UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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April 13, 2006

EA-06-005; EA-06-006; EA-06-007

Timothy Mitchell
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SUBJECT: WITHDRAWAL OF FINDING AND RESPONSE TO TWO DISPUTED NONCITED VIOLATIONS (INSPECTION REPORT 05000313/2005004 AND 05000368/2005004); ARKANSAS NUCLEAR ONE

Dear Mr. Mitchell,

Thank you for your letter dated December 19, 2005, in response to the subject inspection report issued on November 7, 2005. In your response, you disputed a finding, and two noncited violations (NCVs). These issues were associated with: (1) the inadvertent energizing of pressurizer heaters during the implementation of maintenance work instructions, (2) the failure to adequately conduct a risk assessment when taking equipment out of service for maintenance, and (3) an inadequate procedure that led to damaging a reactor coolant pump seal which required entry into a reduced reactor coolant inventory condition to repair. By letter dated January 9, 2006, we informed you that we were evaluating your reply and would inform you of the results of our evaluations.

The NRC conducted a review of your response, including the applicable licensing and regulatory documents. The review was conducted by an NRC staff member who was not involved in the initial inspection effort, and the results have been reviewed by the NRC's Office of Enforcement.

Regarding issue (1), upon further review, the NRC staff agrees that the performance deficiency did not constitute a finding of more than minor safety significance and will be withdrawn. The principal basis for this determination was that the plant's response to all pressurizer heaters energizing was within the normal control limits of the pressurizer pressure control system which should preclude any kind of transient that would challenge the plant's protection systems. Therefore, this constitutes an example of a minor procedural inadequacy; in this case inadequate maintenance work instructions (EA-06-005).

With regard to issue (2), you contend that an adequate risk evaluation was conducted in accordance with 10 CFR 50.65(a)(4), and that a violation of requirements did not occur. Our understanding of the event and subsequent review concluded that a violation did occur as originally documented (EA-06-006). The enclosed evaluation provides the basis for our conclusion.

With regard to issue (3), you contend that no performance deficiency occurred and, therefore, no violation occurred. On the basis of a further review of this issue, the NRC identified that, in addition to an inadequate procedure, there were a number of other causes and contributors of the damaged reactor coolant pump seal which resulted in the plant incurring additional risk to repair. These included: insufficient pre-evolution assessment of the reactor coolant system fill evolution given the plant was in an atypical configuration (i.e., reactor coolant pump uncoupled); inadequate coordination and communication between the outage control organization, maintenance personnel, and control room personnel during conduct of the reactor coolant system fill evolution; not promptly and thoroughly investigating indications of abnormally low seal injection flow; and inadequate communications between engineering personnel and vendor personnel that resulted in an inadequate operability evaluation of the seal condition. Notwithstanding these additional causes and contributors, fundamentally, the existing procedural guidance was insufficient to prevent such an occurrence. Therefore, we have concluded that a performance deficiency did occur and that the original basis for the NCV involving an inadequate procedure documented in Inspection Report 05000313/2005004 and 05000368/2005004 remains valid. Additionally, we have determined that this issue more appropriately pertains to the Barrier Integrity Cornerstone; therefore, the cornerstone assignment will be revised from the Mitigating Systems Cornerstone to the Barrier Integrity Cornerstone. Further, the crosscutting aspect will be revised from human performance to problem identification and resolution (EA-06-007). The details of our evaluation are provided in the enclosure to this letter.

This letter will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC public web site at http://www.nrc.gov/reading-rm/adams.html (The public reading room).

Should you have any further questions, please contact Mr. David N. Graves at (817) 860-8147.

Sincerely,

/RA/

Arthur T. Howell, III, Director
Division of Reactor Projects

Docket Nos. 50-313, 50-368
License Nos. DPR 51, NPF-6

Enclosure: Disputed Violation Evaluation and Conclusions

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ARKANSAS NUCLEAR ONE
INSPECTION REPORT 05000313/2005004; 05000368/2005004
DISPUTED VIOLATION EVALUATION AND CONCLUSIONS

EA-06-006 Noncited Violation 05000313/2005004-04 - Issue (2)

Summary of Licensee Response and NRC's Evaluation

Entergy Response: Entergy denies NCV 05000313/2005004-04, Failure to adequately assess risk for an isolated pressurizer Electromatic Relief Valve (ERV). Entergy disagrees that a violation of regulatory requirements occurred. Entergy's objections to the violation are as follows:

Objection 1:

The risk associated with isolating the ERV was appropriately considered.

NRC Position: NRC acknowledges and agrees that the operators were aware of and qualitatively considered the risk associated with isolation of the ERV as a single component. Discussions between the operators and the inspector at the time of occurrence determined that they were aware of the risk associated with isolating the ERV in conjunction with other equipment that had previously been removed from service (Inverter Y-25 and High Pressure Injection Pump P-36A), and that the ERV was available if needed by manually opening the block valve from the control room.

Objection 2:

The risk associated with the ERV removed from service was appropriately considered when Low Pressure Injection (LPI) Train B was removed from service the following shift.

NRC Position: The inspector's review of the licensee's risk assessment during this maintenance period concluded that the licensee had initially used their risk management program to qualitatively assess the risk of isolating the ERV with the ongoing maintenance on high pressure injection Pump P-36A and Inverter Y-25. During the following shift, licensee staff commenced maintenance on low pressure injection Valve CV-1429, which removed the Green train of Low Pressure Injection (LPI) from service. Based on inspector discussions with the shift manager who was on shift at the time of removing the LPI train from service, the inspector determined that there was an increased quantifiable risk associated with the potential for a pressurizer safety valve to lift while the ERV was isolated, and that this risk increase was not considered prior to removing the LPI train from service. Although the licensee had previously considered the risk of the ERV being isolated and the risk of removing the LPI train from service, the licensee had not considered, prior to removing the LPI train from service, the increased reliance on the pressurizer code safety valves for reactor coolant system over pressure events with the ERV isolated and the potential that these valves might not close after an open demand. Therefore, the risk evaluation was incomplete in that the increased potential for a code safety valve to lift (due to the ERV isolated) and not reseat was not considered.

Objection 3:

No performance deficiency occurred. The definition of "Performance Deficiency" from NRC Inspection Manual Chapter 0612 states:

> "Performance Deficiency: An issue that is the result of a licensee not meeting a requirement or standard where the cause was reasonably within the licensee's ability to foresee and correct, and that should have been prevented. The licensee does not have to be committed to a standard in order to determine whether there is a performance deficiency (PD). For example, a PD is determined to exist if the licensee fails to adhere to a widely accepted industry standard."

NRC Position: NRC determined, based on interviews with the control room operators that were on shift when the LPI train was removed from service, that the increased risk associated with a pressurizer safety valve lifting while the ERV was isolated was not considered prior to removing the LPI train from service. Although the licensee had considered the risk of the ERV being isolated and the risk of removing the LPI train from service, the inspectors determined that the licensee had not considered the increased reliance on the pressurizer code safety valves for reactor coolant system over pressure events and the increased risk that these valves might not close after an open demand while the LPI train was out of service. 10 CFR 50.65(a)(4), requires in part that, "the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities." In this instance, the increase in risk was not properly assessed, and that failure to do so constitutes a performance deficiency and a violation of the stated requirement.

Conclusion: NRC concluded that these circumstances reflect a performance deficiency and a violation of 10 CFR 50.65(a)(4) in that licensee staff failed to adequately assess the risk associated with the ERV being isolated prior to removing LPI Train B from service. NRC determined that this finding was greater than minor because it related to a licensee's risk assessment which had known errors (i.e., failure to consider the increased risk associated with the pressurizer safety valve lifting) that had the potential to change the outcome of the assessment. Using Appendix K, Maintenance Risk Assessment and Risk Management Significance Determination Process, of MC 0609, Significance Determination Process, the finding was determined to have very low safety significance (Green) because the incremental increase in core damage probability was less than 2.24×10^{-8}. The performance deficiency also exhibited human performance crosscutting aspects related to a lack of attention to detail while assessing risk.

EA-06-007 Noncited Violation 05000313/2005004-07 - Issue (3)

Summary of Licensee Response and NRC's Evaluation

Entergy Response: Entergy denies NCV 05000313/2005004-07, Inadequate procedure leads to reactor coolant pump seal damage. Entergy disagrees that either a performance deficiency or a violation of regulatory requirements occurred. Entergy's objections to the violation are as follows:

Objection 1: The root cause of this event was a lack of vendor information and operating experience. Because of this, it was not understood that the reactor coolant pump (RCP) seal could be damaged by pressurizing the seal with the pump uncoupled.

NRC Position: NRC determined that the vendor supplied information did not include information that would inform the licensee that damage would occur if the pump seal was pressurized with the pump uncoupled from the shaft and that a review of operating experience did not identify that this damage could occur. However, the NRC concluded that Procedure 2103.002, "Filling and Venting the RCS," was inadequately scoped. The licensee placed the RCP and its seal in a condition (uncoupled) that was not previously reviewed for seal injection flow. Procedure 2103.002, Step 7.10, allowed initiation of seal injection to an uncoupled pump. This configuration (uncoupled with seal injection initiated), which is not a common configuration, was introduced without analyzing the potential effects of aligning seal injection. The lack of analysis regarding the potential effects of initiating seal injection in this uncoupled configuration resulted in the inadequate procedure not being identified and corrected, and consequently, seal injection was lined up to the uncoupled pump damaging the seal. If the uncommon configuration had been questioned by the licensee, NRC believes it is not unreasonable to expect that the cognizant plant staff, knowing the operational bounds of the equipment they are responsible for, would have been able to determine in advance that initiation of seal injection with the pump uncoupled could result in seal damage. As discussed further below, the argument that an equipment problem cannot be foreseen simply because there is a lack of operating experience or a lack of written notification by the vendor (who, in fact, was aware of the potential for the problem to occur) should not override the fact that indicators in plant conditions were not questioned prior to or during implementation of a procedure that could impact plant equipment, in this case the RCP seals.

Objection 2: There is little or no safety significance associated with this event.

NRC Position: NRC had originally documented that this issue was associated with the Mitigating Systems Cornerstone configuration control attribute. After further review of the information you provided, NRC determined that this performance deficiency is greater than minor, but that it is more accurately described as affecting the Barrier Integrity Cornerstone RCS procedure quality attribute and affected the cornerstone's objective of providing reasonable assurance that physical design barriers (RCP seals) protect the public from radionuclide releases caused by accidents or events. This determination is more appropriate in that the inadequate procedure resulted in establishing seal injection flow to the uncoupled pump's seal causing damage to the seal. The damage was recognized after the pump was recoupled and the reactor coolant system was filled, resulting in leakage from the reactor coolant system into containment.

Placing the reactor in an unplanned reduced inventory condition, which was necessary to repair the RCP seal, constituted a higher risk configuration as analyzed utilizing NRC Manual Chapter 0609, "Significance Determination Process," Appendix A. The estimated increase in core damage frequency was 1E-7/year, which is a condition of very low safety significance (Green). If the condition had been adequately analyzed prior to occurrence, or identified and repaired, while the reactor was defueled, prior to declaring the seal operable, then the issue would have been characterized as an in-process minor issue in accordance with NRC Manual

Chapter 0612, “Power Reactor Inspection Reports,” Appendix E, and would not have been documented. In this situation, there would have been little or no safety significance because a reduced inventory evolution with fuel in the reactor vessel would not have been performed.

Objection 3: No performance deficiency occurred because the condition was not within the licensee’s ability to foresee and correct.

NRC Position: A performance deficiency (PD) is defined as, “An issue that is the result of a licensee not meeting a requirement or standard where the cause was reasonably within the licensee’s ability to foresee and correct, and that should have been prevented. The licensee does not have to be committed to a standard in order to determine whether there is a PD. For example, a PD is determined to exist if the licensee fails to adhere to a widely accepted industry standard.”

NRC noted several instances in which this event could have either been prevented or the risk significance could have been reduced. If the procedure had been adequately written and reviewed to anticipate seal damage under these conditions, then there would have been a check and perhaps no damage. Operators in the control room were not aware that the RCP was uncoupled when they commenced the RCS fill and vent procedure. During interviews with the inspector, the operators indicated that they would not have initiated seal injection to the pump if they had known the pump was uncoupled; although, the reason was based on staffing and ALARA concerns and not the potential for pump seal damage. If the control room staff had known the pump was uncoupled, given the unusual configuration, there would have been an opportunity for the licensee staff to have reviewed in more detail the impact of seal injection initiation.

Additionally, during conduct of the fill and vent procedure, once seal injection flow was initiated to the RCP using one charging pump, abnormal seal flows were observed by the operators (because the normal flow path of seal injection water into the reactor coolant system was blocked by the uncoupled pump resting on the recirculation impeller). Instead of stopping the procedure to investigate the abnormal indications, the operators continued increasing flow until 3 charging pumps were running. If this abnormal indication had been promptly and thoroughly reviewed, the pump seal damage might have been prevented or identified and corrected during the period when the reactor was defueled.

When the flow conditions to the RCP seal were recognized as inappropriate, an operability evaluation was conducted to determine the condition of the seal. This evaluation was conducted with vendor input. However, during communications with the vendor, the licensee did not inform the vendor that seal injection had been initiated with the pump uncoupled. Consequently, the vendor concluded that no seal damage had occurred because the vendor did not know the pump was uncoupled at the time of the injection. The licensee’s operability evaluation was completed and concluded that the seal was operable, and plant operation continued. Later, after refueling and coupling the RCP, when a reactor coolant system fill and vent was performed, the seal was determined to be damaged and leaking. Subsequent communications with the vendor indicated that the vendor was aware that seal injection should not be applied to an uncoupled pump, but given that the licensee staff did not communicate the status of the pump to the vendor, the potential for seal damage was not identified until after the seal had been declared operable and demonstrated leakage following pump recoupling.

Although this communication deficiency is not directly related to the inadequate procedure, if clear and complete communications had occurred at the time of occurrence, then a reduced inventory condition (with fuel in the reactor vessel) could have been avoided.

NRC determined, as the licensee presented in its objection, that the vendor supplied information did not include specific information that would inform the licensee that seal damage would occur if the pump seals were pressurized with the pump uncoupled from the shaft, and that a review of operating experience did not identify any events or information that specifically addressed this event. The licensee contends that without operating experience and vendor input, there was no way for them to have reasonably predicted or prevented this occurrence. While NRC acknowledges that operating experience and vendor input are necessary and useful for enhancing safe operation of a nuclear facility, the NRC believes that in this particular instance, even without these elements, this condition could have been prevented or its significance could have been reduced. As noted in NRC's Position to Objection 1 regarding this issue, the unusual combination of filling and venting the reactor coolant system with an uncoupled reactor coolant pump should have prompted the licensee to make a more detailed evaluation of the actions associated with initiating seal injection flow. Accordingly, this NCV related to Technical Specification 6.4.1, "Procedures," will be sustained as a finding of very low risk significance (Green).

With regard to the crosscutting aspects of this finding, NRC initially determined that this finding had crosscutting aspects related to human performance in that the pump seal damage was caused by an inadequate procedure. Since the procedure had existed in this form for many years, the human performance crosscutting aspect of the inadequate procedure would not be indicative of recent licensee performance. However, there were missed opportunities, as indicated above, to review the procedure to ensure its adequacy for the unusual plant configuration prior to and during use that is indicative of recent performance. Utilizing crosscutting aspect guidance from NRC Manual Chapter 0612, "Power Reactor Inspection Reports," this finding was determined to have problem identification and resolution crosscutting aspects. The Plant Issues Matrix entry will be revised to reflect this determination.

Objection 4: Entergy does not agree that a maintenance condition that requires a reduced inventory window to correct would affect the Mitigating Systems Cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

NRC Position: NRC agrees that this issue did not affect the Mitigating Systems Cornerstone. However, upon further review and as previously discussed, NRC finds that the Barrier Integrity Cornerstone attribute of procedure quality was affected due to the implementation of an inadequate procedure that allowed the initiation of seal injection to an uncoupled RCP. The Performance Issues Matrix will be updated to reflect Barrier Integrity as the affected cornerstone.

Conclusion: Unit 2 Technical Specification 6.4.1, "Procedures," states that written procedures shall be established covering the applicable procedures in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Regulatory Guide 1.33, Appendix A, Section 3.a states, in part, that instructions for filling and venting should be prepared for the reactor coolant system. Contrary to the above, the procedure for filling and venting the reactor cooler system, Procedure 2103.002, was inadequate in that it allowed the initiation of seal injection to an

uncoupled reactor coolant pump which caused damage to the pump seals. The additional risk incurred from the repair of the pump seal could have been avoided with an adequate RCS fill procedure and if there had been effective identification and evaluation of unusual plant conditions associated with the use of this procedure. The violation will be sustained as an issue of very low safety significance for the performance deficiency related to an inadequate procedure. Additionally, ineffective communications between organizations was a contributing cause to this condition. The crosscutting aspect of human performance will be revised to problem identification and resolution, and the cornerstone will be revised from Mitigating Systems to Barrier Integrity.