



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

December 12, 2016

EA-16-175

Mr. Peter A. Gardner
Site Vice President
Monticello Nuclear Generating Plant
Northern States Power Company, Minnesota
Monticello, MN 55362-9637

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT–FINAL SIGNIFICANCE
DETERMINATION OF A WHITE FINDING AND NOTICE OF VIOLATION;
NRC INSPECTION REPORT NO. 05000263/2016011

Dear Mr. Gardner:

This letter provides you the final significance determination of the preliminary White finding discussed in U.S. Nuclear Regulatory Commission (NRC) Inspection Report No. 05000263/2016010, dated September 15, 2016. The report is available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession Number ML16259A318. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. The finding involved the licensee's failure to plan and perform maintenance affecting the safety-related High Pressure Coolant Injection (HPCI) system in accordance with written documents appropriate to the circumstances. Specifically, improperly planned and performed pre-April 2005 maintenance initiated a crack in the safety-related HPCI oil pipe and, for numerous years, the licensee failed to perform maintenance to resolve repeated identification of HPCI oil leakage.

In a telephone conversation with Mr. Kenneth Riemer of NRC, Region III, on September 23, 2016, you declined the opportunity to discuss this issue in a Regulatory Conference and indicated that you would provide a written response. In a letter, dated October 14, 2016, you provided your written response (ML16288A830). In the letter, you acknowledged that a performance deficiency occurred; however, you disagreed with its characterization and your ability to foresee and correct the condition as a result of the 2005 maintenance activities. You disagreed that the pre-April 2005 maintenance was improperly planned and performed because maintenance practices to address nuisance leaks could be performed using 'skill of the craft' that is permitted by Regulatory Guide 1.33, Revision 2 and therefore, the work did not need to be pre-planned and would not require a step-by-step procedure. You characterized the performance deficiency as a failure to adequately assess and act on a potentially degrading condition when the first noticeable change in HPCI oil leakage was identified on January 9, 2016. You ascertained that when the change in leakage occurred, the cause of the degraded condition was reasonably within the licensee's ability to foresee and correct. As a result, you believe the starting point (inception time) for the performance deficiency is January 9, 2016. Further, in your risk assessment, you established that crediting short-term HPCI operation with

continued operation with one Control Rod Drive Hydraulic (CRDH) system pump following HPCI failure is sufficient to prevent core damage.

We evaluated the information provided in your response. Based on our review of Regulatory Guide 1.33, Appendix A, Revision 2, we determined that the pre-April 2005 maintenance activities performed do not fall into the three types of activities allowed by the guide as 'skill of the craft' and not requiring a detailed step-by-step procedure. Furthermore, a number of corrective action documents were generated between 2006 and 2016 documenting the HPCI oil leakage, which provided the licensee numerous opportunities to foresee and promptly correct the degraded condition. Therefore, we concluded that a performance deficiency occurred which involved the licensee's failure to ensure that the pre-April 2005 maintenance was scheduled and planned so as not to compromise the safety of the plant. Further, we determined that the starting point for the performance deficiency was March 14, 2006, when the first condition adverse to quality (CAP 1018528) was generated. Consistent with our preliminary determination, the performance deficiency led to a degraded plant condition for over 10 years. Therefore, the exposure time used in the preliminary significance determination process (SDP) remained the same in our final analysis. However, in the NRC's quantified risk estimate, we focused on the portion of the exposure period, 121 days, when HPCI was most degraded. Finally, we concluded that the site specific Standardized Plant Assessment Risk (SPAR) model success criterion, which required two control rod drive pumps to prevent core damage was appropriate. Enclosure 1 provides a summary of the information provided in your letter dated October 20, 2016 and the NRC's response.

After considering the information developed during the inspection and the additional information you provided in your letter dated October 14, 2016, the NRC has concluded that the finding is appropriately characterized as White, a finding of low to moderate risk significance. According to NRC Inspection Manual Chapter (IMC) 0609, Attachment 2, "Process for Appealing NRC Characterization of Inspection Findings (SDP Appeal Process)," appeal rights only apply to those licensees that have either attended a Regulatory Conference or submitted a written response to the preliminary determination letter. You have 30 calendar days from the date of this letter to appeal the staff's determination of significance for the identified White finding. Such appeals will be considered to have merit only if they meet the criteria in the IMC 0609, Attachment 2. An appeal must be sent in writing to the Regional Administrator, Region III, 2443 Warrenville Rd, Suite 210, Lisle, IL 60532.

In Inspection Report 05000263/2016010, the NRC identified a self-revealing finding preliminarily determined to be of low to moderate safety significance (White) and an associated apparent violation of Technical Specification 5.4.1.a. and Regulatory Guide 1.33, Appendix A, Section 9. After additional review of circumstances associated with the HPCI oil leakage issue, the NRC determined that the licensee's failure to address oil leakage associated with the safety-related HPCI system is a violation of Title 10 of the *Code of Federal Regulations* (CFR) Part 50, Appendix B, Criterion XVI, "Corrective Action". The violation is cited in the Notice of Violation (Notice) found in Enclosure 2. The circumstances surrounding the violation were described in detail in the subject inspection report. In accordance with the NRC Enforcement Policy, the Notice is considered an escalated enforcement action because it is associated with a White finding.

The NRC has concluded that the information regarding the reason for the violation, the corrective actions taken and planned to correct the violation and prevent recurrence, and the

date when full compliance will be achieved is already adequately addressed on the docket in NRC Inspection Report No. 05000263/2016010. Therefore, you are not required to respond to this letter unless the description therein does not accurately reflect your corrective actions or your position.

As a result of our review of Monticello Nuclear Generating Plant performance, including this White finding, we have assessed the plant to be in the Regulatory Response column of the NRC's Action Matrix, effective July 1, 2016. Therefore, we plan to conduct a supplemental inspection using Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," when your staff has notified us of your readiness for this inspection. This inspection procedure is conducted to provide assurance that the root cause and contributing causes of risk-significant performance issues are understood, the extent of condition and the extent of cause are identified, and the corrective actions are sufficient to prevent recurrence.

For administrative purposes, this letter is issued as NRC Inspection Report No. 05000263/2016011. Additionally, apparent violation (AV) 05000263/2016010-01 is now closed and violation (VIO) 05000263/2016-01 is opened in its place.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response, if you choose to provide one, will be made available electronically for public inspection in the NRC Public Document Room or from ADAMS. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information, so that it can be made available to the Public without redaction. The NRC also includes significant enforcement actions on its Web site at <http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions>.

Sincerely,

/RA/

Cynthia D. Pederson
Regional Administrator

Docket No. 50-263
License No. DPR-22

Enclosures:
1. NRC Response
2. Notice of Violation

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U.S. NUCLEAR REGULATORY COMMISSION (NRC) EVALUATION

By letter dated October 14, 2016, Xcel Energy responded to an NRC letter providing a preliminary white finding associated the safety-related high pressure coolant injection (HPCI) system oil leakage at the Monticello Nuclear Generating Plant, dated September 15, 2016. A summary of the licensee's response and NRC review is provided below.

Summary of Information Provided by Xcel Energy:

The licensee requested that the NRC consider three aspects of the finding in determining the final significance and provided its perspectives on: (1) the characterization of the performance deficiency; (2) the point of inception for the performance deficiency; and (3) crediting short-term operation of HPCI with transition to a control rod drive hydraulic (CRDH) system pump in the risk assessment.

The licensee disagreed with the performance deficiency as documented in the NRC inspection report and instead believed the performance deficiency was a failure to adequately assess and act on a potentially degrading condition when the first noticeable change in leakage was identified on January 9, 2016. As a result, the licensee also considered this date to be the point of inception of the performance deficiency and determined that the exposure time used in the significance determination should be 75 days, which represents a period of time from January 9, 2016, to March 24, 2016. The licensee also presented information to support their position that if HPCI operated successfully for 1.5 hours, a single pump in the CRDH system could be credited in the risk assessment to avoid core damage.

NRC Response:

Characterization of the Performance Deficiency:

In its response, the licensee agreed that a performance deficiency occurred, but disagreed with the characterization of the deficiency. Specifically, the licensee believed that the performance deficiency was a failure to adequately assess and act on a potentially degrading condition when the first noticeable change in leakage was identified on January 9, 2016. Contrary to the NRC position, the licensee disagreed that maintenance was improperly planned in 2005, or that the performance deficiency was within their ability to foresee and correct. The NRC staff reviewed the new information contained in the licensee response. This review was segmented into two areas ('Preplanning Maintenance' and 'Ability to Foresee the Cause') similar to the areas of licensee disagreement.

Pre-planning Maintenance – The licensee disagreed with the performance deficiency that maintenance was improperly planned in 2005, as the leaks were considered nuisance leaks which would have been addressed under standard maintenance practices (i.e., 'skill of the craft'), thereby not requiring formal work planning documents. The licensee referred to Regulatory Guide 1.33, Appendix A, Revision 2, to which the licensee is committed via its Quality Assurance Topical Report, as the basis for this position. Although Regulatory Guide 1.33 states that maintenance that can affect the performance of safety-related equipment be preplanned and performed in accordance with written procedures appropriate to the circumstances, the licensee response provided new information in that the Regulatory Guide also states that skills normally possessed by qualified maintenance personnel may not require

detailed step-by-step delineation in a procedure. The NRC staff review of Regulatory Guide 1.33 noted three types of activities among those that may not require detailed step-by-step written procedures. Namely, these activities include gasket replacement, troubleshooting electrical circuits, and changing chart or drive speed gears or slide wires on recorders. Specific to the new information provided by the licensee, the response equated that the assembly of threaded joints is similar to the above activities and it implements controls, both initial and continuing training, under the same methodology. Although the NRC staff originating the performance deficiency recognized Regulatory Guide 1.33 had allowances for 'skill of the craft' activities, it did not draw the same conclusion that assembly of threaded pipe was similar. In particular, the assembly of the threaded pipes performed as the 'skill of the craft' during the pre-April 19, 2005 maintenance caused a crack in the safety-related HPCI oil pipe due to significant loads from applied wrench torques.

Based on new information given in the licensee response, the NRC staff re-evaluated both the performance deficiency and associated violation. From a performance deficiency perspective, the NRC determined the cause of the degraded condition was due to failure to meet a general work control standard delineated in 4 AWI 04-05.01, Section 4.1.7.D. As a result, NRC staff concluded that the performance deficiency is the licensee's failure to ensure maintenance was scheduled and planned so as not to compromise the safety of the plant. The performance deficiency occurred pre-April 19, 2005. From that time until March 21, 2016, numerous work orders were written, however they were subsequently closed with no action taken to repair the leakage.

The NRC originally characterized this issue as an apparent violation of Technical Specification 5.4.1.a and Regulatory Guide 1.33, Appendix A, Section 9. The NRC staff review of the licensee's response determined that three conditions adverse to quality (CAPs 1018528, 1508130, and 1515945) were identified during the period of March 14, 2006 to March 16, 2016 where the licensee failed to promptly correct the conditions. As a result, the NRC staff re-evaluated the regulatory basis for the finding and concluded that the appropriate apparent violation was against Title 10 CFR 50 Criterion XVI, "Corrective Action," for the failure to promptly correct conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective materials and equipment, and nonconformances.

Ability to Foresee the Cause – The licensee disagreed it had the ability to foresee and correct a condition that may have been a result of maintenance in 2005 that would, a decade later, result in a loss of safety function of the HPCI system. Specifically, the licensee believed that the leakage was minor, did not impact HPCI operability, and was stable (i.e., did not degrade) from the period since first discovery in August 26, 2005, until the first significant increase was noted in January 9, 2016. Although the licensee acknowledged that station standards should not have allowed an oil leak to exist for such an extended period of time, the stability of the leak between 2005 and 2016, led the licensee to believe that the problem was threaded joint leakage, a common industry challenge with threaded pipe fittings.

During its review, the NRC staff noted that the licensee had documented the leakage on three separate occasions as conditions adverse to quality (CAPs 1018528, 1508130, and 1515945) between March 14, 2006 and March 21, 2016. Although numerous work orders were written, these work orders were subsequently closed with no action taken to repair the leakage. This resulted in the leakage slowly degrading over an approximate 10 year period until a significant increase in oil leakage occurred on March 26, 2016, extending the inoperability of HPCI during a

maintenance window (thereby extending the unavailability time) and causing a loss of safety function. Therefore, the NRC concluded that this issue was within the licensee's ability to foresee and correct had prompt action been taken following each documented instance of a condition adverse to quality in the licensee's Corrective Action Program (CAP). Because the NRC determined the licensee had the opportunity to foresee and correct the performance deficiency, the information provided by the licensee in its response did not ultimately affect the characterization of the performance deficiency.

The Point of Inception of the Performance Deficiency:

The licensee response stated the point of inception of the performance deficiency was January 9, 2016 because it was not reasonably within their ability to foresee and correct the condition until that time. The NRC staff determined the point of inception of the performance deficiency is when the licensee failed to ensure maintenance was scheduled and planned so as not to compromise the safety of the plant. In this case, the NRC staff determined the performance deficiency resulted in a degraded condition (i.e., the pipe crack) by pre-April 19, 2005 maintenance. As a result, the NRC staff concluded that the licensee's failure to schedule and plan maintenance so as not to compromise the safety of the plant occurred on or before April 19, 2005. Although a work order was generated at that time because oil leakage was minor, the licensee had the ability to foresee and promptly correct the condition, and its underlying cause, on March 14, 2006, when the first condition adverse to quality (CAP 1018528) was generated.

The Significance Determination Process (SDP) estimates the risk of the plant degraded condition as defined by the performance deficiency. The risk is estimated by establishing a period of time over which the HPCI system was degraded to the point that it could not complete its probabilistic risk assessment (PRA) function, or mission. The SDP typically uses a 24 hour mission time. The NRC's Risk Assessment of Operational Events (RASP) Handbook provides guidance for estimating the exposure time of the degraded condition. For this finding, the NRC staff determined that the degraded condition existed for a long time, i.e., over 10 years, but did not initially represent a loss of the PRA function for the HPCI system, as the pipe crack was small and the leakage minimal. For these types of issues, when the system is degrading while it is operating, to the point of failure, the exposure time is established by reviewing the operating history of the system. The NRC staff uses a period of time that represents how long the system was degraded such that it could not perform successfully over the 24 hour mission. For this finding, that period of time over which HPCI could no longer fulfill its mission was approximately 10 months. Although this is the exposure time, the staff focused the quantitative risk estimate on a shorter exposure period because HPCI operation in November 2015 demonstrated the capability to run for 15 hours. For the shorter exposure period, 121 days (November 24, 2015-March 24, 2016), the HPCI system was significantly degraded and could not run for more than approximately 2 hours before failure. A risk calculation for a condition where HPCI can run for 15 or more hours but not complete a 24 hour mission would be needed to fully quantify the risk over the rest of the exposure period. This risk calculation would be complex and was determined to be unnecessary for the evaluation of this finding. Using simplified assumptions and sensitivity evaluations, the NRC staff determined that the SDP outcome would not be different using a 10 month exposure period in the risk calculation from the outcome using the shorter 121 day exposure time.

In summary, the inception of the performance deficiency on or before March 14, 2006, led to a condition degrading over time during HPCI system operation. The best estimate for an exposure time over which HPCI could no longer operate to complete its PRA mission is a period of approximately 10 months. The NRC's quantified risk estimate focused on the portion of the exposure period, 121 days, when HPCI was most degraded.

Crediting HPCI Short-Term Operation with transition to Control Rod Drive Hydraulic (CRDH) pump:

The licensee's response provided a PRA calculation which included credit for successful HPCI operation for 1.5 hours. The PRA credit for successful HPCI operation in the short term potentially impacts the control rod drive (CRD) system success criterion. The site specific Standardized Plant Assessment Risk (SPAR) model used in the SDP evaluation currently requires two CRD pumps for reactor coolant inventory control functional success after HPCI failure. The licensee model was changed to require only one CRD pump for success if HPCI can complete a short term mission of 1.5 hours. The NRC staff reviewed the technical information to determine if a SPAR model change was appropriate for the evaluation of this finding. However, since the staff determined that the exposure time for the finding did not change, the disposition of this new information did not ultimately affect the outcome of the SDP.

As supporting information for the PRA calculation, the licensee provided Modular Accident Analysis Program version 4 (MAAP4) analyses to support a condition-specific change to the licensee's baseline PRA success criterion for high-pressure injection following HPCI failure-to-run. At issue is how many trains of CRD flow are needed, whether actions to enhance flow post-SCRAM (emergency shutdown of reactor) are needed, and how long HPCI or Reactor Core Isolation Cooling system needs to operate. In particular, the under-sized CRD flow rates in question do not balance decay heat removal for a significant period of time (e.g., 14 hours after event initiation), thus setting up a "horse race" between falling vessel water level and decay heat removal requirements.

The NRC staff reviewed this material in detail (and performed some simple confirmatory hand calculations), and noted some strengths and limitations in the provided material. Strengths included use of a recent plant-specific model also used for other regulatory activities and the use of a core damage determinant (both the specific code output and the threshold) recommended in the relevant MAAP4 Applications Guidance (EPRI TR-1020236). Limitations included a lack of consideration of the breakdown between transients where an early cooldown would be procedurally directed versus those where it would not be, and a lack of consideration of containment heat removal with respect to the competing effects it would have on various aspects of the calculations.

In addition, NRC staff noted some variabilities that had the potential to affect the success criteria determination, but were not fully investigated. These included: (i) no treatment of emergency depressurization for the emergent success criterion; (ii) the variability in potential system leakage; and (iii) the vessel water level at the time of HPCI loss given that different contexts would lead to different operating modes of HPCI.

Finally, NRC staff noted some apparent anomalies in the limiting calculation. Specifically, the code outputs for boiled-up core water level and shroud level become seemingly inconsistent, with the latter (which is the applications guidance-recommended indicator) suggesting complete

core uncover. At the same time, a seemingly unphysical turn-around in the core water level and peak core temperature occurs. Given the nature of the code's modeling of CRD injection in the downcomer, and questions regarding recirculation pump assumptions during this timeframe, the staff was not able to assess whether the calculated response is reasonable.

In total, the NRC staff found that while there might be sufficient basis to support a criterion of one CRD pump (not enhanced) after 4 hours of successful HPCI operation, there was not sufficient evidence to support a criterion of one CRD pump at 1.5 hours of successful HPCI operation. Since the degraded condition evaluated by the SDP assumed HPCI could not run for more than approximately 2 hours, the NRC determined that the existing SPAR model success criterion which required two CRD pumps was appropriate.

NOTICE OF VIOLATION

Northern States Power Company, Minnesota
Monticello Nuclear Generating Plant

Docket No. 50-263
License No. DPR-22
EA-16-175

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted from June 1 through September 1, 2016, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10 of the *Code of Federal Regulations* (CFR), Part 50, Appendix B, Criterion XVI, "Corrective Action", requires in part, that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are corrected.

Licensee procedure FP-PA-ARP-01, "CAP Action Request Process," Revision 11, Section 1.2 and Revision 42, Section 2.1, required, in part, that conditions adverse to quality are promptly identified and corrected.

Contrary to the above, between March 14, 2006 and March 21, 2016, the licensee failed to correct oil leakage from the safety-related HPCI system, a condition adverse to quality. Specifically, as documented in Condition Reports nos. 1018528; 1508130; and 1515945, the licensee initiated a number of work orders and subsequently closed them without any further work performed to correct these conditions adverse to quality, which resulted in gradual degradation and loss of HPCI system safety function.

This violation is associated with a White Significance Determination Process finding.

The NRC has concluded that information regarding the reason for the violation, the corrective actions taken and planned to correct the violation and prevent recurrence and the date when full compliance will be achieved is already adequately addressed on the docket in NRC Inspection Report No. 05000263/2016010. However, you are required to submit a written statement or explanation pursuant to 10 CFR 2.201 if the description therein does not accurately reflect your corrective actions or your position. In that case, or if you choose to respond, clearly mark your response as a "Reply to a Notice of Violation, EA-16-175", and send it to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with a copy to the Regional Administrator, Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532, and a copy to the NRC Resident Inspector at the Monticello Nuclear Generating Plant, within 30 days of the date of the letter transmitting this Notice of Violation (Notice).

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001.

If you choose to respond, your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. Therefore, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction.

Enclosure 2

In accordance with 10 CFR 19.11, you may be required to post this Notice within two working days of receipt.

Dated this 12th day of December, 2016.

Letter to Mr. Peter A. Gardner from Ms. Cynthia D. Pederson dated December 12, 2016

SUBJECT: MONTICELLO NUCLEAR GENERATING PLANT–FINAL SIGNIFICANCE
DETERMINATION OF A WHITE FINDING AND NOTICE OF VIOLATION;
NRC INSPECTION REPORT NO. 05000263/2016011

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