momentary RE-218 RMS Alert; June 19, 2007
 CAP01097726; While Testing IP-29 TDAFP Received a High Bearing Temp Alarm; June 19, 2007
 CAP01097727; Procedure Required CAP OI-14 S/G Blowdown Operation; June 19, 2007
 CAP01097736; Declining Trend in 2P-29 TDAFW Pump Speed Noted; June 20, 2007
 CAP01097757; Need to Review Initial Operability Determination of IP-29; June 21, 2007
 CAP01097774; High Condensate Return Temps Required S/G B/D Isolation; June 20, 2007
 CAP01097910; Material Ordered for Project with Short Lead Time; June 20, 2007
 CAP01097923; RMP Revisions May Not Have Been Made Following IST Changes; June 20, 2007
 CAP01097936; Change Made to RMP 9044-1 Did Not Meet Temp Change Criteria; June 20, 2007
 CAP01097983; IST Procedures do not Provide Guidance On Sentinel Valves; June 20, 2007
 CAP01097995; Work Week 7/23 did not Meet the Station Goals for Scope Stability (T-5-End); June 20, 2007
 CAP01098035; Unit 1 Received Alarm 1C04 1C 4-8 Due to IP-29 Turbine Outboard Bearing High Temp; June 20, 2007
 CAP01098039; Unexpected Alarm 1C04 1C 1-8 Charging Pump High Speed; June 20, 2007
 CAP01098040; Required Mission times for Safety-Related Pumps and DGs are not Readily Available; June 20, 2007
 CAP01098063; Unit 1 Received Unexpected Letdown Flow High Alarm; June 21, 2007
 CAP01098065; During Performance of IT-290B, IP-29 Discharge Vent First Off Isolation Valve was Open; June 21, 2007
 CAP01098069; Unit 1 A RCP Seal Inlet Temp Indicator Failed Low; June 21, 2007
 CAP01098101; IP-29 Bearing Temp High Alarm Following Turbine Shutdown; June 21, 2007
 CAP01098126; DT-6375B Drain Trap Sticks; June 21, 2007
 CAP01098166; Degraded Condition of Jacket on Cable ZA1B13BG for 1P-2B; June 21, 2007
 CAP01098352; TDAFW Pump Oil Analysis Frequency; June 21, 2007
 CAP01098356; 1P-29 OB Bearing Oil Low Fault/High Fault Setpoints; June 21, 2007
 CAP01098358; Moisture Observed in Oil Sample from 2P-29 Turbine Reservoir; June 21, 2007
 CAP01098364; AFW Steam Pipe Supports Lubra-plates have been Painted; June 22, 2007
 CAP01098367; Secured Unit 2 Steam Generator Blowdown to Tank; June 22, 2007
 CAP01098413; 1P-29-T Outboard Bearing Temp not Indicating Correctly; June 22, 2007
 CAP01098536; No Specific Training for Turbine-Driven Auxiliary Feedwater Pumps; June 22, 2007
 CAP01099271; AFW Special Inspection, Q-34, Procedure Use and Adherence Review of RMP 9005-2 Performances in February and April of 2002 Show That Out of Tolerance Conditions were Documented as Acceptable by Pen and Ink Comments in the Procedure; June, 2007
 CAP01099272; Oil Sample for 2P-029-T May not have been Taken Correctly; June 26, 2007
 CAP01099386; Overall Concerns with the Oil Analysis Program; June 27, 2007
 CAP01099402; 2007 AFW Inspection - Review of Additional Eng Programs; June 27, 2007
 CAP01099536; Investigate IT 08 and Determine if the Test Preconditions MS 2082; June 27, 2007
 CAP027556; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; August 11, 1997
 CAP068087; IP-29 Outboard Bearing Oiler Bulb Found Empty; October 19, 2005
 CE006925; Auxiliary Feed Pump Outboard Pump Bearing Oiler Level; August 12, 1997
 CAP01099876; Water content Analysis Results for 2P-29 Outboard Bearing

CAP010985336; No Specific Training for Turbine-Driven Auxiliary Feedwater Pumps
CAP01099402; 2007 AFW Inspection - Review of Additional Engineering Programs
CAP01099799; Procedure Issue Identified with Oilview Onsite Analysis
CAP01097923; RMP Revisions May not Have Been Made Following IST Changes
CAP01097983; IST Procedures Do Not Provide Guidance on Sentinel Valves
CAP01098035; Received Alarm 1C04 1C4-8, 1TR-2000A or B Temperature Monitor
CAP01098040; Safety-Related Pump Run Mission Times
CAP01098101; 1P-29 Bearing Temperature High Alarm Following Turbine Shutdown
CAP01098352; TDAFW Pump Oil Analysis Frequency
CAP01098356; 1P-29 Outboard Bearing oil Low Fault/High Fault Setpoints
CAP01098358; Moisture Observed in Oil Sample from 2P-29 Turbine Reservoir
CAP01098364; AFW Steam Pipe Supports Lubra-Plates have been Painted

Drawings

MR87-97/98WPA; 1(2)P29 Terry Turbine governor End Bearing Thermocouple Location;
May 4, 2001
Dresser-Rand Drawing; Bearing-Governor End Chamber Detail
Dresser-Rand; Figure 1; Attachment B; Recommended Oil Level For Ring Oil Lubricated
Bearings; 1988

Procedures

DG-M16; Design Guideline for ASME Section XI Design Reconciliation; Revision 1;
January 30, 1998
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 38;
February 1, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 39; 1;
April 30, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 45; June 11, 2007
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 40;
July 22, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 40; July 23, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 40; October 6, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 40; October 13, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 40; November 6, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 41;
November 23, 2005
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 41;
January 5, 2006
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 42; April 5, 2006
IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1;
Revision 42; June 22, 2006

IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 42; September 11, 2006
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 43; September 23, 2006
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 43; December 14, 2006
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 43; March 15, 2007
 IT 08A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 45; May 31, 2007 June 11, 2007
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 45; June 11, 2007
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1; Revision 45; June 13, 2007
 IT 8A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 1; Revision 45; June 14, 2007
 IT 9A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test; Unit 2; Revision 40; November 10, 2006
 IT 9A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly); Unit 2; Revision 40; November 17, 2006
 IT 9A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly); Unit 2; Revision 41; December 21, 2006
 IT 9A; Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly); Unit 2; Revision 41; March 22, 2007
 IT 295B; Over speed Test Turbine-Driven Auxiliary Feed Pump Refueling Interval; Unit 2; Revision 17; November 13, 2006
 MI 32.1; Flange and Closure Bolting; Revision 13; April 5, 2006
 OI 62B; Turbine-Driven Auxiliary Feedwater System; Revision 12; November 14, 2006
 RMP 9044-1; Auxiliary Feedwater Pump Terry Turbine Overhaul; Revision 9; August 21, 2002
 RMP 9044-1; Auxiliary Feedwater Pump Terry Turbine Overhaul; Revision 11; March 28, 2007
 RMP 9044-1; Auxiliary Feedwater Pump Terry Turbine Overhaul; Revision 12; June 17, 2007
 RMP 9044-2; Auxiliary Feedwater Pump Terry Turbine Governor Replacement; Revision 7; February 14, 2001
 RMP 9005-2; Safety Injection Pump Overhaul; Revision 5; July 18, 2001

Purchase Orders

NMC/PBNP Warehouse Re-Issue Ticket; October 26, 2005
 Nuclear Power Business Unit Material Disbursement Data; November 17, 2001

10 CFR 50.59 Screenings/Evaluations

Modify the 1/2P-29 Baseplate for the Installation of the Terry Turbine Overspeed Trip Device
 Install Keyway in AF Turbine Shaft; June 12, 1998
 Replacement for the AF Turbine Outboard Bearing Oil Reservoir Cooler; September 23, 1999

Work Requests/Work Orders

WO 860264; 1P-1P-29 Auxiliary Feedwater Pump; Unit 1; A TI and A Thermocouple were Installed for a Test of Bearing Temperatures - Remove Both items and Plug Holes on Next oil Change; August 20, 1986

WO 862116; 1P-1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Check Coupling Alignment Hot and Cold. Re-Align as Necessary to Compensate for Thermal Growth of Turbine; February 5, 1987

WO 870569; 1P-1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Inspect Outboard Turbine Bearing and Check Alignment of Coupling; February 12, 1987

WO 870640; 1P-1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Investigate Hot Bearing Turbine Side Outboard; February 17, 1987

WO 871681; 1P-29 Auxiliary Feed Pump Turbine; Unit 1; Remove and inspect Outboard Bearing - Measure Bearing Width and Record; May 5, 1987

WO 872061; 1P-29 Auxiliary Feed Pump Turbine; Unit 1; Install Thermocouples in All Spare Terry Turbine Radial Bearings Per Description in Tech Manual; June 2, 1987

WO 934502; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Oil Samples Taken at Oil Changes on 12/3/92 and 7/16/93 Showed Water in the Outboard Bearing . Identify Source and Repair; April 11, 1994

WO 9403054; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Sample Oil from Turbine Bearing Cases & Drain, Refill turbine Bearing Oil Through Outboard Bearing Cap, Fill Automatic Oilers and Grease Trip Throttle Valve, Drain Overspeed Trip Disc Cavity; July 14, 1994

WO 9405793; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Oil Indicates Water Present in Oil; July 26, 1994

WO 9406198; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Overspeed Trip Button Washer is Out of Position; August 25, 1994

WO 9408902; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Sample Inboard and Outboard Turbine Bearing Oils; October 1, 1994

WO 9409632; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Annual Infrared Inspection; November 3, 1994

WO 9411053; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Sample and Change Turbine Bearing; December 22, 1994

WO 9501961; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Emergency Governor - Changed Oil in Gearbox; April 17, 1995

WO 9502353; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Sample and Change Turbine Bearing; March 28, 1995

WO 9511590; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Oil Leak at Oiler Connection to Bearing Case and at Connection to Governor End Drain; April 7, 1996

WO 9512827; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; December 4, 1995

WO 9600818; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Replace the Governor Valve Stem; April 7, 1996

WO 9601441; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Emergency Governor Inspection; April 7, 1996

WO 9602320; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; 1P-29 Turbine Outboard Bearing Temp Stabilized at 216.6 Deg F During IT-08A; October 21, 1997

WO 9602362; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; The Bulls Eye Sight Glass on the Right Angle Drive Below the Governor Shows No Oil Level; February 27, 1996

WO 9603391; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Repair Insulation; April 8, 1996

WO 9605287; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; May 17, 1996

WO 9607840; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Verify Proper Spring Tension Exists on the Overspeed Trip Linkage (28-32 lbs) in the Not Tripped Position; August 16, 1996

WO 9608593; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Check Torque Bearing Housing Cover Bolt. Install an SAE ½" Washer before Torquing; August 16, 1996

WO 9612019; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; November 6, 1996

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WO 9712766; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Replace Governor Valve Plug; July 2, 1998

WO 9712865; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Overspeed Trip Linkage Ball and socket connection is Worn. Replace Ball and Socket Connector. Unit 1 RST Required; November 10, 1997

WO 9714375; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; December 3, 1997

WO 9714512; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Emergency governor Inspection; November 29, 1997

WO 9714513001; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Perform Overhaul in Accordance with RMP 9044-1 and RMP 9044-2; June 24, 1998

WO 9803299; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; April 7, 1998

WO 9808198; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change 1P-29 Turbine Bearing Oil and grease Overspeed Trip Valve; August 27, 1998

WO 9810478; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 2; Inspect Turbine Outboard Bearing Baffle for Leak Path from Bearing Oil Reservoir to Overspeed Trip Disc Housing; June 21, 1999

WO 9810478001; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 2; Remove Turbine Outboard Bearing Cap to Identify Cause of Lube Oil Leakage; February 28, 1999

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WO 9810853; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Lube Oil Heat Exchanger - SW Supply fittings Loose; June 16, 1998

WO 9811217; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Repair/Replace Outboard Bearing Oil Reservoir Heat Exchanger; June 19, 1998

WO 9812278; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Inspect Outboard Bearing, Sample and Change Lube Oil on Inboard and Outboard Bearing Housings; July 3, 1998

WO 9814659; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change 1P-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; March 4, 1999

WO 9816465; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Replace Inboard and Outboard Bearing Oil Reservoir Coolers with Coolers that are Designed to at Least 150 PSIG; October 18, 1999

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WO 9903915; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change IP-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; July 29, 1999

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WO 9916637; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change IP-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; June 28, 2000

WO 9916638; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change IP-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; January 6, 2001

WO 9923774; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change IP-29 Turbine Bearing Oil and Grease Overspeed Trip Valve; April 22, 2001

WO 9926746; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Replace Inboard and Outboard Journal Bearings. Save Old Bearings for Inspection by Engineering. Clean Inboard and Outboard BRG Reservoirs; May 3, 2001

WO 9926841; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Inspect and Replace OST Tappet Parts as Needed. Replace Numerous Gasket Leaks. Uncouple Per RMP 9044-1 and perform OST Test; March 20, 2001

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WO 9937725; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Install Mounting Bolt Holes in the Baseplate of IP-29-T to Facilitate the Installation of the New Overspeed Trip test Motor April 9, 2001

WO 9937725; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Install Thermocouple Wires as Required to Existing L/N 9029737 and 9060294 and Return to Stores for future Use as Needed in P-029-T; May 7, 2001

WO 9939728; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Change IP-29 Turbine Bearing Oil; NOTE: This callup is for Turbine Only; May 4, 2002

WO 9924453; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Emergency Governor Inspection; May 12, 2001

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 WO 0512256001; 1P-29 Auxiliary Feedwater Turbine-Driven Pump Turbine; Unit 1; Inspect Outboard Bearing for Oil Loss, as per Partial Use RMP 9044-1; November 24, 2005
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LIST OF ACRONYMS USED

CAP	Corrective Action Program
CFR	Code of Federal Regulations
DRP	Division of Reactor Projects
EPRI	Electric Power Research Institute
°F	Degrees Fahrenheit
GL	Generic Letter
IMC	Inspection Manual Chapter
IST	Inservice Test(ing)
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OA	Other Activities
OPR	Operability Recommendation
PDR	Public Document Room
PDM	Predictive Maintenance Manual
PMT	Post-Maintenance Test(ing)
ppm	Part Per Million
SDP	Significance Determination Process
SSC	Structure, System, and Component
TDAFW	Turbine-driven Auxiliary Feedwater
TR	Technical Report
TS	Technical Specification
TSAC	Technical Specification Action Condition
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item

Historical Timeline of Events for Unit 1 1P-29 Turbine-Driven Auxiliary Feedwater Pump

<u>Chronology</u>	<u>Discussion</u>
Pre-1988	Issues with the “wiping” of the original “thrust collar” bearing design for the Turbine-Driven Auxiliary Feedwater (TDAFW) turbine led the licensee to implement a design change to modify the turbine outboard thrust bearing. The original design specifications called for a forced lubrication system; however, this was not implemented by Point Beach and the vendor supported this decision according to plant documentation. Also, the original design specifications called for the implementation of a flex-plate support leg. The flex-plate support leg allowed for thermal growth of the turbine case in the axial direction and also was not installed at that time.
1988	A new outboard bearing was installed which consisted of a single-ball thrust bearing (deep-groove ball) in the outboard bearing journal. Bearing temperature stabilization was defined as three successive readings taken at a ten-minute interval which did not vary by more than three percent. The outboard bearing temperature stabilized at approximately 207°F.
1988-1997	Numerous instances of work orders written for oil leaking from the outboard bearing housing on the turbine.
1997	Alarm Response procedure action range for the high outboard bearing temperature was revised from 225°F to 250°F because “Present criteria exceeded during normal operation of the pump.” Greater than 225°F was made the alert range.
January 1998	Bearing temperature stabilization criteria removed from all inservice tests, because it was no longer required by the American Society of Mechanical Engineers, Section XI.
June-July 1998	10-year overhaul of TDAFW Pump Turbine 1P-29 was performed. Maintenance documentation revealed that the turbine wheel lap was set incorrectly during this overhaul. Two Condition Reports were written on July 1 and July 7 for a turbine outer bearing high temperature alarm. The high temperatures were later determined to be caused by the incorrect oil in the turbine, and incorrectly positioned oil slinger rings, leading to the wiping of the bearing.
March 2000	Condition Report written for TDAFW pump turbine oil indication of cutting wear; however, the pump was considered operable because there were no increasing vibration trends.

June 2000	Root Cause evaluation investigated the root and contributing causes that resulted in the failure of the oil analysis program to identify potentially significant wear and external contamination in the Unit 1 TDAFW pump. The root cause was lack of adequate program oversight to ensure that the program met the requirements of the procedure.
May 2001	Unit 1 TDAFW pump turbine inboard and outboard bearings found damaged and were replaced.
June 2002	Oil samples from the outboard Unit 1 TDAFW pump turbine had an increase in the amount of case hardened cutting wear. Bearing was replaced in October 2002 Refueling Outage.
July 2005	Four-hour pressure test performed on the unit TDAFW pump. Outboard bearing temperature stabilized at 227°F and a condition report was written for a turbine outer bearing high temperature alarm. The condition report stated that, "this was not an unexpected condition for the bearing temperatures to be higher than normal." No further action taken.
March 2007	Revised Procedure RMP 9044-1 issued prior to the Unit 1 refueling outage, which incorporated the incorrect method of determining and setting wheel lap.
April 2007	Unit 1 TDAFW Pump 1P-29 had the 10-year overhaul performed without the vendor onsite. In addition, the overhaul procedure was revised since the Unit 2 overhaul, to improve the work instructions. (This new procedure was found to have several errors discovered since June 12, 2007.) During the initial installation of the pump to turbine coupling, the coupling was installed backwards. A condition report was written and this was corrected. The licensee determined the cause of the improper installation was an inadequate instructions within the procedure.
May 1, 2007	First attempts to run the TDAFW Pump Turbine 1P-29 uncoupled were aborted due to the turbine outboard bearing leaking excessive amounts of oil. A second run was performed and the outboard bearing temperature spiked to 247°F and then precipitously dropped to 155°F. No condition report was written or contact made with the system engineer as the procedure would require. A vendor representative assisted the licensee with troubleshooting, and determined the outboard bearing installed during the overhaul was oversized, causing the oil drain flow path to be blocked. The licensee focused on the excessive oil leak.
May 6, 2007	The post maintenance test run did not require pump or turbine bearing temperature stabilization. The outboard bearing high temp alarmed at 225°F, and the turbine outboard bearing was at 238°F and still rising based on the inspectors review of the chart recorder during this

inspection. The testing was secured with the bearing temps not stabilized. The current system engineer was not contacted as required per the alarm response procedure and operators did not initiate a condition report on the unexpected alarm.

- June 5, 2007 Unit 1 reactor manually tripped due to a Feedwater Control valve issue.
- June 9, 2007, 20:27 Unit 1 returns to power operations from forced outage.
- June 9, 2007, 20:30 Unit 1 TDAFW pump quarterly test IT-8A was performed. A high outboard bearing temperature alarm was received at 225°F. Turbine outboard bearing temperature was at 233°F and still rising based on the inspectors review of the chart recorder during this inspection. The operators concluded that the test was completed satisfactorily without bearing temperatures stabilized. A condition report was written by the operators documenting the receipt of the alarm; however, the prompt operability call was that the pump passed all the acceptance criteria in the test. In addition, the system engineer was not contacted as required per the alarm response procedure. No assessment was performed as part of the prompt operability determination for mission time, capability or increasing temperature trends.
- June 10, 2007 Reactor operators involved with the inservice test the previous day, discussed a concern with respect to the TDAFW outboard bearing temperatures with the Shift Manager. No further action taken by the Shift Manager.
- June 11, 2007 Monday morning condition report reviews raised questions by the plant manager and inspectors regarding the condition report on the receipt of the high temperature alarm. Decision was made by plant management to re-perform the TDAFW Pump 1P-29 inservice test until bearing temperatures stabilized.
- June 12, 2007 Quarterly test was performed to bearing stabilization temperatures. Bearing stabilization was defined as no greater than a 0.5°F change in a five-minute period for two consecutive periods. The test was stopped after approximately two hours due to a turbine outboard bearing temperature of 249.5°F (250°F is action limit to trip the pump). The TDAFW Pump 1P-29 was declared inoperable and a 72-hour Technical Specification action statement was entered.
- June 12 through
June 13, 2007 The licensee performed the following in an attempt to troubleshoot and repair the cause of the high outboard bearing temperature:
- Outboard bearing was replaced due to identified rubbing/wear marks on the bearing installed in the outage;

- Procedure installation steps were corrected to eliminate an interference with the outboard bearing cover and the right angle gear drive adapter plate;
- Replaced roll pins with dowel pins for positioning the outboard bearing cover based on vendor recommendations; and
- Turbine insulation adjusted to reduce temperatures and re-direct heat streaming from the turbine housing directly over the outboard bearing thermocouple penetration.

June 14, 2007

Pump was run following changes at recirculation flow, no bearing stabilization after 80 minutes, test aborted at 249°F. The licensee performed the following in an attempt to troubleshoot and repair the cause of the high outboard bearing temperature:

- Turbine insulation adjusted based on thermography data from the run;
- Removed outboard journal bearing. Increased bearing clearance for a new outboard bearing from 0.004" to 0.007" based on a vendor recommendation to increase oil flow; and
- Installed a shim of 0.012" In the right angle gearbox to turbine connection to offset the identified misalignment;

The original bearing was not appropriately quarantined and the evidence was destroyed through machining inadvertently.

18:20

Operators commenced a Technical Specification required shutdown on Unit 1, Event Notification made to the NRC Headquarters Operations Center, as required.

23:00

The TDAFW Pump 1P-29 was secured from another test run when the outboard bearing temperature reached 247.5°F.

June 15, 2007

The NRC made a decision made to conduct a Special Inspection, based on Management Directive 8.3. The licensee performed the following in an attempt to troubleshoot and repair the cause of the high outboard bearing temperature:

- Thrust bearing axial clearance discovered to be set at 0.004" during the 10-year overhaul (The current as left was 0.013", with a required acceptance criteria of 0.010"-0.015".); and
- Outboard bearing cooler replaced, removed cooler was satisfactory.

June 16, 2007

The licensee performed the following in an attempt to troubleshoot and repair the cause of the high outboard bearing temperature:

- Coupling Shim Pack Stretch was incorrect. 0.015" was required, as found had 0.005" on the top of the coupling and 0.015" on the bottom;

	<ul style="list-style-type: none"> • Outboard bearing with larger clearances installed on 6/14/07 was found wiped; and • Vendor review of licensee procedure for 4/07 overhaul identified the turbine wheel lap was set incorrectly due to the revised procedure errors.
June 17, 2007	<p>The licensee performed the following in an attempt to troubleshoot and repair the cause of the high outboard bearing temperature:</p> <ul style="list-style-type: none"> • Licensee essentially commenced a turbine overhaul; • All identified conditions were corrected which required removal of the turbine casing; and • Inboard bearing thermocouple damaged.
June 18, 2007	The licensee installed a new inboard bearing with a new thermocouple.
June 19, 2007	Turbine rebuild complete. Uncoupled run completed with 80 psig steam pressure, and the turbine outboard bearing temperature stabilized at a temperature of 175°F. This was within 3 degrees of the temperature achieved during the uncoupled run in refueling outage.
13:00	Unit 1 Entered Mode 3
June 20, 2007	The TDAFW Pump 1P-29 coupled runs for Unit 1 were performed. Two runs were performed. The first run, the maximum stabilized outboard bearing temperature while on recirculation was 230.8°F. Turbine insulation was adjusted based on vendor recommendations, and a second recirculation run produced a maximum stabilized outboard bearing temperature on recirculation of 228°F.
June 21, 2007	<p>Licensee discussion with the vendor recommended additional insulation configuration changes and a recirculation run produced a maximum stabilized outboard bearing temperature on recirculation of 223°F. Therefore, turbine insulation adjustments resulted in an overall reduction in temperature of approximately 8°F. Based on the Test results, the Shift Manager declared the TDAFW pump available, but not operable.</p>
June 22, 2007	The outboard bearing was removed and checked based on oil sample analyses from June 21, 2007, which showed slight particulate. The bearing was satisfactory, with minor rubbing noted. This run was on recirculation and produced a maximum stabilized temperature on recirculation of 223°F.

June 23, 2007

Unit 1 was taken to Mode 1 at 06:28 a.m. Bearing stabilization at full flow (400 gpm) yielded a maximum outboard bearing temperature of 226°F. Based on the inspectors questions concerning the effects of increased service water temperatures, the licensee performed an operability determination which concluded the maximum service water temperature would result in a 12.5°F rise, for a temperature of 238.5°F.

At 15:44, TDAFW Pump 1P-29 was returned to an operable status.

Historical Timeline of Events for Unit 2 2P-29 Turbine-Driven Auxiliary Feedwater Pump

<u>Chronology</u>	<u>Discussion</u>
Pre-1987	Issues with the “wiping” of the original “thrust collar” bearing design for the Turbine-Driven Auxiliary Feedwater (TDAFW) turbine led the licensee to implement a design change to modify the turbine outboard thrust bearing. The original design specifications called for a forced lubrication system; however, this was not implemented by Point Beach and the vendor supported this decision according to plant documentation. Also, the original design specifications called for the implementation of a flex-plate support leg. The flex-plate support leg allowed for thermal growth of the turbine case in the axial direction and also was not installed at that time.
1987	A new outboard bearing was installed which consisted of a single-ball thrust bearing (deep-groove ball) in the outboard bearing journal. Bearing temperature stabilization was defined as three successive readings taken at a ten-minute interval which did not vary by more than three percent. The outboard bearing temperature stabilized at approximately 204°F.
October 2005	A condition report written for a turbine outer bearing high temperature alarm of 226°F during a pressure test; however, the condition report description cites past 1998 issues with turbine high temperatures as an acceptable condition. Therefore the condition report was closed to trend.
November 2006	Unit 2 TDAFW 2P-29 had 10-year overhaul performed with vendor onsite, not as many activities were performed as compared to the Unit 1 10-year overhaul completed in the Spring 2007. The inspectors confirmed, per the procedure and work order documents, that the thrust bearing axial clearance (as left 0.013", required 0.010"-0.015"), the Wheel Lap was set appropriately and the coupling alignment was set properly.
November 17, 2006	Post maintenance testing did not require pump or turbine bearing temperature stabilization. The inspectors review of chart recorders determined that the outboard bearing high temperature alarm occurred at 225°F. The chart recorders showed that outboard bearing temperature was at 241°F and slowly rising; followed by a precipitous drop to around 218°F where the temperature stabilized while on minimum flow recirculation (150 gpm) for approximately 3 ½ hrs. No condition report was written on the high temperatures, no oil samples were taken, and no formal engineering evaluation of the condition was documented. Plant and system engineering personnel at the time rationalized the temperature changes as expected, due to the outboard bearing “working in” to the turbine shaft.

December 22, 2006	Quarterly Test IT-9A was performed and TDAFW Pump 2P-29 ran for about one hour (½ min. flow, ½ full flow) with a maximum temperature of 218°F and rising slowly when the pump was secured.
March 23, 2007	Quarterly Test IT-9A was performed and TDAFW Pump 2P-29 ran for about one hour (½ min. flow, ½ full flow) with a maximum temperature of 210°F and rising slowly when the pump was secured.
June 15, 2007	Licensee performs an 'extent of condition' evaluation on TDAFW Pump 2P-29. Residents continue to question whether or not an operability evaluation should be performed.
June 20, 2007	Licensee informs the inspectors that an operability evaluation will be performed based on questions concerning TDAFW Pump 2P-29, including the affects of potential foreign material in the TDAFW Pump 2P-29 as a result of the earing "wearing in" in November 2007 and the inspectors questions concerning a slight declining trend of turbine speed.
June 21, 2007	Oil changed and sampled prior to test. Initial visual indications were 500-1000 ppm water. The entire sample was then used for an analytical test, which the licensee later determined could not analyze water content at that high a level, and therefore the entire oil sample was lost, because the oil sample was not split. Quarterly test was performed with a bearing stabilization run. The TDAFW Pump 2P-29 outboard bearing temperature stabilized at 222°F. Oil was sampled following the extended run.
June 22, 2007	Operability Evaluation completed for turbine speed decreasing trend and increased service water temperatures, declaring TDAFW Pump 2P-29 operable. The predicted increase due to the maximum service water temperature of 90°F, is 12.5°F, therefore the maximum expected temperature of the outboard bearing was 234.5°F.

June 25, 2007

MEMORANDUM TO: Robert G. Krsek, Senior Resident Inspector, Point Beach
Division of Reactor Projects

FROM: Jamnes L. Cameron, Chief, Branch 5
Division of Reactor Projects
/RA/

SUBJECT: SPECIAL INSPECTION FOR ISSUES ASSOCIATED WITH THE
UNIT 1 TURBINE DRIVEN AUXILIARY FEEDWATER PUMP

On June 9, 2007, the Unit 1 Turbine Driven Auxiliary Feedwater (TDAFW) Pump 1P-29 was run in accordance with Quarterly Inservice Test (IST) Procedure IT-8A. During this test, the TDAFW Terry Turbine outboard bearing reached a temperature of 233°F, which was 13 degrees over the bearing high alarm setpoint (Temperatures over 250°F required the pump to be shut down). A condition report was written indicating the temperature was increasing when the pump was secured from the IST; however, no immediate actions occurred to address the anomalous bearing temperature indication. On June 11, licensee engineers reviewed the data from the June 9 IST, and raised the concern that the pump did not appear to reach an equilibrium temperature, as evidenced by the rate of increase. Based on these questions, the licensee re-performed IT-8A beginning on June 12. During the test, the Terry Turbine outboard bearing temperature reached 249.5°F and the operators aborted the test, shut down the TDAFW, and declared the pump inoperable. As a result of its initial investigation, the licensee determined that the outboard turbine bearing was contacting the turbine shaft and oil analysis indicated oil breakdown and metal particulate.

Over the next 72 hours the licensee attempted to identify the cause and repair the TDAFW. The licensee did identify bearing upper housing alignment issues, a potential radiative heat issue from the turbine casing insulation towards the outboard bearing, and potential bearing clearance issues. However, the licensee was not able to identify the cause and repair the Unit 1 TDAFW pump within the allowed outage time of 72 hours per Technical Specification 3.7.5. Therefore, the licensee commenced a Unit 1 shutdown at approximately 18:30 on June 15, 2007, due to the inoperable TDAFW Pump 1P-29. The TDAFW recently had a 10-year overhaul performed in April 2007, during the Unit 1 Refueling Outage. During post-maintenance testing in the refueling outage, the licensee identified issues with the TDAFW turbine outboard bearing losing excessive oil, due to an inappropriately dimensioned bearing installed as part of the overhaul. The licensee corrected those issues prior to startup from the Refueling Outage; however, at this time it preliminarily appears the post maintenance testing performed was not adequate, in that the TDAFW was not run long enough to allow the bearing temperatures to stabilize. Therefore, this condition may have existed since the Unit 1 entered Mode 3 on May 3, 2007. The licensee continues to troubleshoot the cause of the high turbine bearing temperatures.

Attachment 4

As a result, the June 15, 2007, event notification met the criteria of Management Directive 8.3, "NRC Incident Investigation Program," warranting the establishment of a special inspection team. Based on the criteria specified in Management Directive 8.3 (Part I criterion (g and h) and Part II criterion (delta CDP 6.1E-5)) and Inspection Procedure 71153, a Special Inspection was initiated in accordance with Inspection Procedure 93812 and Regional Procedure RP-8.31. The Special Inspection will be performed by you (inspection lead), John Giessner, Resident Inspector, Palisades, and if necessary, Greg Gibbs, Resident Inspector. The Special Inspection will evaluate the facts, circumstances, and licensee actions surrounding the noted anomalous conditions. A Charter was developed and is enclosed. The inspection will start on June 15, 2007.

As a reminder, restart decisions are not within the charter of a Special Inspection Team. If your team should identify such issues, you are to address those concerns with me immediately.

Enclosure: As stated

cc w/encl:

J. Caldwell, Regional Administrator, Region III
G. Grant, Deputy Regional Administrator, Region III
M. Satorius, DRP, Division Director
C. Pederson, DRS, Division Director
S. West, DRP, Deputy Director
J. Giessner, RI, Palisades
S. Richards, NRR
C. Haney, NRR
T. McGinty, NRR
N. Salgado, NRR
T. Blount, NSIR
T. Bloomer, EDO Coordinator, RIII
J. Cushing, NRR - Point Beach PM

SPECIAL INSPECTION (SI) CHARTER

This Special Inspection is chartered to assess the circumstances surrounding anomalous conditions associated with the Unit 1 Turbine Driven Auxiliary Feedwater (TDAFW) Pump, which led to the Technical Specification required shutdown of Unit 1 on June 14, 2007. As of June 15, 2007, the licensee had not identified the cause of the outboard bearing high temperatures. The Special Inspection should:

- Establish the sequence of events related to the maintenance and testing of the Unit 1 TDAFW Pump, including a historical timeline.
- Monitor and assess the licensee's response to the indications of increasing outboard turbine bearing temperatures, including the operability determination, maintenance, and testing.
- Monitor and assess the licensee's determination of the causes for the anomalous conditions associated with the Unit 1 TDAFW Pump, to the extent practicable.
- Monitor and assess the corrective actions associated with the restoration of the Unit 1 TDAFW Pump.
- Assess the licensee's extent of condition evaluation associated with the Unit 1 TDAFW Pump.
- Evaluate the licensee's post maintenance and routine testing of the TDAFW Pump.
- Assess the impact and safety significance of the increased outboard turbine bearing temperatures on the Unit 1 TDAFW Pump.
- Assess the licensee's program and procedures for quarantining and equipment failure analysis of individual failed systems and components.
- Continually assess the need to raise the level of NRC's response to this issue to either an Augmented Inspection Team or Incident Investigation Team and communicate your assessment to the Chief, Reactor Projects Branch 5, DRP.

Charter Approval

Jamnes L. Cameron, Chief
Reactor Projects Branch 5

Mark A. Satorius, Director
Division of Reactor Projects