



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

September 22, 2010

EA-09-167

Mr. Mark A. Schimmel
Site Vice President
Prairie Island Nuclear Generating Plant
Northern States Power Company, Minnesota
1717 Wakonade Drive East
Welch, MN 55089

**SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
NRC SUPPLEMENTAL (95001) INSPECTION REPORT 05000306/2010009**

Dear Mr. Schimmel:

On September 7, 2010, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection at your Prairie Island Nuclear Generating Plant, Unit 2. The enclosed report documents the inspection results which were discussed on June 29 and September 7, 2010, with you and members of your staff.

The NRC performed this supplemental inspection consistent with the NRC Action Matrix due to a White finding in the Mitigating System Cornerstone. Specifically, on September 3, 2009, the NRC issued its Final Significance Determination and a Notice of Violation (NRC Inspection Report 05000306/2009013) for a White finding that involved failures by your staff to design the component cooling water system such that it would be protected from the impact of high energy line break, seismic, or tornado events. Your staff informed the NRC on April 26, 2010, of your readiness for this inspection.

This supplemental inspection utilized NRC Inspection Procedure 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," and was conducted to provide assurance that: (1) the root and contributing causes of the White performance issue were understood; (2) the extent of condition and extent of cause were identified; and (3) your corrective actions were sufficient to address the root causes and contributing causes and to prevent recurrence. Based on the results of this inspection, the NRC concluded that the extent of condition review performed by your staff did not have sufficient breadth to identify conditions similar to the condition that led to the White finding. As a result of this condition, the NRC will not close the White finding. Instead, the NRC will re-perform those portions of the supplemental inspection that precluded closing of the White finding. This inspection will be performed in accordance with Inspection Procedure 95001 following completion of your actions to address concerns identified in the enclosed report. This inspection will also include a review of additional information needed to close an Unresolved Item documented in the enclosed report.

The inspection was an examination of activities conducted under your license as they relate to safety and to compliance with the Commission's Rules and Regulations and with the conditions of your license. Within these areas, the inspection focused on your staff's evaluation of the White performance issue and consisted of a selective review of procedures, documents, and representative records, observation of activities, and interviews of personnel.

Your staff's evaluation identified that the root cause of the issue was inadequate management of Turbine Building High Energy Line Break (HELB) analysis and the cold chemistry laboratory cooling water piping resolution studies. As a result, the vulnerability of the Component Cooling (CC) piping to a HELB was not recognized until July 2008. Based on the results of this inspection, no findings associated with your staff's evaluation of this performance issue were identified. The inspectors determined that your root cause evaluation and associated self-assessment for the White finding were conducted using systematic techniques and adequately identified the root and contributory causes for the specific performance issue.

Corrective actions were developed to address the identified cause and contributors, which included improvements to oversight of engineering studies and analysis as well as development of a HELB design basis document. We concluded that your corrective actions were adequate to address the causes that were identified in your evaluation so as to prevent recurrence. However, the extent of condition performed to understand the breadth of potential interactions of CC and HELB failed to validate that CC piping in proximity to high energy lines would remain operable following a HELB. Therefore, consistent with NRC Manual Chapter 0305, "Operating Reactor Assessment Program," this issue will remain on the plant issues matrix.

The attached report documents one NRC-identified finding of very low safety significance (i.e. one green). The finding was determined to involve a violation of NRC requirements. The finding did not include a cross-cutting aspect. However, because of the very low safety significance, and because the issue was entered into your corrective action program, the NRC is treating the issue as a non-cited violation (NCV) in accordance with Section VI.A.1 of the NRC Enforcement Policy. If you contest the subject or severity of any NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Regional Administrator, U.S. Nuclear Regulatory Commission - Region III, 2443 Warrenville Road, Suite 210, Lisle, IL 60532-4352; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555 0001; and the Resident Inspector Office at the Prairie Island Nuclear Generating Plant. In addition, if you disagree with the cross-cutting aspect assigned to any 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 Prairie Island Nuclear Generating Plant.

M. Schimmel

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

Sincerely,

/RA by Gary L. Shear for/

Steven West, Director
Division of Reactor Projects

Docket Nos. 50-306
License Nos. DPR-60

Enclosure: Inspection Report 05000306/2010009
w/Attachment: Supplemental Information

cc w/encl: Distribution via ListServ

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket Nos: 50-306
License Nos: DPR-60

Report No: 05000306/2010009

Licensee: Northern States Power Company, Minnesota

Facility: Prairie Island Nuclear Generating Plant, Unit 2

Location: Welch, MN

Dates: June 14 through September 7, 2010

Inspectors: J. Ellegood, Senior Resident Inspector,
Palisades Nuclear Plant
D. Betancourt, Reactor Engineer

Approved by: S. West, Director
Division of Reactor Projects

Enclosure

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SUMMARY OF FINDINGS

Inspection Report 05000306/2010009; 06/14/10 – 09/07/10; Prairie Island Nuclear Generating Plant, Unit 2; Supplemental Inspection – Supplemental Inspection Procedure 95001.

The report covers a supplemental inspection performed by the Palisades Nuclear Plant Senior Resident Inspector assisted by NRC regional and headquarters personnel. Because the licensee's extent-of-condition review did not identify and evaluate all locations where potential adverse interaction existed between a High Energy Line Break (HELB) and Component Cooling (CC) piping, the finding will remain open. The inspectors also identified one Green non-cited violation (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Cross-cutting aspects are determined using IMC 0305, "Operating Reactor Assessment Program." Findings for which the SDP does not apply may be Green or 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 Inspection Procedure (IP) 95001, "Inspection for One or Two White Inputs in a Strategic Performance Area," to assess the licensee's evaluation associated with the failure to implement design control measures to ensure that the design basis for the component cooling water system was correctly translated into specification drawings, procedures and instructions. The NRC staff previously characterized this issue as having low to moderate safety significance (White) as documented in NRC Inspection Report 05000306/2009013. During this supplemental inspection, the inspectors determined that the licensee performed an adequate evaluation of the specific performance issue and that corrective actions addressed each of the root and contributing causes. However, the inspectors determined that weaknesses in the licensee's extent of condition review preclude closure of the finding. The licensee identified the root cause as being that Prairie Island provided inadequate management of the Turbine Building HELB analyses and the cold chemistry laboratory component cooling water piping resolution studies.

Additionally, the licensee identified two contributing causes:

Contributing Cause #1: Station management has not developed adequate standards for Operating Experience (OE) evaluations with respect to Extent of Condition resulting in a lack of rigor applied to new issue identification.

Contributing Cause #2: Engineering management has not developed expectations pertaining to Corrective Action Program (CAP) initiation for:

- (1) How long a potential issue can be investigated before it is documented in a CAP; and,*
- (2) when a CAP should be written for valid issues identified in draft or otherwise unaccepted studies.*

Corrective actions as documented in the root cause evaluation included:

- Development of a design basis document for HELB;
- additional management oversight of engineering studies; and
- modification to CC lines vulnerable to HELB.

Findings

Cornerstone: Mitigating Systems

Green: The inspectors identified an NCV of 10 CFR 50, Appendix B, Criterion III, "Design Control." Specifically, the licensee failed to design the D1/D2 diesel generators to survive impact from the design basis missiles. 10 CFR 50, Appendix B, Criterion III states, in part, that "Measures shall be established to assure that applicable regulatory requirements and the design basis...for those systems, structures, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions." Contrary to this requirement, on July 28, 1994, the licensee approved a calculation that used evaluation methodologies that were not included in the license for the facility. The licensee evaluated the condition and concluded D1/D2 remained operable but non-conforming.

The inspectors determined that the failure to design the facility to withstand the impact of the design basis missile was a performance deficiency that warranted a significance evaluation. Using IMC 0612, the inspectors determined the failure to design the D1/D2 diesel to survive an impact from the design basis missile was more than minor because it is associated with the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. The inspectors consulted with the Senior Reactor Analyst (SRA) and determined that the risk associated with the condition was green. No cross-cutting aspect was assigned because the performance deficiency from 1994 was not representative of current performance. (Section 3.01 a)

REPORT DETAILS

4. OTHER ACTIVITIES

4OA4 Supplemental Inspection (95001)

.1 Inspection Scope

The NRC staff performed this supplemental inspection in accordance with Inspection Procedure (IP) 95001 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 and contributing causes of risk-significant issues were understood;
- provide assurance that the extent of condition and extent of cause of risk-significant issues were identified; and
- provide assurance that the licensee's corrective actions for risk-significant issues were or will be sufficient to address the root and contributing causes to preclude repetition.

The licensee entered the Regulatory Response Column of the NRC's Action Matrix in the third quarter of 2009 as a result of one inspection finding of low-to-moderate safety-significance (White). As of July 31, 2008, the licensee had failed to ensure that the design of the Unit 2 component cooling (CC) system would mitigate licensing basis events such as a High Energy Line Break (HELB), seismic, and tornado. Specifically, a CC line was in close proximity to high energy lines for 15A and 15B feedwater heaters. Due to the proximity, a HELB could impact and cause failure of the CC line which would cause a loss of component cooling water system function in 6 minutes due to loss of CC system inventory. The NRC determined the delta core damage frequency for this condition was $3.2e-6/yr$ and, therefore, the finding was of low to moderate (White) safety significance. The NRC issued Report No. 05000282/2009010; 05000306/2009010 in August 5, 2009, with a preliminary White finding. The NRC issued a Notice of Violation (NOV) with a final White finding on September 3, 2009.

The licensee informed the NRC staff that they were ready for the supplemental inspection on April 26, 2010. The licensee performed root cause evaluation (RCE) 01145695 to identify the direct causes, contributing causes and other causal factors, which allowed for the risk-significant finding. The root cause also reviewed organizational attributes that resulted in the White finding including a review of safety culture.

The inspectors reviewed the licensee's RCE, as well as 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 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.

2. Evaluation of the Inspection Requirements

2.01 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-revealing, or NRC-identified) and the conditions under which the issue was identified.

The licensee identified the inoperability of the Unit 2 CC system on July 31, 2008, while investigating the impact that HELB could have on the continued operability of the CC system. Component cooling piping located in the turbine building, and used to supply water to the chemistry cold lab, passed directly underneath high energy piping for the 15A and 15B feedwater heaters. The licensee identified that if a HELB were to occur it could cause a complete loss of CC inventory, if the CC piping was severed.

During the review of this issue the inspectors determined that the licensee had identified potential design deficiencies with the CC piping located in the turbine building multiple times. However, the licensee failed to properly prioritize the resolution of these deficiencies. The inspectors verified that this information was documented in the licensee's RCE.

- 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 licensee's RCE documented that the routing of the CC system through the turbine building was part of the original design of the plant and had been in place since plant construction. The licensee identified at least 13 previous opportunities between 1990 and 2008 in which this issue could have been identified. During that time period, the licensee had pertinent Information Notices, Operating Experience (OE), NRC generic communications and an internal study commissioned to a contractor. The inspectors performed an independent search of the corrective action system and found no other prior opportunities for identification that had not been already documented in the RCE. Taking all this into consideration, the inspectors determined that the licensee's evaluation was adequate with respect to identifying how long the issue existed and 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 NRC determined that this issue was a preliminary WHITE finding, as documented in Inspection Report 05000282/2009010. The licensee did not contest the characterization of the risk significance of this finding and declined the opportunity to discuss this issue in a regulatory conference or to provide a written response. The NRC's final risk determination and finding were issued on September 3, 2009. The licensee's RCE also documented that the finding associated with this issue was a violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," and had safety significance since it resulted in the inoperability of the CC system and the potential to drain the system in 6 minutes.

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

2.02 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 conducted a root cause analysis of the performance issue using Procedure FG-PA-RCE-01. The licensee used an Event and Causal Factor chart, Why Staircase, Failure Mode Analysis, Safety Culture Analysis, Barrier Analysis, and Change Analysis to determine root and contributing causes. The inspectors evaluated the RCE report against the requirements of the licensee's procedures and determined that the evaluations performed followed the administrative procedure requirements.

The inspectors concluded that systematic methods were used to identify the root cause and contributing cause.

- 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 inspectors concluded that the RCE identified and assessed the potential contributors to the failure to ensure component cooling functions would be maintained following initiating events. The inspections concluded the RCE contained detail commensurate with the significance of the issue. The licensee used multiple techniques in conducting the RCE and developed extensive tables and charts to organize and portray information gathered as part of the evaluation. The inspectors were able to understand the logic behind the licensee's conclusion on the root and contributing causes using the information provided in the root cause report.

Root Cause

The licensee stated that the root cause was:

There has been inadequate management of the Turbine Building HELB analyses and the cold chemistry laboratory component cooling water piping resolution studies.

In the subsequent discussion of the root cause, the licensee recognizes that a lack of understanding of the license basis has impacted the resolution of HELB interactions. The inspectors compared the root cause discussion with the information contained in the various root cause methods used and concluded that the analytical techniques support the overall discussion of the root cause.

Contributing Causes

Additionally, the licensee identified two contributing causes:

Contributing Cause #1: Station management has not developed adequate standards for OE evaluations with respect to Extent of Condition resulting in a lack of rigor applied to new issue identification.

Contributing Cause #2: Engineering management has not developed expectations pertaining to the Corrective Action Program (CAP) initiation for:

- (1) How long a potential issue can be investigated before it is documented in a CAP; and,*
- (2) when a CAP should be written for valid issues identified in draft or otherwise unaccepted studies.*

The inspectors concluded that the licensee reasonably identified contributing causes from the data collected.

- 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 OE.

The RCE included a historical review of the licensee's CAP, OE, and NRC communications. In the report, the licensee recognizes that there were a significant number of opportunities to identify the HELB/CC interactions. The licensee's root and contributing causes identify inadequacies in evaluating the OE as significant contributors to the White finding. The discussion of finding provides a chronology of prior opportunities to identify the issue. This is supplemented by additional discussion of OE that provided opportunities to identify the condition.

The inspectors concluded that the licensee's RCE appropriately considered both internal and external OE. The evaluation assessed the licensee's previous lack of recognition, evaluation, and mitigation of the HELB interactions.

- 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(s).

The licensee's evaluation considered the extent of condition associated with identifying any additional vulnerabilities that may have existed in relation to CC water system interactions with high energy lines. As part of the initial walkdowns, a vulnerability related to protection from tornado missiles of the 122 Spent Fuel Pool (SPF) heat exchanger and CC piping going to the aerated drain tank (ADT) evaporator and hydrogen recombiner were identified. The licensee took actions to protect the affected equipment.

The Extent of Condition walkdowns were completed on August 2, 2008, and the results were documented on Engineering Evaluation EC 13000 for the Turbine Building and CAP 1174370-07 for the Auxiliary Building, both documents identified that no additional concerns were discovered.

Although the licensee's root cause discusses the extent of condition review and states, "the result of the evaluation was that there are no additional concerns for the pipe whip or jet impingement for equipment in the turbine building," and that, "no HELB concerns were noted in the auxiliary building." The inspectors identified a location where the licensee had not evaluated a HELB interaction. As part of the inspection, the inspectors walked down limited portions of the auxiliary building and turbine building to identify areas where interactions between high energy lines and safety-related systems might exist. The inspectors identified a CC location in the auxiliary building that the licensee

had not evaluated. Subsequent walkdowns by the licensee identified an additional 31 locations that had not been evaluated. These observations revealed substantial weaknesses in the licensee's extent of condition. Although the licensee had recognized these locations in condition reports and other documentation, the licensee did not have a systematic process in place to evaluate these locations. In addition, the licensee's root cause documented that there were no concerns in either the turbine building or the auxiliary building.

With respect to extent of cause, the licensee focused on areas where programs associated with meeting design basis requirements might have weaknesses. The licensee reviewed condition reports and concluded that weaknesses exist in other programs. The licensee developed corrective actions to develop design basis documents for other programs. The inspectors noted that an additional element of the licensee's root cause was a lack of knowledge of the licensing basis for HELB. The licensee's extent of cause did not evaluate other areas where license basis knowledge could be weak. The inspectors interviewed engineers and determined that weaknesses existed in their understanding of general license requirements. In addition, the inspectors noted condition reports related to poor quality of operability determinations. Therefore, the inspectors concluded that lack of licensing basis knowledge existed in multiple areas.

The inspectors concluded that although the root cause discussed the extent of condition and the extent of cause, the licensee failed to identify both the extent of cause and the extent of condition. Because the interactions identified by the inspectors related directly to the condition that resulted in the White finding, the inspectors concluded that the White finding could not be closed.

- 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 Inspection Manual Chapter (IMC) 0305.

The inspectors concluded that the current safety culture aspect associated with this issue was appropriately considered in the licensee's RCE and included consideration of whether a weakness in any safety culture component was a root cause or a significant contributing cause of the issue. The inspectors interviewed plant personnel to validate the licensee's conclusion and did not identify instances where safety culture weaknesses contributed to the finding.

2.03 Corrective Actions

- a. Inspection Procedure 95001 requires that the inspection staff determines 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 licensee developed corrective actions to address the condition and to prevent recurrence. Corrective actions included:

- isolation of the CC line vulnerable to HELB;
- isolation of another CC line vulnerable to tornado born missiles;
- development of a design basis document for HELB;

- Project Review Group (PRG) review of engineering analysis and studies for progress and priority;
- enhanced expectations for use entering issues into the CAP process; and
- improved reviews of OE.

The inspectors compared the licensee's corrective actions with the identified causal factors and concluded that the completed and proposed corrective actions could reasonably preclude recurrence. The inspectors did note two weaknesses in the corrective action. The Corrective Action to Prevent Recurrence (CAPR) to expand the scope of PRG reviews added review requirements for engineering analysis but the scope of the procedure remained a review for effective business evaluations. The inspectors concluded that PRG members were currently aware of the issues surrounding CC/HELB and would review evaluations with consideration of safety impacts but that expansion of the scope of the PRG procedure would provide longer term confidence that PRG would maintain focus on safety implications. In addition, since the extent of cause did not consider areas where license basis knowledge was weak, corrective action adequacy cannot be evaluated. The corrective actions do include a task to determine other programs that need updated design basis documents.

Although the inspectors identified weaknesses in the licensee's corrective actions, the inspectors concluded that the corrective actions address the underlying condition and could preclude recurrence.

- 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 inspector reviewed the completion dates for corrective actions already taken as well as due dates for corrective actions that have not been completed. The inspectors noted the following:

- the CC line was not modified to isolate it from the turbine building until May of 2010;
- approval of the procedure change for PRG reviews did not occur until June 10;
- approval for funding of the Design Basis Document did not occur until June 17; and
- evaluation of all CC/HELB interactions were not complete when the inspectors started the inspection.

The inspectors concluded that these actions were not properly prioritized and should have been completed sooner.

The inspectors reviewed the schedule for completion of the remaining corrective actions. The inspectors concluded the licensee had established a reasonable schedule based on the scope of activities, safety significance, and regulatory compliance.

- 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 schedules for the completion of the specified corrective actions. As previously stated, several of the completed corrective actions were not completed commensurate with their significance.

The licensee established a project plan for the development of a design basis document for HELB. The project plan establishes additional schedule milestones for completion of corrective actions. This project plan will be periodically reviewed by plant management to validate progress. Other corrective actions will be tracked via the CAP. The majority of the corrective actions had been completed prior to this inspection, and the remaining corrective actions were on schedule for completion. The inspectors reviewed the completed corrective actions and concluded that they had been generally implemented in a timely and effective manner. The inspectors did not identify any concerns with the scheduling or completion of corrective actions.

- 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 has scheduled effectiveness reviews to validate the corrective actions to prevent recurrence. The first CAPR evaluates the HELB design basis document using qualitative criteria and is due March 1, 2012. Since the design basis document will not be complete until November 2011, the due date is reasonable. The other effectiveness review evaluates the CAPR to have engineering studies reviewed by the PRG. This uses qualitative criteria as well and is due on September 30, 2010. The inspectors concluded the licensee had established reasonable effectiveness reviews for the CAPR.

- e. Inspection Procedure 95001 requires that the inspection staff determine that the licensee's planned or completed corrective actions adequately address an NOV that was the basis for the supplemental inspection, if applicable.

The NRC issued its final significance determination and NOV (05000306/2009013-01), Failure to Ensure Design Measures Were Appropriately Established for the Unit 2 Component Cooling Water System. The NRC documented the reason for the violation, the corrective actions taken and planned to be taken to correct the violation and to prevent recurrence, and the date when full compliance was achieved in Inspection Report 05000282/2009010; 05000306/2009010, dated August 5, 2009. The NRC staff did not require a response to the NOV from the licensee; therefore, this inspection requirement was not applicable.

.2.04 Old Design Issues

- a. Inspection Procedure 95001 requires that the inspection staff evaluate the finding to determine if it meets the criteria for an old design issue.

The NRC evaluated Finding VIO-05000306/2009010-02 for treatment as an old design issue in Report No. 05000282/2009010; 05000306/2009010 and concluded that the finding did not meet criteria for treatment as an old design issue. Therefore, this requirement was not applicable to this report.

3. Other Issues

3.01 Findings

a. Inadequate Diesel Design

Introduction: The inspectors identified a violation of 10 CFR 50, Appendix B, Criterion III, design control. Specifically, the licensee failed to design the D1/D2 diesel generators to survive impact from the design basis missiles.

Description: On November 1, 1992, the licensee approved Safety Evaluation 328 that evaluated the tornado missile hazard for the D1 diesel generator. The evaluation addressed a missile path to the D1 diesel generator through a nonsafety-related door. In part, the evaluation used probabilistic methodology to justify the acceptability of the diesel design. In May 1994, the licensee evaluated the effects of tornado borne missiles on the ventilation ducting and exhaust ventilation of both D1 and D2 emergency diesel generators (EDGs). Again, the licensee used probabilistic methods as a basis to show the acceptability of the Prairie Island Nuclear Power Plant design. Regulatory Information Summary (RIS) 2008-014 provides the NRC position on the use of probabilistic methods for evaluation of tornado born missiles. The RIS summarizes prior NRC positions that included acceptance of the use of TORMIS. Although the NRC approved the use of TORMIS in a Safety Evaluation Report (ML080870291), the approval did not incorporate the use of TORMIS into the license basis of Prairie Island. 10 CFR 50.59(c)(2)(viii) requires a license amendment for the use of the TORMIS methodology. Prairie Island Nuclear Power Plant did not receive NRC approval for the use of TORMIS.

The licensee's Updated Final Safety Analysis Report (UFSAR), Section 12.2.1.4.3.1.4, "Design for Missiles," states that Systems, Structures, and Components requiring protection from missiles are identified in accordance with NUREG-0800 SRP 3.5.2. Section 12.2.1.3.2 of the UFSAR states:

Tornado Loads

Tornado loadings used in the design consist of the following:

- a. A pressure drop equal to 3 psi. This pressure is assumed to drop from normal atmospheric pressure in 3 seconds
- b. A lateral force caused by a funnel of wind having a peripheral tangential velocity of 300 mph and a forward progression of 60 mph
- c. The design tornado driven missile was assumed equivalent to an airborne 4"x 12"x 12 ft plank travelling end-on at 300 mph, or a 4000 lbs automobile flying through the air at 50 mph and at not more than 25 feet above ground level

The licensee deviated from these requirements in approving a calculation for the acceptability of tornado design based, in part, on probabilistic evaluation of the tornado born missiles.

Analysis: The inspectors determined that the failure to design the facility to withstand the impact of the design basis missile was a performance deficiency that warranted a significance evaluation. Using IMC 0612, the inspectors determined the failure to design the D1/D2 diesel to survive an impact from the design basis missile was more than minor because it is associated with the Mitigating System Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. Specifically, the D1/D2 diesel is not protected against the external event of adverse weather (i.e. tornado). Using IMC 0609, the inspectors determined the finding was more than minor because it involved the loss of equipment specifically designed to mitigate a severe weather initiating event.

In accordance with IMC 0612, the inspectors evaluated the finding using Reactor Oversight Process (ROP) screening. None of the examples in Appendix E applied; therefore the inspectors applied the minor screening questions. The inspectors determined that the finding was associated with Mitigating System Cornerstone attribute of protection against external events. Specifically, the finding affected the availability and reliability of EDGs during adverse weather (i.e. tornados). The inspectors concluded that the finding would degrade one or more trains of a system that supports a safety function in accordance with Table 4b of IMC 0609.04, "Phase 1 Initial Screening and Characterization of Findings." As a result, the finding screened as potentially risk significant due to external initiating events and a significance determination process phase 3 evaluation was required.

The Region III SRA used NUREG /CR-4461, Revision 2, "Tornado Climatology of the Contiguous US," as a reference for tornado strike frequencies. Table 5-1 provides expected values of tornado strike probabilities. From this data, the Senior Reactor Analyst assumed a tornado strike probability per year of approximately 1.0E-4. The SRA used the Prairie Island Standardized Plant Analysis Risk (SPAR) model to estimate a conditional core damage probability assuming a weather induced loss of offsite power and the failure of the D1 EDG due to the lack of tornado missile protection. The estimated conditional core damage probability was 4.4E-4. Using these values for the initiating event frequency and conditional core damage probability, the delta core damage frequency was estimated to be less than 1E-6/yr. Therefore, the finding was determined to be of very low safety significance (Green). The inspectors also concluded that, due to the age of the performance deficiency, it does not reflect current licensee performance. Therefore, there is no cross-cutting aspect.

Enforcement: 10 CFR 50, Appendix B, Criterion III states, in part, that "Measures shall be established to assure that applicable regulatory requirements and the design basis...for those systems, structures, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions." Contrary to this requirement, on July 28, 1994, the licensee approved a calculation that justified the design of the D1/D2 even though portions of the system lacked the ability to survive impact from the design basis tornado born missiles. Until at least June 17, 2010, the licensee relied on this calculation to demonstrate compliance with license requirements. The calculation used probabilistic methods that are not part of the design basis for the facility. The diesel generators are required to survive impact from tornado born missiles and NUREG-0800 Section 3.5.1 provides deterministic criteria for evaluating acceptability of facility design.

Because this violation was of very low safety-significance and was entered into the licensee's CAP (AR 01237728), this violation is being treated as a Non-Cited Violation (NCV), consistent with the NRC Enforcement Policy: **NCV 05000282/2010009-01; Failure to Design Diesels to Survive Tornado Borne Missiles.**

b. Unresolved Item: Component Cooling Classification

Introduction: The Inspectors identified an unresolved item regarding the licensee's classification of portions of the component cooling system as nonsafety-related. During the inspection, insufficient information was available to determine the correct classification of portions of the CC piping; therefore the inspectors could not determine if the licensee properly applied the 50.59 process to review procedure changes related to isolation of the CC system.

Discussion: During performance of the inspection, the inspectors reviewed the procedural changes, operability recommendations and 50.59 screen associated with actions to isolate portions of the Unit 1 CC system during adverse weather to prevent challenging the safety function of the CC system due to impacts from tornado born missiles. The licensee concluded that a 50.59 evaluation would not be required, in part, because the change did not represent an adverse affect on system design functions. When the inspectors questioned the veracity of that conclusion, the licensee provided additional information that the portions of the CC system that would be isolated had been downgraded from safety related to nonsafety-related in the 1990s. This change eliminated some quality requirements including the need for missile protection. The inspectors reviewed the documentation provided by the licensee but could not determine if changes made to the classification of the CC operation were consistent with regulatory requirements. In addition, the current designation of portions of the CC piping as nonsafety-related does not appear consistent with Licensee Procedure FP-E-RTC-02, Equipment Classification. Pending review of additional documentation to determine the correct classification of the CC piping, this issue will remain an Unresolved Item (URI) and tracked as **URI 05000282/2010009-02; Classification of CC Piping.**

4. Management Meetings

.1 Exit Meeting Summary

On September 7, 2010, the inspectors presented the inspection results to Mr. Brad Sawatzke, Site Director of Operations, and other members of the staff who acknowledged the results of the inspection and the violation of applicable regulatory requirements. The inspectors confirmed that proprietary information was not provided or examined during this inspection.

.2 Interim Exit Meeting

On June 29, 2010 the inspectors presented interim inspection results to Mr. M. Schimmel, Vice President and other members of the staff.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

- T. Roddey, Engineering Manager
- S. Dipasquale, Licensing
- K. Kriesel, Engineering
- D. Kettering, Engineering Director
- B. Sawatzke, Site Director of Operations
- S. Ford, Engineering

NRC

- P. Zurawski, Resident Inspector
R. Orlikowski, Chief (acting)

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000306/2010009-01	NCV	Failure to Design Diesels to Survive Tornado Borne Missiles (Section 3.01 b)
05000282/2010009-02	URI	Classification of CC Piping

Closed

05000306/2010009-01	NCV	Failure to Design Diesels to Survive Tornado Borne Missiles (Section 3.01 b)
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Discussed

05000282/2009013-01	VIO	Failure to Ensure Design Measures Were Appropriately Established for the Unit 2 Component Cooling Water System (Section 2.03 d)
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List of Documents Reviewed

The following is a partial list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspector 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.

- 1C14 AOP1, Loss of Component Cooling, Revision 17
- AB-2, Tornado/Severe Thunderstorm/High Winds, rev. 34
- ACE 01174370, Apparent Cause Evaluation for Unprotected Component Cooling Piping
- Business Case for HELB resources, June 7, 2010
- C47020, 11 CC Surge Tank Lo Lo Level, Revision 36
- C47020, 11 CCSurge tank Hi/Lo LVL, Revision 35
- CAP 01222084, Adverse Trend in errors in OPRS, March 10, 2010
- CAP 01237728, Question related to tornado missile impact in D1/D2, June 17, 2010
- CAP 01241941, NRC has Questioned the 50.59, July 19, 2010
- CAP 1145695, CC Piping adjacent to HELB Location in Turbine Building, July 29, 2008
- CAP 1174370-07 Extent of Condition Review of the Auxiliary Building, April 30, 2009
- CAP 1213357, Potential HELB Pipe whip impact on doors 42&43, January 12, 2010
- CAP 1222084, Adverse trend in errors in OPRs, March 10, 2010
- CAP 1237717, MS Trap & Drain Line pipe Whip into CC pipes, June 17, 2010
- Component Cooling Water System Design Basis document, Revision 4
- Component Cooling Water System, High Energy Line Break presentation, June 14, 2010
- Contract 984, Investigate Design Options for a Chiller in the Cold Chemistry Lab, Release 66
- EC 13000 Extent of Condition Review for the Turbine Building, August 2, 2008
- e-mail A. Smith to S. DiPasquale, FW:Funding Notice- HELB Assessment & Gap Analysis, June 17, 2010
- FG-BUS-PRG-01, Project Review Group, Revision 1
- FG-E-SE-03, 50.59 Resource Manual, Revision 1
- FG-PA-ACE-01, Apparent Cause Evaluation Manual, Revision 17
- FG-PA-RCE-01, Root Cause Evaluation Manual, Revision 17
- FOI A0487 Action Items Complete, May 13, 1998
- FOI A0487, CC System Single Failure Analysis, October 15, 1991
- FP-BUS-IPP-01, Prioritization Guideline, Revision 1
- FP-BUS-PRG-01, Project Review Group, Revision 0
- FP-E-RTC-02, Equipment Classification, Revision 5
- FP-PA-ARP-01, CAP Action Request Process, Revision 25
- FP-PA-ARP-01, CAP Action Request Process, Revision 26
- GEN-PI-002, Probabilistic Risk Assessment of D1 EDG Room Door Vulnerability to Tornado Missiles, June 2, 1993
- GEN-PI-005, Tornado and Seismic Evaluation of D1/D2 Components, Revision 0
- GIP-2, Generic Implementation Procedure, Revision 2
- Justification for the Operability of CC lines in the Fuel Handling Building, March 25, 2009
- LER-05000282-92-007-00, Design Basis reconstitution effort Identified a Condition Outside the Plant Design Basis, Revision 0
- Ltr J. Solymossy to J. Lynch, Prairie Island response to May 2003 INPO Evaluation, December 31, 2003
- Ltr Neve (Tenera) to Sabaitis(PINGP), FOI A0487, "CC System Single Failure Analysis", September 7, 1994

- NF-39245-2, Component Cooling System, Revision 76
- NPA for Project 11383098, HELB Flooding Program Reconstitution Project, June 9, 2010
- NSPM-1, Quality Assurance Topical Report, Revision 3
- OPR 01174493-01, CC Piping to the 122 Spent Fuel Pool, Revision 1
- PCR-01229048, Revise 5AWI 6.0.0, April 24, 2010
- Prairie Island 2010 Workload Resource Plan, May 23, 2010
- Prairie Island Licensing Issue Team Update, May 20, 2010
- Prairie Island Nuclear Power Generating Plant INPO Evaluation, May 2003
- Prairie Island Updated Final Safety Analysis Report, Revision 30
- QF-2331, Nuclear PROJECT Authorization Form
- RCE 01145695, Root Cause evaluation Component Cooling Piping Adjacent to HELB Location in Turbine Building, Revision 4
- Review of Potential HELB Interaction Concern During NRC 95001 Inspection, June 21, 2010
- Review Of Potential HELB Interaction Concern During NRC 95001 Inspection Prairie Island Nuclear Generating Plant, June 21, 2010
- Screen 3196, Compensatory Measures for CC piping in the Auxiliary Building Fuel Handling Area, Revision 1
- SE-304, Safety Evaluation for Prairie Island Flow Diagram Revisions, August 22, 1991
- SE-308, Evaluation of diesel Generator and diesel Cooling Water Pump for Fuel Oil Storage and Day Tank vent Piping design, November 21, 1991
- SE-328, Tornado Missile Hazard vs. D1, November 1, 1992
- SSEL, Safe Shutdown Equipment List, Revision 0
- XH-1-7, Flow Diagram Reactor Coolant System, Unit 1, Revision 81

LIST OF ACRONYMS USED

ADT	Aerated Drain Tank
CAPR	Corrective Action to Prevent Recurrence
CC	Component Cooling
CFR	Code of Federal Regulations
HELB	High Energy Line Break
IMC	Inspection Manual Chapter
IP	Inspection Procedure
NCV	Non-Cited Violation
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PRG	Project Review Group
RCE	Root Cause Evaluation
RIS	Regulatory Issue Summary
ROP	Reactor Oversight Process
SDP	Significance Determination Process
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VIO	Violation

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Sincerely,

/RA by Gary L. Shear for/

Steven West, Director
Division of Reactor Projects

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Letter to M. Schimmel from S. West dated September 22, 2010.

SUBJECT: PRAIRIE ISLAND NUCLEAR GENERATING PLANT, UNIT 2
NRC SUPPLEMENTAL (95001) INSPECTION REPORT 05000306/2010009

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