



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

December 4, 2012

EA-12-220

Mr. Larry Meyer
Site Vice President
NextEra Energy Point Beach, LLC
6610 Nuclear Road
Two Rivers, WI 54241

**SUBJECT: POINT BEACH NUCLEAR PLANT, UNIT 1 - NRC INSPECTION REPORT
05000266/2012009 PRELIMINARY WHITE FINDING**

Dear Mr. Meyer:

On October 29, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Point Beach Nuclear Plant, Unit 1. The enclosed report documents the inspection findings, which were discussed on October 29, 2012, with Mr. Rich Wright 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 personnel.

The enclosed inspection report discusses a finding that has preliminarily been determined to be a White finding, a finding with low to moderate safety significance that may require additional NRC inspections. As described in Section 4OA2 of the enclosed report, you did not have work instructions and procedures appropriate to the circumstances to ensure that following the final alignment of the turbine to the Unit 1 turbine-driven auxiliary feedwater pump during a refueling outage in November 2011, no additional work was performed on the turbine that would affect the overall final alignment. Consequently, on May 21, 2012, approximately 70 minutes after the start of the second quarterly Technical Specification required surveillance test since the November 2011 maintenance, the turbine-driven auxiliary feedwater pump was shut down following failure of the turbine-to-pump coupling. The issue represented a safety concern that you and your staff immediately addressed in accordance with your Technical Specifications and operating license through identification of the cause of the misalignment and implementation of remedial corrective actions by May 23, 2012, to repair the Unit 1 turbine-driven auxiliary feedwater pump. This finding was assessed based on the best available information, using the applicable Significance Determination Process (SDP). The basis for the NRC's preliminary significance determination is described in the enclosed report. The final resolution of this finding will be conveyed in separate correspondence.

The finding is also an apparent violation of NRC requirements and is being considered for escalated enforcement action in accordance with the Enforcement Policy, which can be found on the NRC's Web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>.

In accordance with NRC Inspection Manual Chapter (IMC) 0609, we intend to complete our evaluation, using the best available information, and issue our final determination of safety significance within 90 days of the date of this letter. The SDP encourages an open dialogue between the NRC staff and the licensee; however, the dialogue should not impact the timeliness of the NRC's final determination.

Before we make a final decision on this matter, we are providing you with an opportunity to: (1) attend a Regulatory Conference where you can present to the NRC your perspective on the facts and assumptions the NRC used to arrive at the finding and assess its significance, or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least 1 week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation; and to announce the conference, a public meeting notice and press release will be issued. If you decide to submit only a written response, such submittal should be sent to the NRC within 30 days of your receipt of this letter. If you decline to request a Regulatory Conference or submit a written response, you relinquish your right to appeal the final SDP determination; in that, by not doing either you fail to meet the appeal requirements stated in the Prerequisite and Limitation Sections of Attachment 2 of IMC 0609.

Please contact Michael Kunowski at (630) 829-9618, and in writing, within 10 days from the issue date of this letter to notify the NRC of your intentions. If we have not heard from you within 10 days, we will continue with our significance determination and enforcement decision. The final resolution of this matter will be conveyed in a separate correspondence.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for this inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violation may change as a result of further NRC review.

L. Meyer

-3-

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 Agencywide Document Access and Management 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 By Gary Shear for/

Steven West, Director
Division of Reactor Projects

Docket No.: 05000266
License No.: DPR-24

Enclosure: Inspection Report 05000266/2012009
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ™

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos.: 05000266
License Nos.: DPR-24

Report No.: 05000266/2012009

Licensee: NextEra Energy Point Beach, LLC

Facility: Point Beach Nuclear Plant, Units 1 and 2

Location: Two Rivers, WI

Dates: May 22, 2012 through October 29, 2012

Inspectors: R. Krsek, Senior Resident Inspector, Kewaunee
L. Kozak, Senior Reactor Analyst

Approved by: Michael A. Kunowski, Branch Chief
Branch 5
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

Inspection Report (IR) 05000266/2012009; 05/22/2012 – 10/29/2012; Point Beach Nuclear Plant, Unit 1; Problem Identification and Resolution.

This report covers circumstances behind the May 21, 2012, failure of the Unit 1 1P-29 turbine-driven auxiliary feedwater (TDAFW) pump. The inspectors identified one finding, preliminarily determined to be White, or a finding of low-to-moderate safety significance, which is also an apparent violation for Unit 1. The significance of inspection findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using IMC 0609, "Significance Determination Process," dated June 2, 2011. Cross-cutting aspect is determined using IMC 0310, "Components Within the Cross-Cutting Areas," dated October 28, 2011. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated September 30, 2010. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealed Findings

Cornerstone: Mitigating Systems

Preliminary White. A preliminary finding of low-to-moderate safety significance and an associated Apparent Violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed, in that, on November 8, 2011, the licensee failed to ensure that the work performed on the safety-related turbine for the TDAFW pump 1P-29 via Work Order (WO) 40101094 and routine maintenance procedure RMP 9044-1, an activity affecting quality, was prescribed by documented instructions or procedures of a type appropriate to the circumstances. As a result on May 21, 2012, approximately 70 minutes after the start of the second quarterly Technical Specification (TS) required surveillance test since the November 2011 maintenance, 1P-29 was shut down following failure of the turbine-to-pump coupling. This issue was documented in the licensee's corrective action program (CAP) as action request (AR) 01768931 and the licensee performed a root cause evaluation. As a remedial corrective action, on May 23, 2012, the licensee performed corrective maintenance to repair the failed coupling and address the turbine-to-pump alignment issue, and 1P-29 was subsequently returned to service. In addition, on June 20, 2012, the licensee implemented a permanent modification to the turbine exhaust steam piping by installing a wedge between the exhaust pipe flange and the turbine exhaust flange to eliminate stresses on the turbine. At the end of the inspection period, the licensee had implemented corrective actions to address the WO and procedure deficiencies to prevent a future occurrence and continued to implement additional long-term corrective actions.

The finding was determined to be more than minor in accordance with Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," dated September 7, 2012, because it was associated with the Mitigating Systems Cornerstone attribute of equipment performance and adversely affected the objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012, and Appendix A, "The Significance Determination Process (SDP)

for Findings At-Power,” Exhibit 2, “Mitigating Systems Screening Questions,” dated June 19, 2012. The finding involved an actual loss of function of a single train of auxiliary feedwater (AFW) for greater than the TS allowed outage time and required a detailed risk evaluation. The Region III Senior Reactor Analyst (SRA) performed a detailed risk evaluation of the finding and concluded the total delta core damage frequency (Δ CDF) was 8.7E-6/year, which represents a finding of low-to-moderate safety significance (White). The dominant core damage sequence involved an unsuppressed fire in the control room or cable spreading room, followed by failure of alternate shutdown and failure to recover the AFW function. The inspectors also determined this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, because the licensee failed to implement a corrective action program with a low threshold for identifying issues completely, accurately, and within a timely manner commensurate with their safety significance (P.1(a)). Specifically, during the maintenance that occurred on the TDAFW 1P-29 turbine during November 2011, several conditions adverse to quality were encountered during the actual maintenance activity; however, condition reports were not written to address the issues. (Section 4OA2)

B. Licensee-Identified Violations

No violations were identified.

REPORT DETAILS

Summary of the Plant Event

On May 21, 2012, the licensee declared the Unit 1 turbine-driven auxiliary feedwater (TDAFW) pump (1P-29) out-of-service, approximately 70 minutes after it was started for a Technical Specification (TS) required surveillance test. The pump was immediately shut down after local operators and engineers reported that sparks were emanating from the turbine-to-pump coupling guard area and that pieces of coupling were observed on the pump skid. The licensee initiated its failure investigation process to determine the initial cause, repair the equipment, and then initiate a formal root cause investigation in accordance with the corrective action program (CAP).

A review of work order (WO) history revealed that maintenance personnel encountered significant issues during maintenance performed on 1P-29 during a refueling outage. The maintenance, performed in November and December 2011, was in error, in that, the final alignment of the turbine-to-pump was completed prior to all maintenance activities that could affect the final alignment. In addition, while post-maintenance testing and surveillance testing acceptance criteria were met following the November 2011 maintenance and prior to the May 2012 coupling failure, a review by the inspectors of predictive monitoring data revealed several anomalies when compared with past test results, indicative of alignment issues during the post-maintenance test performed on December 14, 2011.

Following the failure on May 21, 2012, repairs were performed, and the turbine-to-pump alignment was restored to within the manufacturer's guidelines. The licensee discovered during those repairs that the turbine exhaust flange and exhaust piping flange were not aligned, and that this had been the case since original installation. Therefore, the failure of the coupling was attributed to the turbine exhaust flange and exhaust piping flange lack of alignment, which caused the turbine to rotate following the maintenance in November 2011. On May 23, 2012, a final alignment was conducted as the last major maintenance activity and 1P-29 was returned to service. All test acceptance criteria were met and no anomalies were noted in predictive monitoring data when compared with historical results. On June 20, 2012, the licensee permanently installed a tapered wedge between the 1P-29 turbine exhaust flange and the flange of the exhaust piping to resolve the misalignment.

The licensee completed a root cause evaluation and determined that the historical cause was the fact that the steam exhaust piping flange was not properly aligned with the turbine exhaust flange. The licensee also identified that a contributing cause was the failure of the WO and procedures for maintenance to ensure that a final alignment check was completed following maintenance that could affect the overall turbine-to-pump alignment.

4. OTHER ACTIVITIES

4OA2 Identification and Resolution of Problems (71152)

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity, Emergency Preparedness, Public Radiation Safety, Occupational Radiation Safety, and Physical Protection

.1 Selected Issue Follow-Up Inspection: Unit 1 Turbine-Driven Auxiliary Feedwater Pump Failure During Surveillance Testing

a. Inspection Scope

During a review of items entered in the licensee's CAP, the inspectors reviewed a condition report documenting the failure of the 1P-29 coupling and evaluated the licensee's causal evaluation. Following the failure of the pump coupling, the inspection started with interviews of maintenance and engineering personnel involved with the November 2011 maintenance and May 2012 repairs. The inspection continued through offsite equipment testing and the licensee's investigation of the root cause. During the review of the root cause evaluation, the inspectors made several observations, which are documented in the Description section below. Documents reviewed are listed in the Attachment to this report.

This review constituted one in-depth problem identification and resolution sample, as defined in Inspection Procedure (IP) 71152-05.

b. Findings

Introduction: A preliminary finding of low-to-moderate safety significance and an associated Apparent Violation (AV) of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," was self-revealed, in that, on November 8, 2011, the licensee failed to ensure that the work performed on the safety-related turbine for 1P-29 via WO 40101094 and routine maintenance procedure RMP 9044-1, an activity affecting quality, was prescribed by documented instructions and procedures of a type appropriate to the circumstances. As a result of these deficiencies, on May 21, 2012, approximately 70 minutes after the start of the second quarterly TS required surveillance test since the November 2011 maintenance, the pump was shut down following failure of the turbine-to-pump coupling.

Description: On May 21, 2012, the licensee started 1P-29 to perform the TS surveillance test IT-08A, "Cold Start of Turbine-Driven Auxiliary Feed Pump and Valve Test (Quarterly) Unit 1." After approximately 70 minutes, auxiliary operator and engineers stationed at the pump observed sparks emanating from the turbine-to-pump coupling guard area. Coupling pieces were also observed on the skid beneath the coupling and the pump was immediately stopped. The licensee quarantined 1P-29 in accordance with procedure NP 1.1.17, "Quarantine of Areas, Equipment, and Records," initiated action request (AR) 01768931 to document the condition adverse to quality, and wrote WO 342845 to initiate repairs once the cause of the failure was identified. The licensee also entered its complex troubleshooting process to investigate the coupling degradation in accordance with procedure PI-AA-100, "Condition Assessment and Response."

Maintenance History Prior to the Coupling Failure

The last major work performed on 1P-29 prior to the coupling failure on May 21, 2012, was during the Unit 1 refueling outage (1R33) in fall 2011. The work began in November 2011 under WO 40101094, Task 1, to replace the turbine governor due to governor performance issues during its last operation. The inspectors reviewed the subject WO and noted that no major issues were encountered with the governor replacement portion of the work. However, following the replacement of the governor,

the turbine and pump were realigned to install the turbine-to-pump coupling and significant issues were experienced with the alignment.

The coupling manufacturer recommended that for optimal life of the coupling the difference (misalign) between the two ends of the coupling and the turbine and pump should be less 0.007 inch, with a maximum allowed misalignment of 0.024 inch for this flexible-type coupling. The November 2011 as-found alignment documented by maintenance personnel in procedure RMP 9044-1, "Auxiliary Feedwater Pump Terry Turbine Overhaul," Revision 26, was 0.032 inch, compared to the procedure as-left acceptance criterion of 0 +/- 0.002 inch. Although the value was significantly above the procedure acceptance criterion, a CAP document was not written.

Following the governor replacement, the maintenance technician attempting to align the pump stopped work because the force required to turn the turbine jacking bolts was higher than expected. The technician and his supervisor concluded that the turbine was bolt-bound; therefore, moving the pump to facilitate aligning the turbine to the pump was necessary. Upon loosening the pump hold-down bolts, one of the bolts cracked and broke with very little torque. The technician initiated AR01703901, and upon inspection of the failed bolt, the licensee determined that the bolt threads had been machined off and that the remaining non-threaded bolt body (root) was below the minimum diameter where the crack occurred. A review by the licensee and the inspector of WO history demonstrated that the pump bolts were all from original installation. The licensee's inspection of the remaining pump hold-down bolts revealed that some had thread deformation and others were machined down to the required minimum diameter. Following replacement of all the pump hold-down bolts with new bolts, turbine alignment was again unsuccessfully attempted; therefore, the technician and supervisor attributed the misalignment to the turbine being bolt-bound.

Task 7 of WO 40101094 was created to replace the turbine hold-down bolts with new bolts machined down to the minimum root diameter. In summary, the WO steps prescribed that the technicians unbolt the turbine from the steam inlet and outlet piping, remove the existing turbine hold-down bolts, replace with new machined-down turbine hold-down bolts, perform the turbine-to-pump alignment, and then torque the turbine hold-down bolts in place. Neither the WO nor implementing procedure RMP 9044-1 specified that a final alignment was required after any work that could affect the turbine-to-pump alignment. The step sequence in WO 40101094, Task 7, allowed for activities to be completed after the final alignment was achieved, without checking the final alignment (i.e., rebolting of the steam inlet and outlet piping to the turbine) to ensure alignment was not affected. In addition, the work steps authorizing the machining down of the turbine hold-down bolts were not reviewed and concurred upon by engineering personnel.

The licensee identified that while as-found alignment data was recorded in procedure RMP 9044-1, that information was not reviewed by engineering or maintenance personnel for historical comparisons. The licensee's review of historical WO history revealed consistent movement of the 1P-29 turbine in the counterclockwise direction between alignment activities, with the largest as-found gap, prior to the coupling failure, in November 2011.

Post-Maintenance Testing and Testing Following the November 2011 Maintenance

Following the maintenance performed in November 2011, post-maintenance testing of 1P-29 commenced on December 14, 2011, at the end of the Unit 1 refueling outage. A review of the test performed over several hours revealed that the 1P-29 met all the test acceptance criteria. The first quarterly inservice test was then performed on March 13, 2012, and again 1P-29 was run for several hours and all the established test acceptance criteria were met.

Following the May 2012 failure, the licensee and inspectors reviewed all available data collected during testing since December 2011. Two anomalies were identified in the predictive data that were indicative of alignment issues that were not previously recognized since the November 2011 maintenance.

Vibration measurements were taken on the inboard and outboard bearings of both pump and turbine, as required. The overall vibration signature was utilized, as required, for test acceptance criteria and was acceptable. However, additional vibration data was collected in the 3-8 times rotating speed frequencies. While fixed coupling alignment issues are usually revealed in the overall vibration signature, flexible couplings like the one in 1P-29, typically reveal alignment issues in the 3-8 times rotating speed frequencies. Historically, over the past several years, 1P-29 pump inboard and outboard 3-8 times rotating speed vibration values were approximately 0.040 inches per second (ips) and turbine inboard bearing 3-8 times rotating speed vibration values were less than 0.010 ips. On December 14, 2011, the 3-8 times rotating speed vibration values for the pump inboard and outboard bearings had increased to approximately 0.060 and 0.090 ips, respectively, and the turbine inboard value increased to approximately 0.019 ips. On March 13, 2012, the 3-8 times rotating speed vibration values for the pump inboard and outboard bearings had increased to approximately 0.135 and 0.150 ips, respectively, and the turbine inboard value increased to approximately 0.050 ips. Therefore, a review of the previous vibration data after the failure revealed a significant increase in the 3-8 times rotating speed frequencies, indicative of turbine-to-pump alignment issues.

A review of turbine inboard bearing temperatures revealed that bearing temperatures were well below the alert and out-of-service acceptance criteria for temperature. However, the inboard bearing temperature for the December 2011 and March 2012 testing showed an approximate 10-15 degrees Fahrenheit (°F) increase in temperature from the historical value of approximately 80 °F over the past several years. This increase in historical turbine inboard bearing temperature was also indicative of a potential turbine-to-pump alignment issue.

Maintenance Performed Following the May 2012 Failure and Corrective Actions Taken

As stated previously, the licensee initiated an investigation and repair team following the coupling failure. From May 21 through May 23, the licensee investigated and repaired the coupling that failed. During the repairs, the turbine and pump were initially found excessively out of alignment by 0.0670 inch when coupled. When the turbine and pump were uncoupled, the as-found misalignment was 0.0858 inch. The coupling manufacturer's suggested alignment for optimal coupling life was less than 0.007 inch, with a maximum allowed misalignment of 0.024 inch for this type of flexible coupling; the licensee's procedure RMP 9044-1 required less than 0.002 inch. In addition, the licensee discovered that the turbine exhaust flange and exhaust piping flange were

approximately 0.085 inch out of parallel, which was approximately the same misalignment seen when the pump and turbine were uncoupled. This condition had been discovered and corrected on the Unit 2 TDAFW pump 2P-29 during the Unit 2 spring 2011 refueling outage; however, no action request was written to document this condition adverse to quality nor was a work order written to check the Unit 1 1P-29 turbine exhaust flange and exhaust piping flange.

On May 23, 2012, licensee maintenance technicians achieved satisfactory final alignment following the completion of all maintenance that could affect the alignment. Testing performed on May 23 demonstrated that all acceptance criteria were met, 3-8 times rotating speed vibration values for the pump and turbine returned to within the range of normal historical values, and turbine inboard bearing temperature returned to within normal historical values.

The licensee's root cause team identified that the direct cause of the coupling failure was that misalignment between the turbine and pump exceeded the coupling vendor's specification. The licensee's root and contributing causes for this issue were:

- 1P-29 steam exhaust piping was not installed properly during original construction to eliminate stresses on the turbine per vendor recommendations;
- changes made to maintenance practices caused unintended consequences because of the lack of barriers;
- as-found alignment data was taken as information only and evaluations were not performed of tolerance conditions; and
- 1P-29 was not aligned during original installation using vendor recommended dowels, allowing subsequent equipment movement.

At the end of the inspection, the licensee's planned and taken corrective actions included:

- removal of the lack of parallelism between the 1P-29 turbine exhaust flange and steam exhaust piping flange, which was completed in June 2012 under WO 40166796 by installation of a tapered wedge;
- revisions were made to procedure RMP 9044-1 for TDAFW pump overhaul relating to the final turbine-to-pump alignment and bolting;
- the WO planners guide was revised to obtain engineering authorization for alteration of components, i.e., hold-down bolts;
- predictive monitoring criteria were changed for vibration on the TDAFW pumps;
- revisions were made to procedure RMP 9044-1 to specify acceptance criteria for as-found critical measurements and require engineering evaluation if exceeded; and
- determine, document, and resolve whether the vendor recommends installation of dowels.

At the end of the inspection, the licensee had long-term plans in place for the installation of new TDAFW turbines, which were related to corrective actions associated with longstanding issues of high outboard turbine bearing temperatures, first realized by the licensee in 2007 (reference NRC Special Inspection Report 05000266/2007008; 05000301/2007008).

Inspector Observations on Root Cause Evaluation RCE01768931

The inspectors reviewed the root cause evaluation completed by the licensee and determined that the licensee's investigation into the failure of the 1P-29 coupling was inquisitive and thorough. The inspectors made several observations that the licensee entered into the CAP as AR01798336 and AR01798995. Those observations included the following:

- the contributing cause associated with the lack of evaluation of as-found alignment data was categorized as a legacy issue and could be considered a current issue since an action request was not written for this significant as-found misalignment discovered in November 2011;
- the licensee may have missed an opportunity to include the lack of thorough engineering review of predictive monitoring test and performance data as a contributing cause to the failure of the coupling; and
- none of the corrective actions specified reemphasis of the importance of a low threshold for initiating action requests for anomalous data, such as the increased bearing temperatures below alarm limits and the significant as-found misalignment.

Analysis: The inspectors determined that the licensee's failure to perform appropriate maintenance on 1P-29 was a performance deficiency warranting a significance evaluation. The finding was determined to be more than minor in accordance with Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," Appendix B, "Issue Screening," dated September 7, 2012, because it was associated with the Mitigating Systems Cornerstone attribute of equipment performance and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure of the 1P-29 coupling directly affected the reliability and availability of the auxiliary feedwater system (AFW) to mitigate events.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012, and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2, "Mitigating Systems Screening Questions," dated June 19, 2012. The finding involved an actual loss of function of a single train of AFW for greater than the TS allowed outage time, and required a detailed risk evaluation.

The Region III Senior Reactor Analyst (SRA) performed a detailed risk evaluation of the finding. The exposure period was determined using the guidance in the Risk Assessment of Operational Events (RASP) Handbook, Volume 1, "Exposure Time for Component Run Failures," Section 2.4. The inception of the degradation mechanism occurred when the pump was returned to service after the maintenance activities in December 2011 in a misaligned condition. The accumulated run time between the time of inception of the degradation mechanism and the time of failure was less than the 24-hour probabilistic risk assessment (PRA) mission time. For this situation, the RASP manual guidance was to use an exposure time from inception of the condition until the repaired component was returned to service. The exposure time was 161 days.

For the internal events risk contribution, the SRA used the Point Beach Standardized Plant Analysis Risk (SPAR) Model, Revision 8.21. The basic event representing

the 1P-29 failure to run was set to "True" to reflect the failure of the pump due to the misalignment. The delta core damage frequency (Δ CDF) was estimated to be 9.2E-7/year (yr). The dominant internal event core damage sequence was a loss of instrument air initiating event followed by the failure of the TDAFW pump (1P-29) and failure of other AFW pumps due to random events.

In accordance with IMC 0609 Appendix A, the SRA evaluated the external event and large early release frequency (LERF) risk contributions because the internal event Δ CDF was greater than 1.0E-7/yr. The potential risk contribution from LERF was screened using IMC 0609 Appendix H, "Containment Integrity Significance Determination Process," dated May 6, 2004, because Point Beach has a large dry containment and the dominant core damage sequences did not involve steam generator tube rupture or inter-system loss of coolant accident (LOCA) events. For external events, only fire risk was determined to be important for this finding. The potential contribution from fire risk was estimated using information from the licensee Individual Plant Examination of External Events (IPEEE) report supplemented by additional updated information provided by the licensee. The SRA determined that the dominant fire scenarios would involve alternate shutdown for control room and cable spreading room fires because the alternate shutdown procedure relies solely on the use of the TDAFW pump. The motor-driven AFW pumps (1P-53 and 2P-53) and the standby steam generator pumps were disabled in the control room by placing the control switches in pull-to-lock when the alternate shutdown procedure was implemented.

The SRA also determined that for both the control room and cable spreading room fires, operators could recover the AFW function by locally operating the motor-driven AFW pump 1P-53. (This pump and the comparable pump for Unit 2 were installed in 2011 and have reduced the station's risk for certain postulated events). To estimate the human error probability for failing to recover AFW, the SRA used NUREG/CR-6883, "The SPAR-H Human Reliability Analysis Method." For both diagnosis and action, the SRA assumed that the performance shaping factors for stress, complexity, and procedures would be the performance drivers.

Stress was evaluated as high because the fire would cause a significant plant transient requiring shutdown from outside the control room with the additional failure of the AFW train that was normally relied on for decay heat removal.

Complexity was evaluated as moderate because recovery would require a significant amount of communication and coordination outside of the control room during this postulated severe fire event.

Procedures were evaluated as available, but poor. Procedure AOP 10-A, "Safe Shutdown – Local Control," directed operators to monitor steam generator level and to use the TDAFW pump. There was no guidance provided (i.e., no "response not obtained" instructions) for how to proceed if the TDAFW pump failed. Operators would be required to formulate a plan to use 1P-53 locally, ensure that the proper power source was aligned, and then follow generic instructions available for the local operation of breakers.

Given these assumptions, the SPAR-H human error probability (HEP) estimate for failing to recover AFW through local manual operation of the motor-driven AFW pump 1P-53 was 0.22. Further description of the fire scenarios for the control room and cable spreading room are discussed below.

Control Room Fire

During a site visit on August 30, the licensee provided to the SRA a control room fire frequency of $6.0E-3$ /yr. The SRA assumed that a fire lasting 15 minutes, if not suppressed, would result in control room evacuation and alternate shutdown due to habitability issues. The non-suppression probability given these assumptions, from NUREG/CR-6850 Supplement 1, is $7.0E-3$. Nominally, the licensee's probability of failure of the alternate shutdown strategy from the IPEEE was 0.20. For the scenario with the performance deficiency, the SRA assumed the alternate shutdown strategy would fail completely (i.e., probability of failure was 1.0) due to the failure of the TDAFW pump. As discussed above, the SRA assumed that the AFW function could be recovered locally using 1P-53.

Cable Spreading Room Fire

The licensee updated the cable spreading room fire scenarios provided in the IPEEE with more recent information (i.e., frequencies, non-suppression probabilities, and fire modeling results) documented as "Fire SDP Classification Basis, Point Beach Unit 1, 1P-29 Turbine-Driven Auxiliary Feedwater Pump Degraded Coupling." The SRA used this information to estimate the Δ CDF for cable spreading room fires. Two cable spreading room fire scenarios were considered important. In both, if automatic and manual suppression fail, alternative shutdown is assumed to be required. Given the performance deficiency, alternative shutdown using the TDAFW pump would fail. As discussed above, the SRA assumed that the AFW function could be recovered locally using 1P-53.

The first cable spreading room fire scenario is a high energy arcing fault that can occur in the 480-Volt switchgear in the cable spreading room. The frequency of this scenario is $3.9E-4$ /yr. The probability of automatic non-suppression of the fire using the installed halon system is $5.0E-2$. The probability of manual non-suppression in 10 minutes is estimated using NUREG/CR-6850, Supplement 1, to be $9.0E-1$. The nominal failure probability for alternate shutdown from the IPEEE for the cable spreading room was $5E-2$. As discussed above, the SRA assumed that the AFW function could be recovered locally using 1P-53.

The second cable spreading room fire scenario represents other electrical cabinet fires. The frequency of fires in this scenario is $1.8E-3$ /yr. The probability of automatic non-suppression of the fire using the installed halon system is $5.0E-2$. The probability of manual non-suppression in 10 minutes is estimated using NUREG/CR-6850, Supplement 1, to be $3.6E-1$. The nominal failure probability for alternate shutdown from the IPEEE for the cable spreading room was $5E-2$. As discussed above, the SRA assumed that the AFW function could be recovered locally using 1P-53.

The total Δ CDF of the three fire scenarios for the 161-day exposure period was $7.8E-6$ /yr. The dominant fire core damage sequence involved an unsuppressed fire in the control room or cable spreading room followed by failure of alternate shutdown and failure to recover the AFW function. Combining the fire result with the internal event Δ CDF gives a total Δ CDF of $8.7E-6$ /yr, which represents a finding of low-to-moderate safety significance (White).

The inspectors determined this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, because the licensee failed to

implement a corrective action program with a low threshold for accurately identifying issues completely, and within a timely manner commensurate with their safety significance (P.1(a)). Specifically, during the maintenance that occurred on the TDAFW pump 1P-29 during November 2011, several conditions adverse to quality were encountered during the actual maintenance activity; however, condition reports were not written to address the issues. These conditions included as-found alignments excessively out of tolerance, difficulty in the actual physical alignment of the turbine-to-pump that had not been encountered in past maintenance, and the identification of a lack of parallelism between the steam exhaust piping and turbine exhaust flange on the Unit 2 turbine during the spring 2011 refueling outage (this latter item was immediately corrected in the spring 2011 Unit 2 outage, and is therefore not an additional equipment concern).

Enforcement: Title 10 CFR, Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that activities affecting quality shall be prescribed by documented instructions, procedures or drawings of a type appropriate to the circumstances.

The WO 40101094 and routine maintenance procedure RMP 9044-1, "Auxiliary Feedwater Pump Turbine Overhaul," Revision 26, were developed and implemented to perform work on the safety-related turbine for the TDAFW pump 1P-29.

An Apparent Violation (AV) of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," has been identified, in that, on November 8, 2011, the licensee failed to ensure that the work performed on the safety-related turbine for the TDAFW pump 1P-29 via WO 40101094 and routine maintenance procedure RMP 9044-1, an activity affecting quality, was prescribed by documented instructions or procedures of a type appropriate to the circumstances. Specifically, WO 40101094, Task 7, specified a first-time evolution of unbolting the steam exhaust piping from the turbine, aligning the turbine to the pump, and then re-bolting the steam piping to the turbine. Performance of this task and procedure was not appropriate to the circumstances, in that, it did not ensure the final turbine-to-pump alignment was performed after the bolting of the steam exhaust piping to the turbine flange (AV 05000266/2012009-01; Failure To Have Adequate Work Instructions And Procedures For Work Performed On The Turbine-Driven Auxiliary Feedwater Pump).

At the end of this inspection, the licensee had performed a root cause evaluation in response to action request CR01768931 to determine the cause of the event, as well as develop and implement corrective actions. As a remedial corrective action, on May 23, 2012, the licensee performed corrective maintenance to repair the failed coupling and address the turbine-to-pump alignment issue and TDAFW pump 1P-29 was returned to service. In addition, on June 20, the licensee implemented a permanent modification to the turbine exhaust steam piping by installing a wedge between the exhaust pipe flange and turbine exhaust flange to eliminate stresses on the turbine. At the end of the inspection period, the licensee had implemented corrective actions to address the WO and procedure deficiencies to prevent a future occurrence, and continued to implement additional long-term corrective actions.

4OA6 Management Meetings

.1 Exit Meeting Summary

On October 29, 2012, the inspectors presented the inspection results to Mr. Rich Wright and other members of the licensee staff. The licensee acknowledged the issues presented. The inspectors confirmed that none of the potential report input discussed was considered proprietary. Proprietary material received during the inspection was returned to the licensee.

4OA7 Licensee-Identified Violations

None.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

R. Wright, Plant General Manager
L. Meyer, Site Vice President
J. Atkins, System Engineering Manager
P. Baranowski, System Engineering
T. Conboy, Maintenance Director
R. Flessner, Engineering Performance Improvement Supervisor
J. Golding, System Engineering Supervisor
B. Griffin, Communication Specialist
W. Hennessy, Licensing Supervisor
C. Hill, Operations Assistant Manager
F. Huber, Manager of Projects
A. Julka, PRA Manager
J. Keltner, Chemistry Manager
T. Kendall, Design Engineer
R. LaPlante, Design Engineer
D. Lauterbur, Training Manager
J. Leiker, PRA Engineer
L. Locke, Engineering Analyst - Licensing
M. Millen, Licensing Manager
A. Mitchell, Performance Improvement Manager
S. Pfaff, Performance Improvement Supervisor
T. Ruiz, System Engineering Supervisor
B. Scherwinski, Engineering Analyst - Licensing
C. Tresize, Engineering Director
G. Vickery, Operations Director
R. Welty, Radiation Protection Manager
B. Woyak, Program Engineering Manager

Nuclear Regulatory Commission

M. Kunowski, Chief, Reactor Projects Branch 5
L. Kozak, Senior Reactor Analyst
T. Bilik, Senior Reactor Inspector
S. Burton, Senior Resident Inspector, Point Beach
M. Thorpe-Kavanuagh, Resident Inspector, Point Beach
A. Dunlop, Senior Reactor Engineer
M. Jones, Reactor Engineer
R. Wolfgang, Senior Mechanical Engineer, Division of Engineering, NRR

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000266/2012009-01	AV	Failure To Have Adequate Work Instructions And Procedures For Work Performed On The Turbine-Driven Auxiliary Feedwater Pump (Section 4OA2)
---------------------	----	--

Closed

None.

Discussed

None.

LIST OF DOCUMENTS REVIEWED

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspector reviewed the documents in their entirety, but rather that selected sections or 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.

40A2 Identification and Resolution of Problems

- AR01716238; 1P-029-T Bearing Temperature Lower Than Expected
- AR01744014; 1P-29-T Thermocouple 19 Inconsistent
- AR01768931; TDAFWP Coupling Ejected Pieces During Run
- AR01769887; Terry Turbine Exhaust Pipe Flange Misalignment
- AR01770780; 1P-29 Possible Degraded Or Non-Conforming Condition
- AR01771188; Material Receiving Discrepancy / Dresser Rand Gland Cases
- AR01777951; Turbine Exhaust Flange Bolt Hole Spot Faces
- AR01777957; 1P-029 Exhaust Pipe Hanger HB-15-H2 Stop Blocks Installed
- AR01778528; Thermal Expansion During IT-08A
- AR01784886; Eval 1768931 TDAFWP Coupling Ejected Pieces
- AR01791932; Fatal Flaw Identified In Procedure RMP 9044-6 And RMP 9044-8
- AR01795525; Management Review Of 1P-29 Actions
- AR01796798; WO Package Deficiencies – WO 40101094-01
- AR01797619; CR Screening Weakness
- AR01797621; PDM Program Compliance With ER-AA-201-2002
- AR01797634; Inspect 2P-29 Hold Down Studs And Bolting In 2R32
- AR01797668; REC Charter Weakness
- AR01798336; NRC AFW Inspection: Extent Of Cause Issue
- AR01798995; NRC AFW Inspection: Reinforce AR Initiation Threshold
- EC 276517; 1P-029-T Coupling Alignment Review For WO 342825
- EN-AA-203-1001; Operability Determinations / Functionality Assessments; Revision 6
- EPRI Terry Turbine Maintenance Guide AFW Application
- ERI/NRC 98-505, Supplemental Technical Evaluation Report Based On Review Of Additional Responses Concerning The Individual Plant Examination Of External Events At Point Beach Nuclear Plant, March 1999.
- Fire Protection Health Report; July 1 To September 30, 2012
- Individual Plant Examination Of External Events (IPEEE) For Severe Accident Vulnerabilities, June 30, 1995.
- IT 08A; Cold Start Of Turbine-Driven Auxiliary Feed Pump And Valve Test (Quarterly) Unit 1; Completed December 14, 2011, May 21, 2012, And May 23, 2012
- LER 05000266/2012-002-00; Condition Prohibited By Technical Specification 3.7.5, Auxiliary Feedwater; August 20, 2012
- Licensee Document, Fire SDP Classification Basis Point Beach Unit 1, 1P-29 Turbine-Driven D Auxiliary Feedwater (TDAFW) Pump Degraded Coupling, September 2012
- Licensee Slide Presentation, NRC Follow Up Inspection, Point Beach Nuclear Plant, Probabilistic Risk Assessment (PRA) Summary, August 30, 2012.
- MI 32.1; Flange And Closure Bolting; Revision 20
- Modification Classification Form For EC 276517; 1P-029-T Coupling Alignment Review For WO 342825; Completed May 23, 2012
- NPM 2012-0266, 1P-29 Coupling Internal Events Significance Determination, August 30, 2012

- NUREG/CR-6850 Supplement 1, Fire Probabilistic Risk Assessment Methods Enhancements, September 2010
- OE33937; Motor Damage Due To A Fatigue Failure Of A Turbine Plant Cooling Water Pump Flexible Coupling; July 26, 2011
- OI 62B; Turbine-Driven Auxiliary Feedwater System (P-29); Completed May 23, 2012
- Order No. 6118-M-6-AC; Installation And Operation Instructions For DVMX S/N 681-S-1029/31
- PB Open Prompt Operability Determinations List; Indicator OX-14; July 2012
- PBF-2534; Troubleshooting Process For Equipment ID P-029; May 23, 2012
- PBTP 247; Cold Start Of Turbine-Driven Auxiliary Feed Pump And Governor Compensation Adjustment Unit 1; Completed February 19, 2012 And March 13, 2012
- Project No. 0940-01; Report On Dynamic 4-Square Test Of Thomas 262 Series 54 Disc Coupling For NextEra Energy (RIC S/N: 45497); June 20, 2012
- RCE01768931-03; 1P-29 TDAFWP Coupling Degraded During IT 08A Run; Completed August 2, 2012
- Response To NRC Question No. 1; August 30, 2012
- Response To NRC Question No. 1; May 31, 2012
- Response To NRC Question No. 10; May 31, 2012
- Response To NRC Question No. 2; August 30, 2012
- Response To NRC Question No. 2; May 31, 2012
- Response To NRC Question No. 3; August 31, 2012
- Response To NRC Question No. 3; June 1, 2012
- Response To NRC Question No. 3; May 31, 2012
- Response To NRC Question No. 4; August 31, 2012
- Response To NRC Question No. 4; May 31, 2012
- Response To NRC Question No. 5; August 31, 2012
- Response To NRC Question No. 5; May 31, 2012
- Response To NRC Question No. 6; August 31, 2012
- Response To NRC Question No. 6; June 1, 2012
- Response To NRC Question No. 7; May 31, 2012
- Response To NRC Question No. 8; August 31, 2012
- Response To NRC Question No. 8; May 31, 2012
- Response To NRC Question No. 9; June 1, 2012
- Risk Assessment Of Operational Events (RASP) Handbook, Volume 1 (Internal Events) And Volume 2 (External Events)
- SCR 2012-0089; 1P-29 Turbine Driven Aux Feed Pump Turbine Alignment; May 23, 2012
- TAR 01768931; TDAFWP Coupling Ejected Pieces During Run; Revisions 0 And 1
- Tech Spec EQUIPMENT OOS And Fire Impairments; August 30, 2012
- WO Package 00342825; 1P-029-T Contingency Work Order To Overhaul If Required -2C
- WO Package 40101094; 1P-29-T Governor Valve Dimensions Out Of Criteria

LIST OF ACRONYMS USED

°F	Degrees Fahrenheit
ADAMS	Agencywide Document Access Management System
AFW	Auxiliary Feedwater
AR	Action Request
AV	Apparent Violation
CAP	Corrective Action Program
CFR	Code of Federal Regulations
DRP	Division of Reactor Projects
HEP	Human Error Probability
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IPEEE	Individual Plant Examination of External Events
IPS	Inches Per Second
IR	Inspection Report
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
NRC	U.S. Nuclear Regulatory Commission
PARS	Publically Available Records System
PRA	Probabilistic Risk Assessment
RASP	Risk Assessment of Operational Events
RMP	Routine Maintenance Procedure
SDP	Significance Determination Process
SPAR	Standardized Plant Analysis Risk
SRA	Senior Reactor Analyst
TDAFW	Turbine-Driven Auxiliary Feedwater
TS	Technical Specification
WO	Work Order
Δ CDF	Delta Core Damage Frequency
yr	Year

L. Meyer

-3-

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 Agencywide Document Access and Management 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 By Gary Shear for/

Steven West, Director
Division of Reactor Projects

Docket No.: 05000266
License No.: DPR-24

Enclosure: Inspection Report 05000266/2012009
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ™

DISTRIBUTION:
See next page

DOCUMENT NAME: PTBH 2012 009

Publicly Available Non-Publicly Available Sensitive Non-Sensitive

To receive a copy of this document, indicate in the concurrence box "C" = Copy without attach/encl "E" = Copy with attach/encl "N" = No copy

OFFICE	RIII	RIII	RIII	RIII
NAME	MKunowski:rj	SOrth	LKozak	GShear for SWest
DATE	12/ 03/12	12/03/12	12/03/12	12/04/12

OFFICIAL RECORD COPY

Letter to L. Meyer from S. West dated December 4, 2012

SUBJECT: POINT BEACH NUCLEAR PLANT, UNIT 1 - NRC INSPECTION REPORT
05000266/2012009 PRELIMINARY WHITE FINDING

DISTRIBUTION:

Cayetano Santos

RidsNrrDorlLp3-1 Resource

RidsNrrPMPPointBeach

RidsNrrDirslrib Resource

Chuck Casto

Cynthia Pederson

Steven Orth

Jared Heck

Allan Barker

Christine Lipa

Carole Ariano

Linda Linn

DRPIII

DRSIII

Tammy Tomczak

Lauren Casey

Nick Hilton

Jeremy Bowen

ROPreports.Resource@nrc.gov