



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

August 13, 2010

Mr. Paul Freeman
Site Vice President
Seabrook Nuclear Power Plant
NextEra Energy Seabrook, LLC
c/o Mr. Michael O'Keefe
P.O. Box 300
Seabrook, NH 03874

SUBJECT: SEABROOK STATION, UNIT NO. 1 - NRC INSPECTION PROCEDURE 95001
SUPPLEMENTAL INSPECTION REPORT 05000443/2010007

Dear Mr. Freeman:

On June 30, 2010, the U. S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection pursuant to Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area", at your Seabrook Station, Unit No. 1. The enclosed inspection report (IR) documents the inspection results discussed at the exit meeting on June 30, 2010, with you and members of your staff.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed because a finding of low to moderate safety significance (White) was identified in the 3rd quarter of 2009. This issue was documented in NRC IR 05000443/2009007. The NRC was informed in February 2010 that you would be ready for the supplemental inspection on June 7, 2010.

The objectives of this supplemental inspection were to provide assurance that: (1) the root causes and the contributing causes for the risk-significant issues were understood; (2) the extent of condition and extent of cause of the issues were identified; and (3) corrective actions were or will be sufficient to address and preclude repetition of the root and contributing causes. The inspection consisted of examination of activities conducted under your license as they related to safety, compliance with the Commission's rules and regulations, and the conditions of your operating license.

During the course of the inspection, the inspectors identified significant weaknesses, as defined in the supplemental inspection procedure. These weaknesses were: a lack of thoroughness in the cause analysis related to identification of root and contributing causes; inadequate extent of condition and extent of cause reviews and failure to fully implement an identified corrective action.

The inspectors informed you of these weaknesses during a de-brief on June 10, 2010. In response to these weaknesses you reconvened the root cause team; re-evaluated root and contributing causes; re-evaluated and expanded the extent of condition and extent of cause reviews; and implemented the incomplete corrective action. Your revised root cause evaluation (RCE) was completed on June 22, 2010.

Normally, in these situations, the identified significant weaknesses are conveyed to the licensee in writing, and the original performance issue will remain open and will not be removed from consideration in the assessment program until the weaknesses identified in the supplemental inspection are addressed and corrected. In this case, because you promptly responded to the identified weaknesses that we debriefed with you on June 10, 2010, we restarted the supplemental inspection based on the changes and additional actions you completed between June 10, 2010, and June 22, 2010.

As a result, based on the inspectors' review of your revised root cause analysis, the inspectors ultimately determined that, your problem identification, evaluation, and corrective actions relative to the White finding were adequate. Your staff had determined that the root cause of the B Emergency Diesel Generator (EDG) failure on February 25, 2009, was an inadequate gasket design for the turbocharger coolant outlet flange. Specifically, this design change did not adequately address joint performance history, evaluation of reported rubber gasket extrusion, and possible failure modes for the new gasket design. You immediately corrected the design issues associated with the B EDG turbocharger coolant outlet flange and also implemented several long term corrective actions to the design control process including: revising the design control manual to ensure internal operating experience (OE) was reviewed prior to implementing design changes; and conducting failure modes and effects analyses for changes to high risk or low margin systems.

In addition, based on the significant weaknesses the inspectors identified with your initial root cause evaluation you have also implemented actions to review and improve your process for evaluating significant plant issues.

Based on the results of this inspection, no findings of significance were identified.

NextEra's comprehensive actions to correct the inspector identified weaknesses resulted in an RCE that adequately addressed the root and contributing causes, extent of condition and extent of cause, and corrective actions. Given NextEra's ultimately acceptable performance addressing the loss of B EDG event, the White finding will only be considered in assessing plant performance for a total of four quarters, and following issuance of this report that documents successful completion of supplemental inspection 95001, in accordance with the guidance in Inspection Manual Chapter (IMC) 0305, "Operating Reactor Assessment Program."

P. Freeman

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Sincerely,



Arthur L. Burritt, Chief
Projects Branch 3
Division of Reactor Projects

Docket No. 50-443
License No: NPF-86

Enclosure: Inspection Report No. 05000443/2010007
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Sincerely,

/RA/

Arthur L. Burritt, Chief
Projects Branch 3
Division of Reactor Projects

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U. S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No.: 50-443

License No.: NPF-86

Report No.: 05000443/2010007

Licensee: NextEra Energy Seabrook, LLC

Facility: Seabrook Station, Unit No.1

Location: Seabrook, New Hampshire 03874

Dates: June 7, 2010 through June 30, 2010

Inspectors: D. Schroeder, Senior Resident Inspector, Lead Inspector
A. Ziedonis, Resident Inspector
S. Ibarrola, Reactor Inspector

Approved by: Arthur Burritt, Chief
Projects Branch 3
Division of Reactor Projects

Enclosure

SUMMARY OF FINDINGS

IR 05000443/2010007; 06/07/2010-06/30/2010; Seabrook Station, Unit No. 1; Supplemental Inspection - IP 95001.

This inspection was conducted by a Senior Resident Inspector and a Resident Inspector from Region I's Division of Reactor Projects and a Reactor Inspector from Region I's Division of Reactor Safety. No findings of significance were identified. 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.

Cornerstone: Mitigating Systems

The NRC staff performed this supplemental inspection in accordance with IP 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area", to assess NextEra's evaluation associated with a White inspection finding involving a failure to establish adequate design control measures to modify a cooling water flange on the B Emergency Diesel Generator (EDG). This performance deficiency resulted in a spray of glycol and water coolant into the room and an emergent shutdown of the EDG from the control room. The NRC staff previously characterized this issue as having low to moderate safety significance (White) as documented in NRC IR 05000443/2009007. The significance determination was finalized in a letter to NextEra dated November 12, 2009.

During the course of the inspection, which started on June 7, 2010, the inspectors identified significant weaknesses, as defined in the supplemental inspection procedure. These weaknesses, debriefed with NextEra on June 10, 2010, were: a lack of thoroughness in the cause analysis related to identification of root and contributing causes; inadequate extent of condition and extent of cause reviews and failure to fully implement an identified corrective action. As a result of these weaknesses NextEra reconvened the root cause analysis team; re-evaluated root and contributing causes; and re-evaluated and expanded the extent of condition and extent of cause reviews; and implemented the incomplete corrective action. The revised root cause evaluation (RCE) was completed on June 22, 2010, and subsequently reviewed by the inspectors. Based on the results of this second inspection, the inspectors determined that the June 22, 2010 RCE was adequate and corrective actions were appropriate and properly prioritized. NextEra was informed at the exit meeting that the inspection objectives were satisfactorily completed on June 30, 2010.

Normally, if a supplemental inspection reveals significant weaknesses in the licensee's (1) evaluation or the root causes of the original inspection finding, (2) determination of the extent of performance problems, or (3) actions taken to planned to correct the issue, then additional agency action may be needed to satisfy the inspection requirements. In these situations, the significant weaknesses are conveyed to the licensee in writing, and the original performance issue will remain open and will not be removed from consideration in the assessment program until the weaknesses identified in the supplemental inspection are addressed and corrected.

In this case, because NextEra promptly responded to the identified weaknesses that were debriefed on June 10, 2010, the inspectors restarted the supplemental inspection based on changes and additional actions completed between June 10, 2010, and June 22, 2010. Based on our inspection of the revised RCE, the inspection objectives were satisfactorily completed.

Enclosure

NextEra determined that the root cause of the issue was an inadequate gasket design for the turbocharger coolant outlet flange. Specifically, this design change did not adequately address joint performance history, evaluation of reported rubber gasket extrusion, and possible failure modes for the new gasket design. This resulted in the selection of a hard 1/16 inch annular gasket that was not appropriate for this two-bolt flange. Other factors were listed as contributing and direct causes in the revised RCE. The direct causes for the joint failure were vibration, misalignment, and flange face imperfections. Contributing causes were an inadequate challenge board process for EDG maintenance, inadequate engineering process controls, and misalignment caused by deficient weld activities. The inadequate gasket design in combination with these other factors resulted in a joint failure less than a month after installation, with less than ten hours of run time on the EDG.

The immediate corrective actions for the event were to replace the cupped flange on the adapter plate with a machined flange, correct the flange face alignment issue, install a full face gasket, and lock wire the cap screws for the two-bolt flange connection. Several long term corrective actions were also implemented following completion of the RCE. NextEra's design control manual was revised to ensure that internal operating experience (OE) is reviewed prior to implementing design changes and to conduct a failure modes and effects analysis for changes to high risk systems. The work management manual was revised to provide meeting structure and expectations for the EDG pre-maintenance and pre-start challenge meetings. Additional instructions were added for piping installation and maintenance to ensure that proper alignment of flanges is attained after the welding process.

The significant weaknesses identified during this inspection indicated a lack a thorough preparation by NextEra. The self-assessment conducted to confirm readiness for the inspection was based upon a limited scope that provided a narrow look at the corrective actions contained in the existing RCE. A thorough self-assessment would have identified a need for significant changes to the root cause analysis and an incomplete corrective action item. To address this issue NextEra implemented actions to review and improve their process for evaluating significant plant issues.

Findings

No findings of significance were identified.

REPORT DETAILS**4. OTHER ACTIVITIES**4OA4 Supplemental Inspection (95001).1 Inspection Scope

This supplemental inspection was performed in accordance with IP 95001 to assess NextEra's evaluation of a White finding that affected the Mitigating Systems cornerstone objective in the Reactor Safety strategic performance area. NextEra informed the NRC in February 2010 that they would be ready for the supplemental inspection on June 7, 2010. The inspection objectives were to:

- provide assurance that the root and contributing causes of risk-significant issues were understood;
- provide assurance that the extent of condition and extent of cause of risk-significant issues were identified; and
- provide assurance that corrective actions for risk-significant issues were sufficient to address the root and contributing causes and to preclude repetition.

Seabrook station entered the Regulatory Response Column of the NRC's Action Matrix in the third quarter of 2009 as a result of one inspection finding of low to moderate safety significance (White). The White finding involved a failure to adequately control design changes implemented on the B EDG jacket water cooling system in January 2009. On February 25, 2009, the gasket installed on flange JTR 005 failed, resulting in a spray leak of coolant, emergent shutdown of the B EDG from the control room, and unplanned availability of the B EDG. Troubleshooting activities and evaluations performed in response to this failure determined that the 1/16 inch annular gasket was an inadequate design selection to seal a joint with flange face cupping. This, combined with vibration and piping misalignment, resulted in the failure of the flanged joint. The finding was characterized as having low to moderate safety significance (White) based on the results of a phase 3 risk analysis as discussed in NRC IR 05000443/2009007.

The inspectors reviewed NextEra's RCE for the flange failure, a separate RCE to address a QA finding involving the B EDG vibration issue and other evaluations conducted in support of the RCEs. The inspectors reviewed corrective actions that were taken to address the identified causes. The inspectors also held discussions with NextEra personnel to ensure that the root and contributing causes and the contribution of safety culture components were understood and corrective actions taken were appropriate to address the causes and preclude repetition.

.2 Evaluation of the Inspection Requirements2.01 Problem Identification

- a. IP 95001 requires that the inspection staff determine that the evaluation documented who identified the issue (i.e., licensee-identified, self-revealing, or NRC-identified) and under what conditions the issue was identified.

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NextEra identified a leak in the turbo charger jacket water cooling line at the two-bolt flanged connection during a routine operability test on February 25, 2009. This required an emergent shut down of the B EDG. Subsequent to the failure, NextEra found the bolts for flange JTR 005 loose and the gasket material severely damaged and blown out along a part of its circumference. The flange faces had irregularities (bowing and cupped surfaces) and there was a misalignment (gap) between the right bank turbo charger outlet flange and the jacket water coolant pipe flange.

The NextEra initial RCE identified several factors that contributed to the failure of the B EDG jacket water cooling line at flange JTR 005. In January 2009, NextEra had implemented design change 08MSE211 to change the flange JTR 005 gasket design from a 1/8 inch thick full face gasket to a 1/16 inch annular configuration. The combination of the thinner annular gasket design, cupped surfaces, bowed flange, flange gap, and bolt loosening from vibration resulted in gasket compression well below the minimum required. Even though flange JTR 005 successfully passed a post-maintenance test on January 31, 2009, the as-built gasket design and flange conditions in combination with vibrations that loosened the bolts, left flange JTR 005 in a condition to fail with continued B EDG operation. Following the failure on February 25, 2009, the station formed a failure investigation process team to perform initial data gathering and investigation. A new gasket design was developed and installed, the flange surface and alignment were resolved, and the EDG was tested and declared operable on March 2, 2009. The inspectors verified that this information was documented in NextEra's RCE.

The inspectors determined that NextEra's initial RCE appropriately documented who identified the issue and under what conditions the issue was identified.

- b. IP 95001 requires that the inspection staff determine that the evaluation documented how long the issue existed and prior opportunities for identification.

The RCE correctly documented that the gasket that caused the February 25, 2009, failure of the B EDG was installed on January 29, 2009.

As discussed in the RCE, there were several prior opportunities to discover and correct the casual factors associated with the JTR 005 flange failure. In June 2002, shortly after the installation of a piping modification for the EDG jacket coolant outlet piping, the JTR 005 flange developed a spray leak, and plant operators terminated a routine surveillance test. NextEra tightened the flange bolts and determined that these bolts could have been tightened by a technician while the equipment was operating and that the EDG could meet its mission time with this action. This was the first opportunity for Seabrook personnel to identify this issue. In August 2005, the EDG subject matter expert generated a condition report that requested the use of a different gasket material to seal this flange due to a history of chronic leakage. This resulted in design modification 06MSE037 that replaced the harder DURLON sheet gasket material with a rubber AFLAS sheet gasket material. The basis for this change was that the rubber gasket was more forgiving for vibration, could fill in imperfections in the mating surfaces, and would compensate for additional alignment issues or gaps between the flanges. The AFLAS gasket was installed in May 2006, and remained in service until June 2008. The AFLAS gasket was replaced in June 2008 with a full faced DURLON gasket, based on evidence of extrusion of the AFLAS gasket. The DURLON 1/8 inch full face gasket leaked initially and use of 150% of nominal bolt torque was approved in order to seal the flange joint. Leakage of the flange joint resulted in another engineering modification to try a different

style gasket. A thin, annular gasket was specified to provide greater gasket compression, without regard to the existing factors that were making the joint difficult to seal in the first place. This resulted in the design change 08MSE211 that recommended installation of the 1/16 inch DURLON annular gasket that failed on February 25, 2009.

The inspectors determined that the initial RCE for the event appropriately documented how long the issue existed and prior opportunities for identification.

- c. IP 95001 requires that the inspection staff determine that the evaluation documented the plant specific risk consequences, as applicable, and compliance concerns associated with the issues.

NextEra's RCE documented the risk consequences of the issue, which included the following:

- Unscheduled emergent maintenance;
- Entry into a technical specification action statement;
- A significant increase in EDG unavailability for equipment maintenance rule and performance indicators;
- Change in core damage probability of $1.68\text{E-}6$ per year with no recovery of the B EDG; and
- Change in core damage probability of $7.92\text{E-}7$ per year assuming a 4 hour recovery of the B EDG.

NextEra assumed that the B EDG was recoverable in 4 hours in their revised analysis of the risk consequence of the event. NextEra also documented that the significance of the event was the removal of one of two safety system emergency alternating current sources, decreased system availability, increase in core damage probability, and additional maintenance rule out of service time.

The NRC independently determined this issue was a White finding, as documented in IR 05000443/2009007, since the change in core damage frequency (CDF) for the failure of the B EDG was greater than $1\text{x}10\text{E-}6$. Specifically, the NRC performed a phase 3 risk analysis to calculate the delta CDF. The result was $2.27\text{E-}6$, which represents a low to moderate safety significance. The risk analysis assumed an exposure time of 625 hours, and that based on the nature of the failure, no additional operator recovery credit was provided for the B EDG. The dominant internal event sequences involved a loss of offsite power event with subsequent failure of the A EDG and the supplemental emergency power system resulting in a Station Black Out.

NextEra provided a response to the NRC Notice of Violation (NOV), which informed NextEra of the final White finding. In the response letter, dated December 11, 2009, they acknowledged the White finding and violation, discussed the causes, corrective actions to prevent recurrence and stated that full compliance was achieved on March 2, 2009.

The inspectors concluded that NextEra appropriately documented the risk consequences and compliance concerns associated with the issue.

d. Findings

No findings of significance were identified.

2.02 Root Cause, Extent of Condition, and Extent of Cause Evaluation

- a. IP 95001 requires that the inspection staff determine that the problem was evaluated using a systematic methodology to identify the root and contributing causes.

The inspector verified that NextEra used the following methods for systematic identification of the casual factors for the event.

- Events and casual factors analysis;
- Cause and effect analysis;
- Barrier analysis;
- Change analysis; and
- Data gathering through interviews and documents review.

The inspectors questioned NextEra's cause and effect analysis basis, specifically the determination of the identified casual factors. NextEra had initially determined that the flange cupping, vibration, and flange face misalignment were not casual to the event. The explanation presented in the basis incorrectly used the definition of a root cause to determine causal factors. This was not in accordance with their Root Cause Analysis procedure, OE 4.3, which defines a causal factor as a condition that either caused the incident or increased the chances of occurrence. Subsequently, NextEra revised the cause and effect analysis basis and determined that the cupped flange, vibration, and flange face misalignment were each casual factors to the event. NextEra also identified an additional contributing cause during the inspection that was welding activities performed near the flange joint just prior to the failure likely resulted in a pipe stress that increased misalignment.

While the root cause analysis contained good technical information, the inspectors questioned the classification of the causal factors identified by the analysis, because it appeared to contradict the guidance provided in NextEra's root cause procedure and because it ultimately limited the scope of the extent of condition and extent of cause that NextEra's procedures required be performed. NextEra re-convened their root cause team and made significant changes to the RCE. As a result of the changes NextEra re-classified three technical causes as direct causes and identified an additional contributing cause. The inspectors determined that not classifying the identified causal factors in accordance with the NextEra's root cause analysis procedure and not identifying all contributing causes was a performance deficiency. However, the inspectors also determined that this performance deficiency was of minor significance because it did not change the scope of the corrective actions required to correct the identified significant condition adverse to quality.

In addition to the gasket failure RCE, a separate RCE {Action Request (AR) 194730} was conducted for the B EDG right bank turbocharger vibration, which was a known, longstanding condition. A review of the existing vibration monitoring for the right bank turbocharger showed that it was exhibiting an adverse trend. Two root causes were identified in this RCE. First, plant and design engineering accepted the elevated

vibrations on the B DG right band turbocharger and did not aggressively pursue identification of the source and corrective actions. Second, the equipment monitoring process was inadequate since the processes did not address when and how to develop an action plan for degraded performance monitoring parameters. Key corrective actions included the development of a system monitoring process to establish performance monitoring and system parameters that strategically measure the system health. This process established an engineering and/or operational basis for alert and alarm limits, and established actions that are required when established limits are exceeded. A corrective action was assigned to reinforce proper use of the corrective action process to identify problems, conduct investigations, and track corrective actions. An action plan was developed to resolve the elevated vibration issue, including the use of a vendor specialist. Corrective actions were also taken to tighten turbocharger mantle bolts and periodically retighten these bolts. Shims were installed to eliminate clearance between the mantle and housing in select locations. Additional information on the vibration RCE is contained in IR 0500443/2010003.

Following the revision of the RCE during the inspection, and taking the RCE for the EDG vibrations into consideration, the inspectors determined that NextEra applied systematic methods to evaluate the issue and identify root and contributing causes.

- b. IP 95001 requires that the inspection staff determine that the RCE was conducted to a level of detail commensurate with the significance of the problem.

NextEra determined that the root cause was an inadequate gasket design for the turbocharger coolant outlet flange, due to an inadequate assessment of joint performance history, evaluation of reported rubber-based gasket extrusion, and possible failure modes for the new gasket design. This resulted in the selection of a hard 1/16 inch annular gasket that was not appropriate for this two-bolt flange. The inadequate gasket design in combination with direct and contributing causes resulted in a joint failure less than a month after installation, with less than ten hours of run time on the EDG.

The immediate corrective actions for the event were to replace the cupped flange on the adapter plate with a machined flange, correct the flange face alignment issue, install a full face gasket, and lock wire the cap screws for the two-bolt flange connection. The initial RCE completed by NextEra contained good technical information: technical data from the vendor that was used to confirm the failure mechanism for the gasket; and OE from Callaway that documented the failure of a gasket similar to the turbocharger two-bolt flange gaskets installed at Seabrook. An events and causal factors analysis was used to identify causal factors that were used to specify the root and contributing causes. Based on the RCE additional long term corrective actions were also implemented. NextEra's design control manual was revised to ensure that internal OE is reviewed prior to implementing design changes and to conduct a failure modes and effects analysis for changes to high risk low margin systems. The work management manual was revised to provide meeting structure and expectations for the EDG pre-maintenance and pre-start challenge meetings.

Subsequent to the revision of the RCE, which addressed problems with the identification of causal factors and the identification of an additional contributing cause, the inspectors concluded that the RCE was conducted to a level of detail commensurate with the significance of the problem.

- c. IP 95001 requires that the inspection staff determine that the RCE included a consideration of prior occurrences of the problem and knowledge of prior OE.

NextEra's RCE included an evaluation of internal and external OE. One of the causal factors identified was the failure to consider performance history of the JTR 005 joint as a design input. This factor was included in the identified root cause for the failure of the B EDG. Based on the weakness identified in the use of internal OE, corrective actions were assigned and included the following:

- Revision of the design change manual that requires a review of performance history for the affected equipment prior to approval of a design change; and
- Training of the design engineers to ensure that internal OE and failure modes are considered for all design changes on risk-significant or low margin systems.

The RCE included a search of external OE to identify similar events that have occurred throughout the industry. OE from Callaway was similar in some respects to the failure at Seabrook. At Callaway, a gasket failed on a two-bolt flange on their EDG coolant system after nine years in service. The gasket material used was similar in composition to the material used at Seabrook. This OE did not directly apply to Seabrook because the gasket failure mechanism at Seabrook was not a time based failure. Callaway determined that the failure was caused by a lack of gasket compression that allowed water saturation of the gasket, weakening it over time to the point of failure. Callaway had not noted any leakage at the joint prior to the gasket failure. The inspectors questioned the relevance of this OE regarding extent of condition because the EDG coolant system has similar gaskets that have been in service for eight years. The root cause team determined that there is potential applicability of the Callaway OE to other Seabrook components. A corrective action was added to the revised RCE to evaluate this and other industry experience to determine if the applicable gaskets should be periodically replaced.

The inspectors concluded that the revised RCE included appropriate consideration for prior occurrences of the problem and other applicable OE.

- d. IP 95001 requires that the inspection staff determine that the RCE addresses the extent of condition and the extent of cause of the problem.

The inspectors questioned the adequacy of the extent of condition and the extent of cause of the problem as documented in the RCE. The initial RCE extent of cause did not consider other minor modifications (MSEs/MSPs) that were approved and previously implemented using the same deficient process that was used to approve the modification that caused the gasket failure. Based on the inspectors' questions, NextEra determined that additional review of similar design changes was required to provide an adequate extent of cause review. A sample of 61 similar maintenance support evaluations were reviewed from a population of 371 design changes approved in the past five years. These design changes were assessed by a multidiscipline team in a challenge board format. The design change reviews focused on ensuring that adequate consideration of internal OE, potential failure modes, and failure mechanisms were utilized. Some of the modifications were found to be deficient, but none of the deficiencies were determined to be a current vulnerability to plant safety or equipment reliability. The inspectors independently reviewed a selection of these design modifications to confirm NextEra's conclusions that plant safety and equipment reliability

were not compromised. NextEra subsequently reconvened their root cause team and revised their extent of condition and extent of cause evaluations. The narrow extent of cause was not in accordance with Seabrook Root Cause procedure, OE 4.3, and was a performance deficiency. The additional actions taken by Seabrook personnel did not reveal any additional equipment deficiencies, and this performance deficiency was determined to be a minor violation.

The initial RCE extent of condition was based on the root cause only, and did not consider contributing causes. The extent of condition was revised to include torque checks, visual inspections, and flange flatness checks of other similar (spare) turbocharger two-bolt flanges. Flange flatness checks were done to provide reasonable assurance that the cupped condition on the JTR 005 flange was an isolated condition. These additional checks that were performed did not identify cupped conditions on other applicable EDG system flanges. The narrow extent of condition review was not in accordance with Seabrook Root Cause procedure, OE 4.3, and was a performance deficiency. Because the additional actions taken by Seabrook personnel did not reveal additional equipment deficiencies this performance deficiency was determined to be minor.

Following the revision to the RCE, the inspectors determined that NextEra's revised RCE, appropriately addressed the extent of condition and extent of cause for the B EDG failure.

- e. IP 95001 requires that the inspection staff determine that the root cause, extent of condition, and extent of cause evaluations appropriately considered the safety culture components as described in IMC 0310.

NextEra's initial RCE included an evaluation of the human performance, problem identification and resolution, and safety conscious work environment safety culture components. This evaluation identified minor weaknesses in the corrective action program (CAP) and the use of internal OE. The safety culture analysis identified several instances where condition reports were not initiated when they should have been, and corrective actions were assigned to address these missed opportunities. An example of these missed opportunities is that several times when bolts were found loose or leaks were found during maintenance, no condition reports (CRs) were written to document them. When questioned why they were not documented, maintenance personnel stated that their practice was to initiate CRs if a bolt was found loose unexpectedly. However, if implementing a work order to check for bolt tightness, it was assumed that finding loose bolts was not unexpected since the work orders contained the steps to retorque. This was a gap in the technicians' understanding of the CR reporting process.

As part of the initial RCE, NextEra identified that the use of internal OE was inadequate during the design modification process for 08MSE211, which was determined to be an individual performance issue and not a generic issue for the site. This evaluation did not identify any significant weaknesses in any safety culture component.

Based on a review of the safety culture portion of NextEra's initial RCE, the inspectors identified that the additional safety culture components that are included in the inspection scope of safety culture assessment for supplemental inspections were not addressed. The NRC procedure criterion changed after the completion of the RCE and before the supplemental inspection was conducted. This weakness could have been

identified by NextEra during the self-assessment conducted prior to the start of the 95001 inspection. The root cause team reconvened to evaluate the four additional safety culture components of accountability, continuous learning environment, organizational change management, and safety policies. None of the safety culture components were identified as significant contributors to the EDG gasket failure. The inspectors reviewed NextEra's evaluation in this area, determined that it was thorough and that the safety culture components did not contribute to the failure.

Following the revision to the RCE, the inspectors determined that NextEra's RCE, extent of condition, and extent of cause appropriately considered all of the applicable safety culture components as described in IMC 0310.

f. Findings

No findings of significance were identified.

2.03 Corrective Actions

- a. IP 95001 requires that the inspection staff determine that (1) appropriate corrective actions are specified for each root and/or contributing cause, or (2) that NextEra has an adequate evaluation for why no corrective actions are necessary.

NextEra's corrective actions to address the root and contributing causes were assigned in accordance with Next Era procedures PI-AA-204, "Condition Evaluation and Corrective Action", and OE 4.3, "Root Cause Analysis".

NextEra personnel took prompt corrective actions to restore the B EDG to an operable status. These actions included:

- Replaced the cupped adapter plate with a machined flange;
- Corrected the alignment issue between the flange faces;
- Installed a full faced 1/16 inch thick DURLON gasket;
- Added lock wires to the two bolt connection; and

Following completion of the initial RCE, corrective actions to prevent recurrence included:

- Performing an in-field case study with each design engineer using a prepared case study highlighting the actual versus expected performance; and
- Revision of the design control manual to require a review of internal OE and to address the failure modes and effects analysis of the new design.

Following completion of the initial RCE, additional corrective actions to address the contributing causes included:

- Revision of the work management manual to provide expectations for the diesel pre-maintenance and pre-start challenge meeting structure;
- Coaching and mentoring the preparer, reviewer, and approver of design change 08MSE211 on the findings of the RCE;
- Revision of the design control manual to require engineering challenge boards for all minor modifications for all high risk/low margin systems; and

- Revision of the maintenance manual to include additional programmatic controls for high risk/low margin systems so that troubleshooting for these systems is conducted in a timely manner.

The inspectors questioned the corrective action taken to ensure that the deficient design modification (08MSE211), which was identified as the root cause, would not be used during future maintenance activities. NextEra found that the modification was still active, and took prompt action to cancel the deficient design modification. The RCE incorrectly stated that the deficient design modification had been voided as a part of prompt corrective actions, and did not list this action as a corrective action in the RCE corrective action table. The deficient design modification applied to all two-bolt EDG coolant flanges, but the prompt corrective action implemented addressed only the JTR 005 flange. The failure to cancel the deficient design modification was not in accordance with NextEra procedure PI-AA-205, "Condition Evaluation and Corrective Action", and was determined to be a performance deficiency. This performance deficiency was determined to be a minor violation because no other annular gaskets had been installed using this design modification, and the contributing causes of cupping and misalignment that led to the gasket failure were not evident on other flanges.

The inspectors determined that the corrective actions were appropriate and addressed each root and contributing cause. Additionally, in response to the weaknesses identified with the RCE during the NRC inspection, NextEra assigned a corrective action in the revised RCE to evaluate the root cause and the inspection preparation process.

- b. IP 95001 requires that the inspection staff determine that corrective actions have been prioritized with consideration of risk significance and regulatory compliance.

NextEra's corrective actions to address the root and contributing causes were prioritized in accordance with NextEra procedure PI-AA-204, "Condition Evaluation and Corrective Action". The procedure assigns one of five risk rankings to each significance level 1, 2 or 3 corrective action. Actions receive priority for completion based on their risk ranking. The procedure states that corrective actions should be performed in a timely manner commensurate with safety significance.

NextEra took immediate corrective actions to restore the B EDG to an operable status. Repair of the failed JTR 005 connection was documented in Work Order (WO) 01185637. This WO replaced the cupped adapter plate with a machined flange, corrected the alignment issue, installed a full face gasket, and added lock wires to the two-bolt connection. Since the vibration level at this flange remained elevated, NextEra initiated compensatory actions to monitor the lockwire condition and check the bolt torque on the associated eight-bolt flange monthly.

Following completion of the initial RCE, longer term corrective actions were assigned and tracked in accordance with procedure OE 4.3, "Root Cause Analysis". The completion of these items was tracked on the original condition report. The prioritization of these items considered licensing and regulatory performance and nuclear safety.

Based on inspector questions related to the identification of all root and contributing causes, extent of condition, and extent of cause, the root cause team reconvened, identified the following new corrective actions: and assigned them a high priority for completion.

- Revise the flange maintenance manual to require disassembling bolted flanges/joints after welding
- Create a case study describing the alignment issues with this root cause and present it to applicable work groups
- Perform torque checks and visual inspections on applicable two bolt flanges
- Evaluate current EDG coolant flange gasket replacement strategy
- Develop a preventive maintenance task to perform visual inspections of specified two bolt flanges
- Evaluate the root cause and the inspection preparation process for enhancement

These corrective actions should have been identified and completed by NextEra prior to the start of the inspection. To address extent of condition, actions included visual inspections of similar two-bolt flanges on the EDGs and a torque check of selected two-bolt flanges on the EDGs. The visual inspections did not reveal any vulnerability with these flanges related to leakage or alignment issues. The torque checks that were conducted did not reveal any loose flange bolts, which addressed the vibration contributing cause. To address potential cupping of other two-bolt flanges, NextEra measured the flatness of representative spares from initial construction to provide assurance that the cupping of the JTR 005 flange was an isolated issue. The additional inspection also confirmed that none of the other two bolt flanges had annular gaskets installed.

The extent of cause was re-evaluated, and a sampling of approved modifications were reviewed for errors similar to the human performance error that allowed the approval of the modification which caused failure of the JTR 005 joint and resulted in the failure of the B EDG. These 61 design change packages were chosen for review to determine if weaknesses existed with previously approved design change packages that were similar to the modification identified as the root cause of the B EDG flange failure. The design change reviews focused on ensuring that there was adequate consideration of internal OE, potential failure modes, and failure mechanisms. Some of the modifications were found to be deficient, but none of the deficiencies were determined to be a current vulnerability to plant safety or equipment reliability. The inspectors independently reviewed a selection of these design modifications to confirm NextEra's conclusions.

Following the completion of these additional corrective actions, the inspectors determined that appropriate corrective actions were prioritized with consideration of risk significance and regulatory compliance.

- c. IP 95001 requires that the inspection staff determine that a schedule has been established for implementing and completing the corrective actions.

NextEra assigned due dates for corrective actions in accordance with procedure PI-AA-205, "Condition Evaluation and Corrective Action".

Due dates for corrective actions were established and documented in the RCE in a table format. NextEra conducted a self-assessment in preparation for this inspection that evaluated the completion of corrective actions assigned. The self-assessment concluded that there were instances of corrective actions that were not properly implemented and/or documented, and assigned actions to correct these deficiencies in

AR 223198. Inspectors verified that selected corrective actions had been completed, and reviewed the status for the completion of other assigned corrective actions. With the exception of the effectiveness review, all corrective actions assigned have been completed.

- d. IP 95001 requires that the inspection staff determine that quantitative and qualitative measures of success have been developed for determining the effectiveness of the corrective actions to prevent recurrence.

As documented in the initial RCE, NextEra established measures for determining the effectiveness of the corrective actions, including corrective actions to prevent recurrence. These measures included the following:

- All the actions have been implemented as written and by the scheduled due dates;
- No similar issues have been reported since the corrective actions were implemented;
- No new unwanted/unexpected conditions have occurred due to the corrective actions implemented for this event; and
- No inadequate design changes that did not properly evaluate the history of the issue or give consideration to possible new failure modes created by the design change have occurred.

NextEra staff entered the effectiveness review into their CAP for completion in July 2010. The inspectors determined that qualitative and quantitative measures of success had been developed for determining the effectiveness of the corrective actions to prevent recurrence.

- e. IP 95001 requires that the inspection staff determine that the corrective actions planned or taken adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection.

The NRC issued an NOV to NextEra on November 12, 2009. NextEra provided the NRC a written response to the NOV on December 11, 2009. NextEra's response described: (1) the reason for the violation; (2) completed corrective actions and the results achieved; (3) corrective steps to avoid further violations; and (4) the date when full compliance was achieved. NextEra restored full compliance on March 2, 2009. During this inspection, the inspectors confirmed that NextEra's revised RCE, following NextEra's additional actions after the inspection debrief, and corrective actions adequately addressed the NOV.

- f. Findings

No findings of significance were identified.

40A6 Exit Meetings

Exit Meeting Summary

On June 10, 2010, the inspectors presented a debrief of inspection results, including weaknesses observed in the station's preparation for the supplemental inspection. These five weaknesses were identified in the initial RCE and discussed at this debrief:

- Vibration and flange cupping were not listed as root or contributing causes;
- The extent of condition did not address the potential for flange face cupping on other turbocharger two-bolt flanges and potential for less than recommended gasket crush;
- The extent of cause did not address previously implemented modifications that may not have had an adequate review;
- No corrective action assigned to void the engineering modification that allowed the installation of annular gaskets in two-bolt flanges; and
- Callaway OE contradicts the assumption made that these gasketed flanges will show signs of leakage prior to gasket failure.

On June 30, 2010, the inspectors presented the inspection results to Mr. Paul Freeman and other members of the NextEra staff, who acknowledged the inspection results. The inspectors also confirmed with NextEra that no proprietary information was reviewed by inspectors during the course of the inspection.

Regulatory Performance Meeting

On June 30, 2010, the NRC discussed with NextEra, at Seabrook station, its performance in accordance with IMC 0305, Section 10.01.a. The meeting was attended by Region I Division of Reactor Projects, Branch 3, Branch Chief, and other NRC staff. During this meeting, the NRC and NextEra discussed the issues related to the White finding that resulted in the Seabrook station being placed in the Regulatory Response Column of the Action Matrix. This discussion included the causes, corrective actions, extent of condition, extent of cause, and other planned actions by NextEra. This discussion also included the lack of thorough preparation for the supplemental inspection by NextEra.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee personnel

P. Freeman, Site Vice President
E. Metcalf, Plant General Manager
M. O'Keefe, Licensing Manager
R. Noble, Engineering Manager
M. Ossing, Engineering Support Manager
M. Collins, Design Engineering Manager
P. Willoughby, Licensing Engineer
R. Am, EDG System Engineer

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed:

05000443/2009007-01 VIO Inadequate B EDG Design Change

Discussed

None

LIST OF DOCUMENTS REVIEWED

Other Documents

OE 4.3, Seabrook Station Administrative Procedure, Root Cause Analysis, Revision 21
AR 191440 Root Cause Evaluation
NRC Supplemental Inspection Report 05000443/2007007
NRC Annual Assessment Letter 05000443/2010001
AR 191440 Report
Supplement to AR 191440 Root Cause Evaluation
EDG Coolant Leak 95001 Inspection Preparation Self Assessment (AR 223118)
AR 049647 Report
AR 196295 Report
AR 393792 Report
AR 393630 Report
AR 393712 Report
DURLON Gasket Fundamentals Information Sheet, dated January 2003
DURLON 8500 Aramid/Inorganic Fiber w/NBR Rubber Binder Compressed Sheet
Gasket Material Specification Sheet, dated September 2006
Additional Safety Culture Components for AR 191440 Assessment
PI-AA-204, Condition Identification and Screening Process, Revision 8
PI-AA-205, Condition Evaluation and Corrective Action, Revision 8

Maintenance Support Evaluations

08MSE211, EDG Turbocharger CC Water Piping Optional Gasket Configuration and Bolting Type

06MSE037, EDG Turbocharger CC Water Piping Gasket Replacement, Revision 01

Drawings

P06623, Revision 6

LIST OF ACRONYMS

ADAMS	Agency-wide Documents Access and Management System
AR	Action Request
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Reports
EDG	Emergency Diesel Generator
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
OE	Operating Experience
RCE	Root Cause Evaluation
SRA	Senior Risk Analyst