



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
1600 E. LAMAR BLVD.  
ARLINGTON, TX 76011-4511

May 11, 2017

EA-16-273

Adam C. Heflin, President and  
Chief Executive Officer  
Wolf Creek Nuclear Operating Corporation  
P.O. Box 411  
Burlington, KS 66839

SUBJECT: WOLF CREEK GENERATING STATION - NRC INSPECTION REPORT  
5000482/2016003 AND RESPONSE TO DISPUTED NON-CITED VIOLATION

Dear Mr. Heflin:

On November 8, 2016, the U.S. Nuclear Regulatory Commission (NRC) issued the subject inspection report and non-cited violation (NCV) of Technical Specification 5.4.1.a, "Procedures," associated with the failure to develop and specify preventive maintenance activities that considered vendor recommendations and operating experience to ensure safety-related equipment remains capable of performing its safety functions (Agencywide Documents Access and Management System (ADAMS) Accession ML16314B839).

On December 8, 2016, you provided a response (ADAMS Accession ML16350A100) in which you contested the NCV 05000482/2016003-01 described in the inspection report. On December 19, 2016, the NRC acknowledged receipt of this letter (ADAMS Accession ML16354B181) and informed you that we would evaluate your response and provide you the results of our evaluation.

We conducted a detailed review of your response and the applicable regulatory requirements, in accordance with Part I, Section 2.2.7, of the NRC Enforcement Manual. The NRC staff who performed the review were not involved with the original inspection effort. After careful consideration of the basis for your denial of the NCV, we have concluded that the inspection report adequately describes the violation and characterization of the finding; however, clarification regarding the basis for the NCV is provided in the enclosure to this letter. As a result, the NRC is upholding the NCV contained in the inspection report.

The results of the NRC's evaluation of your reply to the NCV are contained in the enclosure to this letter. In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 2.390, "Public inspections, exemptions, requests for withholding," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC's ADAMS, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

Sincerely,

  
Kriss M. Kennedy  
Regional Administrator

SCOTT A. MORRIS  
DEPUTY, RA, RTR

Docket No. 50-482  
License No. NPF-42

Enclosure:  
NRC Evaluation of Licensee Response  
to Non-Cited Violation

cc: Electronic Distribution



## **NRC EVALUATION OF LICENSEE RESPONSE TO NON-CITED VIOLATION**

### **Restatement of the Non-Cited Violation**

Technical Specification 5.4.1.a, "Procedures," requires, in part, that procedures shall be established, implemented, and maintained covering the applicable procedures recommended in Appendix A to Regulatory Guide 1.33, Revision 2. Section 9.b of Appendix A to Regulatory Guide 1.33, Revision 2, requires that preventive maintenance schedules be developed to specify inspections of equipment and inspection or replacement of parts that have a specific lifetime. The licensee established Procedure AP 16B-003, "Planning and Scheduling Preventive Maintenance," which provides direction for implementing the preventive maintenance program to meet the Regulatory Guide 1.33 requirement. Section 6.2 of Procedure AP 16B-003 requires, in part, that preventive maintenance activities be developed by considering vendor recommendations and operating experience.

Contrary to the above, until October 16, 2016, the licensee did not ensure that preventive maintenance activities were developed by considering vendor recommendations and operating experience. Specifically, the licensee did not ensure that adequate preventive maintenance activities were developed for the NB0215 186/M lockout relay by considering vendor recommendations to trip the relay electrically during any scheduled outage of the equipment and operating experience documented in Performance Improvement Request 2003-2708 and Condition Report 54212. As a result, the NB0215 186/M lockout relay failed on or before August 2, 2016, and the safety-related 4160V NB02 bus was susceptible to locking out as a result of an overcurrent condition.

The licensee entered this condition into their corrective action program as Condition Reports 106164, 108440, and 108548. The licensee replaced the relay armature assembly and retested the relay satisfactorily. Additional corrective actions to address the preventive maintenance activities are expected as a result of Condition Reports 108440 and 108548. This violation is being treated as a non-cited violation consistent with Section 2.3.2 of the Enforcement Policy: NCV 05000482/2016003-01, "Failure to Adequately Adjust Testing and Preventive Maintenance for Safety-Related Lockout Relays."

### **Summary of Licensee Response**

The Wolf Creek Nuclear Operating Corporation (Wolf Creek or licensee) contested the non-cited violation as described above in a letter dated December 8, 2016. The letter provided the licensee's basis for denying the non-cited violation. Wolf Creek contends that the performance deficiency described in the non-cited violation is not valid because Wolf Creek staff did comply with the requirements of Procedure AP 16B-003 when they determined that no change to the 6-year preventive maintenance frequency was required. Wolf Creek provided a response in writing and provided additional information when requested during the NRC evaluation of Wolf Creek's response. A summary of Wolf Creek's documentation of their assessment of each of the procedure criteria is discussed below:

#### **1. Wolf Creek Vendor Recommendations**

Performance Improvement Request 2003-2708 evaluated industry operating experience (OE) 16724, "General Electric Type HEA Lockout Relay Test Internal." Wolf Creek took into consideration the history of the relays, the application, the low failure rate, the environment

Enclosure



in which the relays operate, and vendor recommendations, and determined that the vendor recommendation was very conservative with the requirement to perform annual testing.

The station that issued OE 16724 had an informal discussion with General Electric (GE) regarding sluggish behavior of Type HEA relays tested on a 3-5 year interval. There are no records of any official GE publication that makes reference to "sluggish operation" in Type HEA relays.

General Electric issued two prior service advice letters (SAL) related to Type HEA relays. Service Advice Letter 165.1 issued in 1981, which addressed the potential for malformed torsion springs in certain relays; and SAL 175.1 issued in 1983, which addressed the potential for mis-operation of relays manufactured within a specific time period. Wolf Creek indicated both SALs resulted in inspections of all safety-related GE Type HEA lockout relays with no issues.

Wolf Creek concluded that no evidence existed that GE officially indicated these relays exhibit sluggish behavior based on testing frequency.

## 2. Equipment History

Wolf Creek reviewed the preventive maintenance history of GE Type HEA relays in service at the Wolf Creek Generating Station. Wolf Creek stated that since January 1, 2000, only 1 out of 119 tests would have resulted in a failure of a safety-related GE Type HEA relay to actuate, and this very low failure rate supports the current preventive maintenance frequency.

Wolf Creek also stated that for the NB0215 186/M lockout relay specifically, which failed on August 2, 2016, the preventive maintenance was performed six times prior to this failure starting on November 15, 1988, with the last successful test on August 10, 2009. Therefore, there were five performances over 21 years in which the relay actuated at or below the acceptance criteria of 87.5 Vdc.

## 3. Regulatory and Code Requirements

Wolf Creek identified that no regulatory or code requirements specify a preventive maintenance frequency for these types of protective devices.

## 4. Operating Experience

Wolf Creek identified that OE 16724, issued on June 11, 2003, indicated that the failure of the relay to actuate at another station was caused by excessive time between preventive maintenance. The preventive maintenance frequency of the relay discussed in this OE was 4 years. Wolf Creek reiterated that the discussion between GE and the station that issued the OE regarding the performance of preventive maintenance every 3-5 years for relays that exhibit "sluggish" behavior, was an informal communication. Thus, no official documentation from GE which described this behavior as being caused by inadequate preventive maintenance frequencies existed.



Wolf Creek reiterated that personnel determined a 6-year preventive maintenance frequency coinciding with breaker maintenance was appropriate based on the low number of failures of the relays at Wolf Creek Generating Station and the fact that these relays operated in air conditioned environments.

On June 19, 2012, Wolf Creek received an industry experience notification pertaining to GE Type HEA relays, and initiated Condition Report 54212. Wolf Creek indicated that there were two recommendations in the notification: (1) review GE SAL 165 which Wolf Creek determined did not apply to Wolf Creek Generating Station; and (2) review the subset of lockout relays that are not normally actuated each cycle, or within the preventive maintenance frequency in accordance with Relay Industry Guidance AP-913. Relays that can be tested on-line should be tested as soon as practical. Wolf Creek determined that no changes to the preventive maintenance activities for the safety-related GE Type HEA relays were necessary. Wolf Creek reiterated the very low failure rate previously discussed would indicate that a 6-year preventive maintenance frequency was sufficient.

#### 5. Predictive Maintenance Requirements

Wolf Creek indicated that there were no predictive maintenance recommendations for these types of protection devices.

#### 6. Component Functional Importance

Wolf Creek stated that Performance Improvement Request 2003-2708 evaluated the functional importance of the safety-related GE Type HEA relays, and that the failure of one of these devices might allow a safety-related piece of equipment to be further damaged or cause the bus to trip if the condition was severe enough. Wolf Creek reiterated that preventive maintenance test results since January 1, 2000, showed only one test result out of 119 had a failure to actuate. Therefore, Wolf Creek stated that the preventive maintenance frequency was adequate for the functional importance of these components.

### **Wolf Creek's Conclusion**

The above information demonstrates that Wolf Creek complied with Procedure AP 16B-003 by considering vendor recommendations and industry operating experience in developing preventive maintenance activities for the NB0215 186/M GE Type HEA lockout relays.

In addition, Wolf Creek asserted that it had considered equipment history and station operating experience and that when all of the criteria is evaluated; including service conditions and low failure rate, the adequacy of the current preventive maintenance practices is supported. Wolf Creek also stated that had the NB0215 Type HEA 86 relay been tested more frequently, no evidence existed that a failure of this relay to actuate would have been prevented.

Finally, Wolf Creek stated that the non-cited violation over-emphasized the consideration of vendor recommendations and did not provide appropriate credit for all of the information, including equipment history, service operating conditions, and station specific operating experience. Wolf Creek denied the performance deficiency as described by the inspectors, and therefore, denied that there was a valid basis for the non-cited violation.



## **NRC Evaluation**

The NRC acknowledged that Wolf Creek did review the operating experience in 2003 under Performance Improvement Request 2003-2708 and Condition Report 54212.

The NRC also evaluated Wolf Creek's review of individual preventive maintenance attributes to determine if Wolf Creek should have reasonably concluded that the preventive maintenance periodicity would require revision to a shorter frequency.

The NRC assessment of Wolf Creek's response to each of the attributes of a preventive maintenance designation is provided below:

### **1. Vendor Recommendations**

The NRC reviewed the vendor recommendation for testing of the Type HEA relays during any scheduled outage and preferably at yearly intervals. The NRC also reviewed the Electric Power Research Institute (EPRI) guidance related to functional testing of these types of relays. (Electric Power Research Institute recommends a functional test interval of between 18 months and 2 years depending on the fuel cycle.) Lastly, the NRC evaluated a sampling of industry OE involving failure of these types of relays and associated causes. The NRC noted that two aspects were commonly identified with these industry failures: mechanical binding and age-related degradation.

Several OE documents identified a contributing factor of relay inactivity of the relay over long periods of time. As part of this review, the NRC asked Wolf Creek if it had performed an age-related analysis of the recent relay failure or if it had conducted a failure mode analyses on the relay to determine the cause of the failure. Wolf Creek responded that neither an age-related analysis nor relay failure mode analysis were performed following the August 2, 2016, safety-related relay failure. Wolf Creek also stated that a replacement preventive maintenance frequency had not been evaluated.

Wolf Creek indicated that the environment in which the Type HEA relay is located was a factor discussed in their procedural guidance in determining the preventive maintenance frequency. The NRC noted that the same procedural guidance also discussed attributes such as the age of the installed equipment, the qualified life of the equipment, and equipment idled in a standby mode for a long period. These attributes are not discussed in previous or more recent Wolf Creek assessments of the preventive maintenance frequency of these relays. The NRC determined that the basis of the relay being operated in an air conditioned environment was not unique to Wolf Creek and would not, in and of itself, provide a basis for extending or maintaining a preventive maintenance frequency of 6 years. Of the industry OE reviewed by the NRC, none identified the relay environment as causing or contributing to the relay failure.

In the 2003 OE analysis, Wolf Creek asserted that it would continue to monitor the system for adverse trends, and that future preventive maintenance intervals would be adjusted according to information received from the preventive maintenance performance. Wolf Creek then concluded that no changes were required to the 6-year preventive maintenance testing interval. The NRC noted that four performances of the relay preventive maintenance tests documented relay actuation above the test allowance of 87.5 Vdc but less than the maximum allowed by the licensee of 95 Vdc. The licensee did not consider these tests to be failures, and therefore, did not generate condition reports to evaluate the condition. In



the absence of condition reports to evaluate test results that were out of tolerance, it was not clear how or if Wolf Creek monitored these relays for adverse trends to determine if preventive maintenance intervals needed to be adjusted.

In addition, the NRC requested the basis for the original preventive maintenance selection of 6 years, which occurred prior to February 2, 2000. Wolf Creek could not locate the original basis for the selection of a 6-year preventive maintenance interval, but it did indicate that prior preventive maintenance frequency was something less than 6 years. In the absence of a basis for the 6-year preventive maintenance interval, the NRC determined that the OE analysis by Wolf Creek in 2003 was insufficient to conclude a 6-year preventive maintenance interval was appropriate. In addition, the NRC's review of more recent (June 19, 2012) industry OE on age-related and mechanical binding issues with this type of relay indicates that a 6-year preventive maintenance periodicity (and in this event approximately 7 years passed between tests when a 1 year grace period was included by Wolf Creek) results in an undue period of time for a degraded or degrading condition to exist in a safety-related system prior to its identification.

The NRC determined that the GE SALs referenced by Wolf Creek were first issued in 1981 and 1983 and involved manufacturing defects identified at that time. The NRC determined that the Wolf Creek conclusion that these SALs had been previously analyzed and did not impact Wolf Creek did not have any relevance to the determination that a 6-year preventive maintenance test frequency was appropriate. Wolf Creek acknowledged that the relay preventive maintenance frequency was not evaluated as part of Condition Report 54212, which in June 2012, evaluated industry experience related to GE Type HEA relays.

## 2. Equipment History

The NRC asked Wolf Creek if it had performed a relay failure rate analysis at the time of the 2003 OE assessment or during the Condition Report 54212 review. Wolf Creek indicated that a failure rate analysis was not performed, though they had determined three instances of potential failures were the result of sluggish operation. The NRC considered sluggish relay behavior to be indicative of relay degradation and that Wolf Creek should have evaluated the adverse relay operation. The NRC noted that preventive maintenance activities and tests of safety-related components are intended, in part, to ensure that safety-related components are capable of performing their safety function(s) and to identify degrading performance prior to failure.

Wolf Creek Procedure AP 16B-003 defined preventive maintenance as "maintenance activities designed and scheduled to ensure function, improve availability, and minimize the effects of aging on systems, structures, and components." This definition was consistent with the NRC understanding of the purpose of preventive maintenance activities. The NRC determined that a preventive maintenance frequency of once every 6 years, and the licensee's acceptance of a failure once every six times a component is tested, is not consistent with the preventive maintenance expectation that preventative maintenance frequencies (and acceptable failure rates) be commensurate with the risk and safety significance of the affected components.

## 3. Regulatory and Code Requirements

Wolf Creek identified that there are no regulatory or code requirements associated with specifying a preventive maintenance frequency for these types of devices. The NRC did not



identify any regulatory or code requirements specific to the preventive maintenance frequency of these relays.

#### 4. Operating Experience

The NRC determined that Wolf Creek addressed the OE discussion with GE as "anecdotal," and in the absence of "official" documentation from GE regarding sluggish behavior, Wolf Creek discounted the OE assessment and concluded the Wolf Creek 6-year preventive maintenance frequency was sufficient. The NRC asked Wolf Creek whom it had contacted at GE at the time of this evaluation. Wolf Creek indicated the evaluator could not recall who at GE was contacted. Wolf Creek had previously asserted that in their discussion with GE, GE stated that no official documentation of "sluggish operation" was generated by GE.

The NRC determined that dismissing the OE discussion with GE as informal and relying on the lack of "official" documentation from GE was a missed opportunity by Wolf Creek to revisit the 6-year periodicity of the relay preventive maintenance testing. In light of the 2003 and 2012 OE, this was an opportunity for Wolf Creek to investigate the preventive maintenance test frequencies that had been established within the industry to determine if the licensee was an outlier or consistent with current industry practice. There is no discussion in the Wolf Creek OE event report evaluations or their response to the non-cited violation that explores an industry perspective to support this conclusion, particularly given the similarity of this type of relay application, environment, and safety significance at other nuclear utilities.

#### 5. Predictive Maintenance Requirements

Wolf Creek stated that there are no predictive maintenance recommendations for these types of protection devices. The NRC did not identify any predictive maintenance recommendations for these types of relays. As previously discussed in the Vendor Recommendations section, the NRC identified only preventive maintenance frequency recommendations from EPRI for functional testing of these relays when they are not in-service (every 18-24 months).

#### 6. Component Functional Importance

The NRC agreed that the function of the component as described by Wolf Creek and the potential safety impact from the relay failure was accurate. However, the NRC's evaluation of these circumstances does not support Wolf Creek's conclusion that the preventive maintenance frequency is adequate for the importance of the identified function.

### **NRC Conclusion**

The NRC considered the following information in determining that sufficient information existed for Wolf Creek to conclude that additional engagement of the vendor and industry peers should have been performed:

- 2003 OE and Condition Report 54212
- Difference between Wolf Creek preventive maintenance test frequency of once every 6 years, in comparison to the vendor recommendation



- Preventive maintenance test frequency of once every 4 years that resulted in a relay failure at another facility
- Sufficient industry operating experience on the type of relay failures existed in 2012

The NRC Information Notice 2012-06, "Ineffective Use of Vendor Technical Recommendations," issued on April 24, 2012, states, in part, that "the NRC staff's review of recent operating experience involving ineffective use of vendor technical recommendations indicated that many of these events potentially allow latent failures to exist undetected and become an underlying cause of risk-significant initiating events. The NRC review of this event concluded that lengthy preventive maintenance test intervals can result in degraded or degrading conditions going undetected for long periods of time resulting in increased safety-related component vulnerability and risk."

In addition, the NRC concluded that the current position maintained by Wolf Creek that no further evaluation of the preventive maintenance test frequency is warranted, even though a failure has occurred, does not sufficiently establish whether any performance trends exist for these components at Wolf Creek, particularly as they age. The lack of a failure analysis of the August 2016 relay failure and the lack of any age-related component analysis or replacement preventive maintenance frequency based on service life precludes Wolf Creek from establishing confidence that future safety-related relay failures will be minimized and/or detected.

Based on the result of the review, the NRC concluded that the non-cited violation of Technical Specification 5.4.1.a for the licensee's failure to ensure that adequate preventive maintenance activities were developed for the NB0215 186/M lockout relay, as documented in NRC Inspection Report 05000482/2016003, is valid. In addition, this NRC's review reinforces the characterization in the inspection report that this is indicative of current licensee performance and, absent any revision to the current preventative maintenance frequency, could result in future unexpected relay failure(s).