



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
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January 28, 2010

EA-09-083

Mr. Christopher R. Costanzo
Vice President
NextEra Energy Duane Arnold, LLC
3277 DAEC Road
Palo, IA 52324-9785

**SUBJECT: DUANE ARNOLD ENERGY CENTER
NRC SUPPLEMENTAL INSPECTION REPORT NO. 05000331/2009013**

Dear Mr. Costanzo:

On December 15, 2009, the U.S. Nuclear Regulatory Commission (NRC) staff completed a supplemental inspection pursuant to Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," at your Duane Arnold Energy Center (DAEC). This inspection was conducted in response to a White inspection finding associated with the failure to promptly identify and correct a condition adverse to quality, which resulted in the Train B emergency diesel generator output breaker tripping under full load conditions while conducting a monthly surveillance test. The enclosed inspection report documents the inspection results, which were discussed with you, and other members of your staff, at the telephone exit and regulatory performance meeting conducted on December 15, 2009.

As required by the NRC Reactor Oversight Process Action Matrix, this supplemental inspection was performed because a White finding having low to moderate safety significance was identified in the 2nd quarter of 2009. This issue was documented previously in NRC Inspection Report 05000331/2009009. The NRC staff was informed on September 17, 2009, of your staff's readiness for this inspection. The NRC performed this supplemental inspection to assess your evaluation of a White finding, which impacted the Mitigating Systems Cornerstone.

The objectives of this inspection were to: (1) provide assurance that the root causes and the contributing causes of the risk-significant performance issues are understood; (2) provide assurance that the extent of condition and extent of cause of the issues are identified; and (3) provide assurance that the corrective actions are sufficient to address the root causes and contributing causes, and to prevent recurrence. 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.

The inspector determined that your staff performed an adequate evaluation of the White finding. Your staff's evaluation identified that there were two root causes that, when combined, led to the 'B' EDG output breaker tripping open. The first root cause was a lack of detailed instructions

associated with the installation/set up of the Engine Overspeed Switch (EOS) microswitch. The second root cause identified was the operators' use of the EOS conduit as a handle during both the shiftly checks performed to verify that the overspeed trip was reset, and the actual resets of the overspeed trip required during EDG surveillance testing, which resulted in the momentary movement of the microswitch and contributed to the EOS microswitch hex locknut loosening.

The inspector also concluded that you identified reasonable/appropriate corrective actions for each root and contributing cause and that the corrective actions appeared to be prioritized commensurate with the safety significance of the issues. However, the inspector had several observations regarding specific aspects of the root cause evaluation that warranted additional consideration by your staff.

The attached report documents one NRC-identified finding having very low safety significance (Green). The finding was determined to involve a violation of NRC requirements. The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action, because the licensee failed to thoroughly evaluate problems such that the resolutions address causes and extent of conditions as necessary (P.1(c)). Because of the very low safety significance and because the issue was entered into your corrective action program, the NRC staff is treating this issue as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest the subject or severity of this NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator, Region III; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Duane Arnold Energy Center. In addition, if you disagree with the characterization of the finding in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region III, and the NRC Resident Inspector at the Duane Arnold Energy Center. The information that you provide will be considered in accordance with Inspection Manual Chapter 0305.

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

C. Costanzo

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We will gladly discuss any questions you have concerning this inspection.

Sincerely,

/RA by Gary Shear, Acting For/

Steven West, Director
Division of Reactor Projects

Docket No. 50-331
License No. DPR-49

Enclosure: DAEC Supplemental Inspection Report 05000331/2009013
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No: 50-331
License No: DPR-49

Report No: 05000331/2009013

Licensee: NextEra Energy Duane Arnold, LLC

Facility: Duane Arnold Energy Center

Location: Palo, IA

Dates: December 07 through December 15, 2009

Inspectors: C. Scott, Reactor Engineer

Approved By: K. Riemer, Chief
Branch 2
Division of Reactor Projects

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SUMMARY OF FINDINGS

IR 05000331/2009013; 12/07/2009 - 12/15/2009; Duane Arnold Energy Center; Supplemental Inspection; Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area."

This report covers a one-week period of inspection conducted by one Region III reactor engineer. One finding of very low safety significance (Green) was identified by the inspector, and was considered a Non-Cited Violation (NCV) of NRC regulations. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process." Cross-cutting aspects are determined using IMC 0305, "Operating Reactor Assessment Program." Findings for which the Significance Determination Process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

Cornerstone: Mitigating Systems

The NRC performed this supplemental inspection in accordance with IP 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation of the White inspection finding associated with the 'B' EDG output breaker tripping under full load conditions while conducting a monthly surveillance test in November 2008. The NRC staff previously characterized this issue as having low to moderate safety significance (White) in an NRC letter dated June 9, 2009, which finalized the preliminary assessment of the finding in NRC Inspection Report 05000331/2009009.

During this supplemental inspection, the inspector determined that the licensee performed an adequate evaluation of the NRC-identified finding for failure to identify and correct a condition adverse to quality associated with the 'B' EDG output breaker trip, which occurred during a routine monthly surveillance test. The licensee identified the cause of the breaker trip to be from a partial initiation of the overspeed trip logic from the overspeed micro switch. The licensee identified that there were two root causes that, when combined, led to the 'B' EDG output breaker tripping open. The first root cause was a lack of detailed instructions associated with the installation/set up of the Engine Overspeed Switch (EOS) microswitch. The second root cause identified was the operators' use of the EOS conduit as a handle during both the shiftly checks performed to verify that the overspeed trip was reset, and the actual resets of the overspeed trip required during EDG surveillance testing, which resulted in the momentary movement of the microswitch and contributed to the EOS microswitch hex locknut loosening. Based on the results of this supplemental inspection, the inspector concluded that: (1) the licensee understood the root causes and the contributing causes of the risk-significant performance issues that resulted in the White finding; (2) the licensee identified the extent of condition and extent of cause of the issues; and (3) the licensee's corrective actions are sufficient to address the root causes and contributing causes, and to prevent recurrence.

Given the licensee's acceptable performance in addressing 'B' EDG output breaker trip under full load conditions, the White finding associated with this issue will only be considered in assessing plant performance for a total of four quarters in accordance with

the guidance in IMC 0305, Operating Reactor Assessment Program. The Resident Inspectors will continue to monitor the licensee's performance and track the licensee's progress in implementing the remaining corrective action.

Findings

- Green. A finding of very low safety significance and associated NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," was identified by the inspector for the licensee's failure to implement the requirements of PI-AA-205, "Condition Evaluation and Corrective Action," which states in part that the "Closure of Corrective Actions is not permitted until corrective actions are completed..." Specifically, the licensee failed to complete the corrective actions as written, in that the B EDG overspeed micro switch was not verified to be installed in accordance with the licensee's setup procedure, prior to closing CA 51294. The licensee reopened CA 51294 to complete its original assignment and entered the deficiency into their corrective action program as CAP 71693. Additionally, the licensee planned to perform an extent of condition and extent of cause evaluation to address the deficiency.

The inspector determined that the issue was a performance deficiency because it was the result of the failure to meet a requirement, and the cause was reasonably within the licensee's ability to foresee and correct, and should have been prevented. The finding was determined to be more than minor because if left uncorrected, could become a more significant safety concern. Specifically, the assignments in CA 51294 were designated as corrective actions to prevent recurrence (CATPRs) of a risk-significant issue associated with the 'B' EDG output breaker tripping under full load. Using IMC 0609, Appendix A, the inspector determined the finding was of very low safety significance (Green) because the finding did not result in a loss of operability or functionality. This finding has a cross-cutting aspect in the area of Problem Identification, Corrective Action Program, because the licensee failed to thoroughly evaluate problems such that the resolutions address causes. Specifically, the licensee's procedure requires that a senior manager evaluate and ensure all corrective actions with significance level 'A' are complete prior to closure. However, the Maintenance Manager, assigned to CA 51294, did not thoroughly evaluate the corrective action and inappropriately closed CA 51294 before verifying the assigned actions were complete (P.1(c)) (Section 02.03.f).

REPORT DETAILS

4. OTHER ACTIVITIES

4OA4 Supplemental Inspection (95001)

01. Inspection Scope

This inspection was conducted in accordance with Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation of a White finding which affected the mitigating systems cornerstone in the reactor safety strategic performance area. The inspection objectives were to:

- provide assurance that the root causes and contributing causes of risk-significant performance issues are understood;
- provide assurance that the extent of condition and extent of cause of risk-significant issues were identified; and
- provide assurance that licensee corrective actions to risk-significant performance issues are sufficient to address the root causes and contributing causes, and to prevent recurrence.

In a letter dated June 9, 2009, the NRC communicated the final significance determination for a finding having low to moderate safety significance (i.e., White), with one associated violation of NRC requirements, at Duane Arnold. The finding was associated with the failure to promptly identify and correct a condition adverse to quality, which resulted in the Train B emergency diesel generator output breaker tripping under full load conditions while conducting a monthly surveillance test. The details of the performance issue and the preliminary results of the NRC's significance evaluation were documented in 05000331/2009009. Duane Arnold entered the Regulatory Response column of NRC's Action Matrix in the 2nd quarter of 2009 as a result of the White finding. On September 17, 2009, the licensee staff notified the NRC staff that it had completed its Root Cause Evaluation, RCE 1078 Rev 3, of the circumstances surrounding the risk-significant performance issue and were ready for the NRC to assess the licensee's evaluation and subsequent corrective actions. In preparation for the inspection, the licensee also performed a self-assessment to assess their readiness for the supplemental inspection.

The inspectors reviewed the licensee's RCE in addition to other evaluations conducted in support and as a result of the RCE. The inspectors reviewed corrective actions that were taken or planned to address the identified causes. The inspectors also held discussions with the licensee personnel to ensure that the root and contributing causes and the contribution of safety culture components were understood and corrective actions taken or planned were appropriate to address the causes and preclude repetition.

.02 Evaluation of the Inspection Requirements

02.01 Problem Identification

- a. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents who identified the issue (i.e., licensee-identified, self-revealed, or NRC-identified) and the conditions under which the issue was identified.

While performing a Technical Specification required surveillance run of the 'B' EDG on November 2, 2008, operators received an engine overspeed alarm. This was the first instance of the overspeed alarm coming in while the EDG was running. The overspeed alarm cleared, and then multiple alarms were received over the next several minutes. After approximately 30 to 50 'B' EDG overspeed alarms being received and then clearing, the output breaker unexpectedly tripped open while the EDG was loaded. The 'B' EDG never reached an actual overspeed condition and the engine continued to run unloaded after the breaker tripped open. Operations personnel declared the 'B' EDG inoperable.

The licensee entered their failure investigation process (FIP) to troubleshoot, identify, and repair the cause of the 'B' EDG output breaker tripping open. Subsequent investigations, as part of the FIP, identified several concerns that were resolved prior to restoration of the engine to operable status. These concerns were identified as; the overspeed alarm could be actuated by shaking the conduit, the micro switch $\frac{3}{4}$ " locknut was loose, and the wires connecting the EOS showed minor damage to the outer jacket in the last six inches to the switch. On November 5, 2008, the 'B' EDG was repaired and declared operable. Root Cause Evaluation (RCE) 1078 was initiated to determine the root cause of the 'B' EDG output breaker trip.

The inspector determined that the root cause evaluation adequately described the conditions of this self-revealing event.

- b. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's evaluation of the issue documents how long the issue existed and prior opportunities for identification.

The inspector determined that the root cause evaluation adequately identified how long the issue existed and whether there were any prior opportunities for identification.

The licensee concluded that both of the root causes had to exist in order for the event to occur because none of the causes would have in and of itself caused the 'B' EDG output breaker trip. The combination of the causes resulted in a condition that resulted in a trip of the 'B' EDG output breaker at the completion of the operability run performed in November of 2008. During station troubleshooting efforts related to breaker opening, a clear relationship was confirmed between the as-found condition of the EOS micro switch and the failure. The micro switch plunger spring preload had been lost. The licensee determined the condition reached a critical point at the time of the test, and under the influence of normal engine vibration at that point, initiated repetitive spurious overspeed alarms, and ultimately a trip of the "B" EDG output breaker. The licensee's RCE identified no single cause for the micro switch failure and concluded that the

'B' EDG became inoperable at the time of the output breaker trip with no past operability concerns identified.

The licensee identified that there may have been multiple opportunities to identify and correct the degraded conditions before the event. The licensee began receiving the first of many spurious overspeed trip alarms on February 13, 2008, during shiftly EDG overspeed trip checks. The licensee continued to receive spurious overspeed trip alarms until the "B" EDG output breaker finally tripped on November 2, 2008. Multiple examples of missed opportunities were discussed in the root cause evaluation, including the licensee's decision not to expand the scope of their troubleshooting investigation following the replacement of an overspeed annunciator card in July 2008. This was contrary to the requirements of licensee procedure ACP 109.3, Troubleshooting Process, which states that following initial troubleshooting efforts, the licensee shall "collect results, data, outcomes, facts, information, etc. obtained from executing the Troubleshooting Plan. Compare these results to the expected results of the plan...If the problem is not corrected, then return to section 3.10 [Approval of Formal Troubleshooting Plan] and revise the Troubleshooting plan as necessary. If further follow-up actions are required, then enter the Corrective Action process. Follow-up actions may include: [an] Apparent Cause Evaluation (ACE)." In addition, the licensee identified a missed opportunity to consider the overspeed switch as a potential source of the alarms by performing an apparent cause evaluation. However, the Management Review Committee (MRC) accepted the ACE closure, with the belief that the cause was with local annunciator electronic alarm cards, even though there were outstanding actions yet to be completed. The licensee also determined that CAPs generated to address the frequent overspeed alarms were closed to other CAPs and work orders (WOs) without ensuring that the problem identified had been adequately investigated. The RCE also noted that there were several CAPs written that identified the specific operator action, using the conduit as a handle, occurring during the spurious trips as happening during the daily reset checks. However, none of the investigations effectively analyzed the effect of that action.

The inspector determined that the root cause evaluation adequately identified how long the issue existed and whether there were any prior opportunities for identification.

- c. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's evaluation documents the plant-specific risk consequences, as applicable, and compliance concerns associated with the issue.

The RCE determined that there was no direct impact on nuclear safety as a result of this event. The licensee noted that the 'A' EDG was operable and available at the time of the 'B' EDG trip. There was no single cause for the micro switch failing identified, but rather, the RCE team concluded that a combination of several factors caused the trip on November 2, 2008. Therefore, it was concluded that the EDG became inoperable at the time of the trip and no past operability concerns were identified.

While the RCE did not specifically address the compliance concerns, the licensee did provide a response to the NRC Follow-Up Inspection Report, which informed the licensee of the preliminary White finding. In the licensee's letter, dated May 29, 2009, they indicated that they understood the staff's position with regard to the safety significance and cause of the performance issue. The licensee did not request a Pre-decisional Enforcement Conference (PEC) nor did they contest the characterization of the finding

and violation. Additionally, the licensee contracted with an outside engineering firm to provide Probabilistic Risk Assessment (PRA) support of the Phase III SDP for the 'B' EDG output breaker trip. In a letter dated February 13, 2008, the engineering firm provided the results of their analyses to a Region III Senior Reactor Analyst. In the report, the licensee concluded that the safety significance of the 'B' EDG event was WHITE based on an exposure time of 180 days.

Based upon the above documented observations, the inspector concluded that although the licensee did not specifically address the safety significance in the RCE, the licensee was able to provide additional documentation that adequately assessed the safety significance and impact on nuclear safety.

d. Findings

No findings of significance were identified.

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

- a. Inspection Procedure 95001 requires that the inspection staff determine that the licensee evaluated the issue using a systematic methodology to identify the root and contributing causes.

The licensee used the following systematic methods to complete RCE-1078:

- events and causal factors analysis;
- failure mode analysis;
- data analysis;
- why staircase; and
- data gathering through interviews and documents review.

The licensee used an Organizational and Programmatic (O & P) Analysis to evaluate the possible programmatic deficiencies and organizational weaknesses that created an environment that allowed error precursors to go unidentified for long periods of time and that ultimately led to poor work order quality.

The inspector determined that the root cause evaluation adequately applied systematic methods in evaluating the issue in order to identify root causes and contributing causes.

- b. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's RCE was conducted to a level of detail commensurate with the significance of the issue.

The licensee's RCE included an extensive event narrative and an event and causal factor tree as discussed in the previous section. The licensee's RCE determined the root causes which led to the partial initiation of the overspeed trip logic were: 1) a lack of detailed instructions associated with installation/set-up of the Engine Overspeed Switch (EOS) micro switch, and 2) the operators use of the EOS conduit as a handle during

overspeed resets or reset checks resulted in momentary movement of the micro switch and contributed to the EOS micro switch hex locknut loosening. The RCE determined the contributing causes included: 1) the arrangement of supports for the conduit assembly to the EOS micro switch allowed engine vibration to affect the tightness of the locknut, and 2) CAP items were closed to other CAPs and WOs without ensuring that the problem identified had been adequately investigated.

Based upon the work performed for this root cause, the inspectors concluded that the root cause evaluation was conducted to a level of detail commensurate with the significance of the problem.

- c. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's RCE included a consideration of prior occurrences of the issue and knowledge of operating experiences (OE).

The licensee's RCE included an evaluation of internal and external OE. The licensee conducted an internal search in their corrective action program for CAPs generated for overspeed alarms received from February 2008 to September 2008. No other significant issues were found during the CAP data review related to the EDG overspeed issues. In addition to the CAP review, the licensee reviewed the work performed on the EDG since 1996 to establish if this or a similar condition existed prior to the repairs done in February, 2007. The licensee did identify one work order to replace the micro switch in 1993. The RCE could not locate any information on similar trips on either engine prior to the maintenance to replace the micro switch in February 2007. Based on the data from the internal OE search the licensee concluded that the previous efforts to address spurious overspeed trip annunciators were mainly focused on the alarm cards even after initial corrective actions failed to correct the problem. The licensee identified similar events that could have been used to prevent this problem had they been appropriately classified, investigated, and had appropriate action put in place.

The licensee did a formal industry OE search that included a search in the INPO Plants Events Database. The licensee also questioned the Fairbanks Morse Owners Group to determine if there was similar operating experience in the industry with respect to opposed piston engines and/or Fairbanks Morse engines. The questionnaire results indicated that other sites have had issues with the set up of the limit switch and lock washer loosening due to vibration. However, the licensee determined that no formal industry OE existed prior to the event and did not consider this a missed opportunity.

The inspector determined that the root cause evaluation adequately included consideration of prior occurrences of the problem and knowledge of prior operating experience.

- d. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's RCE addresses the extent of condition and extent of cause of the issue.

The inspector determined that the root cause evaluation adequately addressed the extent of condition and extent of cause of the problem. In RCE 1078, the licensee looked at the potential impact of the risk-significant performance issue on plant staff, plant processes, plant organizations and plant equipment.

People: The licensee concluded that the extent of condition was not limited to a single individual or small group of individuals. This is because there were only two groups of people that performed work on or around the micro switch of the EDG. The operations personnel perform shiftly resets, and maintenance personnel troubleshoot and repair the components.

Processes: The licensee evaluated the repair of the limit switch and running the diesel for extent of condition. The RCE concluded that the diesel runs are not specific to this type of failure in that it did not matter what type of surveillance was being conducted during the failure. It was determined that all runs of the diesel are bound by the extent of condition. The process of repairing the micro switch contains several sub-processes that include troubleshooting and replacement. The licensee determined that the aforementioned processes are bound by the extent of condition.

Organization: The RCE concluded that the only organizations affected by the extent of condition of the event were the Maintenance and Operations department.

Equipment: The licensee determined that the extent of condition evaluation includes 'A' EDG because there are identical components. The Technical Support Center (TSC) Diesel was also included because it contains similar components. The licensee reasoned that a similar event has the potential to affect the 'A' EDG. The licensee's FIP team reviewed the 'A' EDG common cause evaluation, CE 6808, prepared on November 3, 2008. The conditions found by the FIP team with the 'B' EDG did not call in to question the conclusion of the common cause evaluation. Specifically,

- No inadvertent engine overspeed alarms have been received on the 'A' EDG during standby or running conditions.
- The maintenance history on the 'A' EDG did not suggest that there was a problem with the setup of the installed overspeed trip.
- Performance of STP 3.8.1-03 "Standby Diesel Generators Operability Test" was completed November 2, 2008, exercising the engine start and normal shutdown circuits with no control problems.
- The high contact resistance readings on the engine overspeed relay and shutdown relay did not cause the inoperability of the 'B' EDG and, therefore, did not represent a common cause concern.

The licensee's extent of condition evaluation did not find evidence of a generic issue related to design, manufacturer defects, or the historical maintenance performed on the 'A' EDG. It was determined that the extent of condition did not include the TSC DG because the TSC DG is not safety related and the design of the limit switch is slightly different.

In the extent of cause evaluation, the licensee identified the "EOS Microswitch" as the cause of the invalid output breaker trip and as a critical component. The evaluation determined that this component was actuated by a mechanical linkage on a machine to cause a specific action. The licensee did a search to find those components for which the same cause applies. Additionally, the extent of cause listed the components that may be removed and replaced as a part of disassembly, components that actuate to cause a specific function, and the components that require mechanical setup for proper

operation. The licensee identified that some components associated with instrumentation and bistables/switches, such as Control Building Chiller low flow switches and the Core Spray Pump discharge pressure switches for the Alternate Depressurization System permissive bistable, were applicable. The licensee initiated corrective actions for those components that have a mechanical machine interface with no setup instructions. The inspector reviewed the corrective actions and concluded that they were sufficient to address the critical components identified in the extent of cause.

The inspector determined that the licensee's extent of cause was adequate to address the root causes and contributing causes identified. However, the inspector had several observations regarding specific aspects of the extent of cause and corrective actions that warranted additional consideration by the licensee staff. The inspector observed that the evaluation was too narrowly focused on addressing the mechanical failure of the B EDG and struggled to specifically assess the applicability of the root causes across disciplines or departments for different programmatic activities. A considerable portion of the licensee's evaluation focused on the mechanical failure of the micro switch component rather than the important organizational weaknesses that may have led to the 'B' EDG output breaker trip such as the reliance on skill of craft rather than detailed installation procedures, or the management's decision not to enter into formal troubleshooting. With further review and subsequent discussions with the licensee staff, the inspector determined that the licensee's evaluation sufficiently evaluated the applicability of the extent of cause as it relates to the root causes and contributing causes on the plant organizations.

- e. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's root cause, extent of condition, and extent of cause evaluations appropriately considered the safety culture components as described in IMC 0305.

The inspectors determined that, in general, the root cause evaluation, extent of condition, and extent of cause appropriately considered the safety culture components as described in IMC 0305. The inspectors noted, however, that the licensee's root cause evaluation and the safety culture components review identified the possible safety culture weaknesses associated with the performance issue but failed to specifically consider whether any safety culture weaknesses were a root cause or contributing cause.

The licensee completed a Safety Culture Components Review as part of the root cause evaluation. Separate from the root cause evaluation, the licensee provided a White paper to clarify and further evaluate the impact of safety culture weaknesses on the event. Upon review, it was determined that the licensee addressed the safety culture components relevant to the event.

- f. Findings

No findings of significance were identified.

02.03 Corrective Actions

- a. Inspection Procedure 95001 requires that the inspection staff determine that: (1) the licensee specified appropriate corrective actions for each root and/or contributing cause, or (2) an evaluation that states no actions are necessary is adequate.

The inspector reviewed applicable corrective actions and corrective actions to prevent recurrence and determined that the licensee specified reasonable corrective actions for each root/ contributing cause. The inspector also reviewed implementation of the corrective actions to verify completion status and found that the licensee completed the majority of the planned corrective actions, except for one. However, during a self-assessment, done in preparation for this inspection, the licensee identified that they had not completed the actions listed in CA 51294. The inspector determined that the licensee's failure to complete the actions listed in CA 51294 was a performance deficiency and is discussed in section 02.03.f of this report.

The licensee's root cause evaluation concluded that two root causes and two contributing causes applied to the 'B' EDG output breaker trip event. These causes are discussed above in Section 02.02.b. Corrective actions included the following:

- Develop and implement guidance in either a new procedure or existing procedure detailing the set-up and installation of the overspeed micro switches. This guidance shall define requirements for installation including criteria to assure that the Margin to trip is maintained and the structural soundness of all fasteners (CATPR).
- Inspect the set-up of ZC3236A (microswitch) on 1G031A ('A' EDG) to assure set-up is in accordance with the new procedural guidance. Validate that ZC3236B set-up that occurred via CWO A80272 was done in accordance with the procedure that was developed for the switch installation. If it needs to be adjusted generate a CWO (CATPR).
- Review the installation of the equipment identified in the extent of cause evaluation to assure adequate instructions for set-up of margins to trip are established.
- Discontinue the practice of resetting the EDG engine overspeed latch once per shift (CATPR).
- Perform an inspection of the internal linkage of 1G021 during RFO21. This linkage was disassembled during RFO 20 and should be inspected to assure appropriate tolerances are maintained for the setup of the microswitch.
- Install EDG fuel rack reset access stairs to assist Operators while performing the overspeed resets.

- Revise the ACP 1408.1, Attachment 5, Online Prioritization Matrix to require troubleshooting activities be Priority 2 items.
- Develop and implement a Learning Opportunity associated with troubleshooting directly associated with this RCE. This Learning Opportunity will be provided to Engineering, MRC, IST, Operations, and Maintenance.

- b. Inspection Procedure 95001 requires that the inspection staff determine that the licensee prioritized corrective actions with consideration of risk significance and regulatory compliance.

The inspectors determined that the licensee adequately prioritized the corrective actions with consideration of the risk significance and regulatory compliance. The licensee's corrective actions appeared to be prioritized commensurate with the safety significance of the issues.

- c. Inspection Procedure 95001 requires that the inspection staff determine that the licensee established a schedule for implementing and completing the corrective actions.

The licensee established a reasonable schedule for implementing the corrective actions. Corrective actions reviewed were complete with the exception of CA 51294, which directed the licensee to verify the set-up of the micro switch on the 'B' EDG. The licensee is scheduled to verify the set-up of the 'B' EDG during their next EDG maintenance overhaul in February 2010. The licensee also has a comprehensive effectiveness review scheduled for completion at the end of operating cycle 22.

The inspectors determined that the licensee adequately established a schedule for implementing and completing the corrective actions.

The licensee's RCE included a table that listed each corrective action with the appropriate root cause or contributing cause. The table also included the due date and licensee owner.

- d. Inspection Procedure 95001 requires that the inspection staff determine that the licensee developed quantitative and/or qualitative measures of success for determining the effectiveness of the corrective actions to preclude repetition.

The licensee is scheduled to perform an Effectiveness Review, at the end of the RFO22, to assess all the corrective actions to prevent recurrence discussed above. This Effectiveness Review is being tracked in DAEC's CAP as EFR 51301.

The inspector determined that the licensee developed appropriate quantitative or qualitative measures of success for determining effectiveness of the corrective actions to prevent recurrence.

- e. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's planned or taken corrective actions adequately address a Notice of Violation (NOV) that was the basis for the supplemental inspection, if applicable.

The NRC issued an NOV to the licensee on June 9, 2009. The licensee implemented several corrective actions to address the deficiency. The corrective actions included, in part, replacing the 'B' EDG overspeed micro switch, developing written instructions for installation and setup of the micro switch, inspecting the 'A' EDG overspeed switch for extent of condition; stopping the practice of resetting the EDG overspeed latch once per shift, repair of the overspeed electrical conduit support bracket, and revisions to the station's administrative control procedure for troubleshooting to require more rigorous troubleshooting activities for Priority 2 items. The inspector determined that the licensee had planned and taken corrective actions to adequately address the NOV.

f. Findings

Introduction: A finding of very low safety significance and associated NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures and Drawings," was identified by the inspector for the licensee's failure to implement the requirements of PI-AA-205, "Condition Evaluation and Corrective Action." Specifically, the licensee inappropriately closed CA 51294 before completing the associated corrective actions to prevent reoccurrence.

Description: During this supplemental inspection, the inspector assessed the licensee's root cause evaluation and corrective actions associated with the 'B' EDG output breaker tripping under full load conditions during a monthly surveillance on November 2, 2008. The 'B' EDG never reached an actual overspeed condition and the engine continued to run unloaded after the breaker tripped open. Operations personnel declared the 'B' EDG inoperable. The finding was characterized as White based on the results of a Phase 3-risk analysis performed by a region-based SRA, as discussed in detail in NRC IR 05000331/2009009. The failure of 'B' EDG during the monthly surveillance was attributed to a partial initiation of the overspeed trip logic from the overspeed micro switch. Immediately following the event the licensee took several corrective actions to restore operability and operations declared the EDG operable on November 8, 2008.

As a result of the 'B' EDG output breaker trip the licensee initiated RCE 1078. Based on the root causes and contributing causes identified, the licensee recommended several corrective actions to address each cause. The licensee designated the trip of the 'B' EDG output breaker as being a Significant Condition Adverse to Quality (SCAQ) and, in accordance with licensee procedure PI-AA-205, classified the recommended actions as CAPTRs.

On September 17, 2009, the licensee informed the NRC they were ready for inspection. In preparation for the NRC 95001 inspection, the licensee conducted a self-assessment to evaluate the RCE 1078 against NRC Inspection Procedure 95001 and to determine the licensee's readiness for the inspection. During the self-assessment, the licensee identified that CA 51294 had not been completed as written. This corrective action was initiated by the RCE 1078 to address one of the licensee's two root causes and classified as a significance level 'A'. According to licensee procedure PI-AA-205, level 'A' corrective actions address SCAQs and require special management attention to ensure completion. The corrective actions listed in CA 51294 were to: 1) inspect the set-up of the ZC3236A micro switch on the 'A' EDG to assure that it was set-up in accordance with the new procedural guidance and 2) validate that the setup of ZC3236B ('B' EDG micro switch) was done in accordance with the new procedural guidance. On March 1, 2009, the licensee closed CA 51294 and documented the inspection of the

ZC3236A micro switch as being complete. Following the self-assessment, the licensee did a review of CA 51294 and determined that set-up of the micro switch on the 'B' EDG was not validated in accordance with the new procedure. Specifically, the licensee did not verify the completion of step 5.10(2) of procedure GENERA-F010-01, which required verification that manufactured applied torque was present on the external lock nut on the switch. Licensee procedure PI-AA-205 states that the "closure of Corrective Actions is not permitted until corrective actions are completed..." On August 7, 2008, the licensee initiated CAP068886 to document the inappropriate closure of CA 51294. CA 53056 was initiated to determine if existing work orders for the scope of the February 2010 maintenance window could include the check on the setup of the 'B' EDG micro switch.

Upon the review of CA 53056, the inspector noticed that the licensee classified the corrective action as a level 'C.' Further review revealed that the check on the 'B' EDG micro switch had been scheduled for February 2010 and CA 53056 was to remain open pending completion of the work. The inspector questioned the safety significance and the licensee's decision to wait until February to perform the work. During discussions with the inspector, the licensee's engineering staff was able to provide technical justification and reasonable assurance that 'B' EDG was still operable. Additionally, the inspector questioned the licensee's classification of CA 53056 as a level 'C' corrective action. Upon further discussion with the licensee, it was discovered that the significance level of the CA 530056 was incorrect and not in accordance with licensee procedure PI-AA-205. Based on site procedures, CA 53056 should have been classified as a level 'A' since it was tied to CA 51294, a level 'A' CATPR. The licensee initiated CAP 71693 to determine why the misclassification occurred and reopened the original corrective action, CA 51294, to validate the setup of the micro switch on the 'B' EDG.

It should be noted that corrective actions to validate the setup of the 'B' EDG micro switch were initiated by the licensee to correct a risk-significant event associated with a White finding. The inspector identified a previously unknown weakness in the licensee's classification of CA 53056 and, as such, added value to the licensee's identification of the failure to complete CA 51294.

Analysis: The inspectors determined that the licensee's failure to complete the corrective actions as written prior to closure, of CA 51294, was contrary to licensee procedure PI-AA-205, "Condition Evaluation and Corrective Action," and was a performance deficiency.

The finding was determined to be more than minor because, if left uncorrected, the finding had the potential to lead to a more significant safety concern. Specifically, the failure to complete the CATPR of a SCAQ has the potential to lead to a more significant safety concern. The assignments in CA 51294 were designated, by the licensee, as corrective actions to correct a risk-significant issue associated with the 'B' EDG output breaker tripping under full load. Failing to verify the appropriate torque on the external lock nut on the switch could potentially lead to a partial initiation of the overspeed trip logic and leave the 'B' EDG vulnerable to a reoccurrence of the output breaker tripping under full load conditions. The inspectors concluded this finding was associated with the Mitigating Systems Cornerstone.

The inspectors determined the finding could be evaluated using the SDP in accordance with IMC 0609, "Significance Determination Process," Attachment 0609.04, "Phase 1 - Initial Screening and Characterization of Findings," Table 4(a) for the Mitigating Systems

because the finding is associated with the 'B' EDG. The inspectors determined that the issue had very low safety significance (Green) because the finding did not result in an actual loss of operability or functionality.

The inspectors also determined the finding had a cross-cutting aspect in the area of Problem Identification, Corrective Action Program, because the licensee failed to thoroughly evaluate problems such that the resolutions address causes. Specifically, the licensee's procedure requires that a senior manager evaluate and ensure all corrective actions with significance level 'A' are complete prior to closure. Contrary to this requirement, the Maintenance Manager inappropriately closed CA 51294 before verifying that the assigned actions were complete. [P.1(c)]

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Licensee procedure PI-AA-205, "Condition Evaluation and Corrective Action," Revision 03, states, in part, that the "Closure of Corrective Actions is not permitted until corrective actions are completed..."

Contrary to the above, on March 1, 2009, the licensee failed to implement the requirements of licensee procedure PI-AA-205, "Condition Evaluation and Corrective Action." Specifically, the licensee failed to complete the corrective actions as written, in that the 'B' EDG overspeed micro switch was not verified to be installed, in accordance with the licensee's setup procedure, prior to closing CA 51294. Because this violation was of very low safety significance and it was entered into the licensee's corrective action program as CAP 071693 this violation is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy (NCV 05000331/2009013-01).

40A6 Exit Meeting

.01 Exit Meeting Summary

The inspector presented the inspection results by telephone conference to Mr. Chris Constanzo, Site Vice President, and other members of licensee management on December 15, 2009. The licensee confirmed that no proprietary information was reviewed during this inspection.

.02 Regulatory Performance Meeting

On December 15, 2009, the NRC discussed with the licensee, via teleconference, its performance in accordance with IMC 0305, Section 10.01.a. The meeting was attended by Region III Deputy Division Director of Reactor Projects and other NRC staff. During this meeting, the NRC and the licensee discussed the issues related to the White finding that resulted in the Duane Arnold Energy Center, 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 licensee actions.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

C. Costanzo, Site Vice President
D. Curtland, Plant General Manager
B. Eckes, NOS Manager
S. Catron, Licensing Manager
K. Kleinheinz, Engineering Director
B. Kindred, Security Manager
B. Simmons, Training Manager
C. Dieckmann, Operations Manager
G. Rushworth, Assistant Operations Manager
R. Porter, Chemistry & Radiation Protection Manager
M. Davis, Emergency Preparedness Manager
M. Lingenfelter, Design Engineering Manager
M. Ogden, Maintenance Manager (acting)

Nuclear Regulatory Commission

K. Feintuch, Project Manager, NRR
K. Riemer, Chief, Reactor Projects Branch 2

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Discussed

05000331/2009012-01 NCV Failure To Implement Licensee Procedure PI-AA-205,
"Condition Evaluation and Corrective Action" (02.03.f)

Closed

05000331/2009009-01 VIO Failure to Promptly Identify and Correct a Significant
Condition Averse to Quality Associated with the 'B' EDG

05000331/2009012-01 NCV Failure To Implement Licensee Procedure PI-AA-205,
"Condition Evaluation and Corrective Action" (02.03.f)

LIST OF DOCUMENTS REVIEWED

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

PLANT PROCEDURES

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
PI-AA-205	Condition Evaluation and Correction Action	Revision 3
CAEFRM	Corrective Action Effectiveness Review Manual	Revision 3
GENERA-F010-01	I&C Inspections	Revision 20
ACP 1408.1	Work Orders: On Line Prioritization Matrix Guideline	Revision 149
RCEM	Root Cause Evaluation Manual	Revision 17

CORRECTIVE ACTION PROGRAM DOCUMENTS REVIEWED

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
CAP061469	SCAQ-B SBDG 1G021 Output Breaker 1A411 Trip Open During STP 3.8.1-05B	11/02/2008
CAP068886	CAQ- CA 51294 Closed Without All Actions Completed	08/07/2009
CA051294	CAQ- RCE 1078- Inspect the Set-up of ZC3236A 1G031A	12/12/2008
CA053056	CAQ- CA 51294 Closed Without All Actions Complete	08/11/2009
CA051293	CAQ RCE 1078- CA1- EOS Micro switch Setup	12/12/2008
PCR51588	CAQ RCE 1078- CA1- EOS Micro switch Setup	01/27/2009
CA051295	CAQ-RCE 1078- Extent of Cause	12/12/2008
CA051296	CAQ- RCE 1078- Engine Overspeed Reset Checks	12/12/2008
CA051297	CAQ- RCE 1078- Inspect EDG	12/12/2008
CA051298	CAQ-RCE 1078- Install Handle on EDGs	12/12/2008
CA051300	CAQ- RCE 1078 - Learning Opportunity	12/12/2008
CA051299	CAQ- RCE 1078- Online Prioritization Matrix	12/12/2008
CA052436	CAQ- RCE 1078 - Learning Opportunity	05/15/2009
CA052438	CAQ- RCE 1078 - Learning Opportunity	05/15/2009
CA052439	CAQ- RCE 1078 - Learning Opportunity	05/15/2009
CA052437	CAQ- RCE 1078 - Learning Opportunity	05/15/2009
CA052696	SCAQ-B SBDG 1G021 Output Breaker 1A411 Trip Open During STP 3.8.1-05B	06/16/2009
CAP061469	SCAQ-B SBDG 1G021 Output Breaker 1A411 Trip Open During STP 3.8.1-05B	11/02/2008
CAP068886	CAQ- CA 51294 Closed Without All Actions	08/07/2009

CORRECTIVE ACTION PROGRAM DOCUMENTS REVIEWED

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
CA051294	Completed CAQ- RCE 1078- Inspect the Set-up of ZC3236A 1G031A	12/12/2008
CA053056	CAQ- CA 51294 Closed Without All Actions Complete	08/11/2009
CA051293	CAQ RCE 1078- CA1- EOS Micro switch Setup	12/12/2008
PCR51588	CAQ RCE 1078- CA1- EOS Micro switch Setup	01/27/2009
CA051295	CAQ-RCE 1078- Extent of Cause	12/12/2008
CA051296	CAQ- RCE 1078- Engine Overspeed Reset Checks	12/12/2008
CA051297	CAQ- RCE 1078- Inspect EDG	12/12/2008
RCE 001084	Negative Trend in NRC PI&R Cross-Cutting	
RCE 1078	'B' EDG Output Breaker Trip	Revision 3

CONDITION REPORTS GENERATED DURING INSPECTION

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
CAP071693	RCE 1078- CA to Inspect B EDG Overspeed Micro switch	12/08/2009
CAP071757	NRC 95001 Observations	12/11/2009
CAP071835	Review B EDG 95001 Inspection Lessons Learned	12/15/2009

MISCELLANEOUS

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
PWR 46423	CA 51299 CAQ- RCE 1078- Online Prioritization Matrix	03/25/2009
EWR035692	Licensee Training: Troubleshooting 101, A Case Study on EDG Micro Switch Failure Engineering Work Request- Provide Support to Phase III Significance Determination for the SDDB 1G201 Trip	01/30/2009
EFR051301	RCE1078- Effectiveness Review RCE 1078 Safety Culture Analysis White Paper	12/12/2008

MISCELLANEOUS

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
OTH034590	RCE 1078 - EDG SDR PMs	12/12/2008
OTH034589	RCE 1078- EDG Relay Panel Heaters	12/12/2008
SA 52778	RCE 1078 NRC Inspection Procedure 95001 Assessment	Revision 1
OTH040715	RCE 1078 Enhancements	08/12/2009
OTH040716	RCE 1078 Clarification	08/12/2009
PK 88172	Installation Instructions for BZE6/V and BZG/H Enclosed Switches	
BZE6-RQ	Drawing: Switch-Enclosed	
NG-053K	Replacement Parts Specification	Revision 9

Work Orders

<u>Number</u>	<u>Description or Title</u>	<u>Date or Revision</u>
1148072	Inspect TEs and Check Timing Relays	08/17/2009
A80272-S	Replace Components(EOS, EOR relay, SDR relay, wiring as directed)	12/03/2008
1151279	Manufacture and Install Fuel Rack Reset Lever Access Stairs in Accordance with ECP 1893	08/13/2009
1151280	Manufacture and Install Fuel Rack Reset Lever Access Stairs in Accordance with ECP 1893	08/17/2009

LIST OF ACRONYMS USED

ACE	Apparent Cause Evaluation
ADS	Automatic Depressurization System
CAP	Corrective Action Program
CATPR	Corrective Action to Prevent Reoccurrence
CAQ	Condition Adverse to Quality
CE	Condition Evaluation
CFR	Code of Federal Regulations
CWO	Corrective Work Order
DAEC	Duane Arnold Energy Center
DG	Diesel Generator
EDG	Emergency Diesel Generator
EFR	Effectiveness Review
EOS	Engine Overspeed Switch
FIP	Failure Investigation Process
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IST	In-service Testing
IMC	Inspection Manual Chapter
MRC	Management Review Committee
NCV	Non-Cited Violation
NOV	Notice of Violation
NRC	U.S. Nuclear Regulatory Commission
OE	Operating Experience
O & P	Organizational and Programmatic
PEC	Pre-decisional Enforcement Conference
RCE	Root Cause Evaluation
RFO	Refueling Outage
SCAQ	Significant Condition Adverse to Quality
SDP	Significance Determination Process
SRA	Senior Reactor Analyst
STP	Surveillance Test Procedure
TSC	Technical Support Center
URI	Unresolved Item
WO	Work Order

C. Costanzo

-3-

We will gladly discuss any questions you have concerning this inspection.

Sincerely,

/RA by Gary Shear, Acting For/

Steven West, Director
Division of Reactor Projects

Docket No. 50-331
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Letter to C. Costanzo from S. West dated January 28, 2010

SUBJECT: DUANE ARNOLD ENERGY CENTER
NRC SUPPLEMENTAL INSPECTION REPORT NO. 05000331/2009013

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