

September 22, 2006

EA 05-157
EA 05-176

Mr. David A. Christian
Senior Vice President and
Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

SUBJECT: KEWAUNEE POWER STATION – NRC SUPPLEMENTAL INSPECTION
REPORT 05000305/2006015(DRS)

Dear Mr. Christian:

On August 18, 2006, the U.S. Nuclear Regulatory Commission (NRC) completed a supplemental inspection pursuant to Inspection Procedure 95002, "Inspection For One Degraded Cornerstone or any Three White Inputs in a Strategic Performance Area," at your Kewaunee Power Station. The enclosed inspection report documents the inspection findings, which were discussed on August 18, 2006, with Ms. L. Hartz, Site Vice-President, and other members of your staff.

As discussed in our annual end-of-cycle assessment letter dated March 4, 2006, plant performance for Kewaunee was categorized within the Degraded Cornerstone column of the Action Matrix of NRC Inspection Manual Chapter (IMC) 0305, "Operating Reactor Assessment Program," based on performance deficiencies in the Mitigating Systems cornerstone. The findings involved: (1) a performance issue having substantial safety significance (Yellow) related to the potential for flooding of safety-related structures, systems, or components; and (2) a performance issue having low to moderate safety significance (White) related to the potential for air entrainment into the auxiliary feedwater pumps. These performance deficiencies were previously described in Inspection Reports (IRs) 05000305/2005014 and 05000305/2005018, respectively. A supplemental inspection as prescribed by the Action Matrix was performed in May 2006, and documented in IR 05000305/2006007. The report identified performance deficiencies and concluded that your staff had not conducted the root cause evaluation to a level of detail commensurate with the significance of the problem. Furthermore, the NRC determined that not all corrective actions were sufficiently developed to ensure that the identified performance deficiencies were adequately addressed. Finally, the NRC concluded that your staff had not established either qualitative or quantitative measures for determining the effectiveness of the corrective actions to prevent recurrence. Consequently, the NRC did not have assurance that your planned corrective actions were sufficient to address the causes for the performance deficiencies associated with the violations.

The specific purposes of the current inspection were to: (1) assess deficiencies identified in IR 05000305/2006007; (2) assess the corrected root causes for the above findings; and (3) assess in accordance with the guidance outlined in Inspection Procedure 95002 the combined root cause evaluation that was performed as a result of the deficiencies identified in IR 05000305/2006007.

Based upon the results of this inspection, no findings of significance were identified and the inspectors concluded that adequate actions had been taken by Kewaunee to address deficiencies identified during the May 2006 inspection. As discussed in Section 06.01 of IMC 0305, safety-significant inspection findings are carried forward for four calendar quarters or until appropriate licensee corrective actions have been completed, whichever is greater. Therefore, the White finding related to the potential for air entrainment into the auxiliary feedwater pumps, which was identified in 3rd quarter of 2005, and the Yellow finding related to the potential for flooding of safety-related structures, systems, and components, which was identified in the 4th quarter of 2005, will no longer be considered in the assessment process after the 3rd quarter of 2006.

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

Sincerely,

/RA/

Cynthia D. Pederson, Director
Division of Reactor Safety

Docket No. 50-305
License No. DPR-43

Enclosure: Inspection Report 05000305/2006015(DRS)
w/Attachments: Supplemental Information

cc w/encl: L. Hartz, Site Vice President
C. Funderburk, Director, Nuclear Licensing
and Operations Support
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L. Cuoco, Esq., Senior Counsel
D. Zellner, Chairman, Town of Carlton
J. Kitsemel, Public Service Commission of Wisconsin
State Liaison Officer, State of Wisconsin

D. Christian

-2-

The specific purposes of the current inspection were to: (1) assess deficiencies identified in IR 05000305/2006007; (2) assess the corrected root causes for the above findings; and (3) assess in accordance with the guidance outlined in Inspection Procedure 95002 the combined root cause evaluation that was performed as a result of the deficiencies identified in IR 05000305/2006007.

Based upon the results of this inspection, no findings of significance were identified and the inspectors concluded that adequate actions had been taken by Kewaunee to address deficiencies identified during the May 2006 inspection. As discussed in Section 06.01 of IMC 0305, safety-significant inspection findings are carried forward for four calendar quarters or until appropriate licensee corrective actions have been completed, whichever is greater. Therefore, the White finding related to the potential for air entrainment into the auxiliary feedwater pumps, which was identified in 3rd quarter of 2005, and the Yellow finding related to the potential for flooding of safety-related structures, systems, and components, which was identified in the 4th quarter of 2005, will no longer be considered in the assessment process after the 3rd quarter of 2006.

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

Sincerely,

Cynthia D. Pederson, Director
Division of Reactor Safety

Docket No. 50-305
License No. DPR-43

Enclosure: Inspection Report 05000305/2006015(DRS)
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cc w/encl: L. Hartz, Site Vice President
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U.S. NUCLEAR REGULATORY COMMISSION
REGION III

Docket No: 50-305

License No: DPR-43

Report No: 05000305/2006015

Licensee: Dominion Energy Kewaunee, Inc.

Facility: Kewaunee Power Station

Location: Kewaunee, Wisconsin

Dates: August 14 through August 18, 2006

Inspectors: S. Burton, Senior Resident Inspector
B. Jose, Reactor Engineering Inspector

Approved by: J. Lara, Chief
Engineering Branch 3
Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000305/2006015(DRS); 8/14/2006 - 8/18/2006; Kewaunee Power Station. Supplemental Inspection 95002, Inspection for One Degraded Cornerstone or any Three White Inputs in a Strategic Performance Area.

This report documents a supplemental inspection by NRC inspectors. The inspection identified no violations of NRC requirements but discusses a White finding and a Yellow finding from a previous inspection. The significance of most findings is indicated by their color (Green, White, Yellow, or Red) using Inspection Manual Chapter 0609, "Significance Determination Process." Findings for which the significance determination process does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power plants is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

Cornerstone: Mitigating Systems

The U.S. Nuclear Regulatory Commission (NRC) performed this supplemental inspection, in accordance with Inspection Procedure (IP) 95002, to assess the licensee's corrective actions and additional evaluations performed as a result of deficiencies identified in May 2006, during an IP 95002 supplemental inspection and documented in Inspection Report (IR) 05000305/2006007.

The supplemental inspection documented in IR 05000305/2006007 was conducted to assess the licensee's evaluations associated with a degraded cornerstone, due to two findings characterized as having low to moderate (White) and substantial (Yellow) risk significance. The findings involved: (1) a performance deficiency having substantial safety significance (Yellow) related to the potential for flooding of safety-related systems, components or structures; and (2) a performance deficiency having low to moderate safety significance (White) related to the potential for air entrainment into the auxiliary feedwater pumps. These performance deficiencies were previously described in NRC Inspection Reports 05000305/2005014 and 05000305/2005018, respectively.

Report 05000305/2006007 identified performance deficiencies and concluded that the licensee had not conducted the root cause evaluation to a level of detail commensurate with the significance of the problem. Furthermore, the NRC determined that not all corrective actions were sufficiently developed to ensure that the identified performance deficiencies were adequately addressed. Finally, the NRC concluded that the licensee had not established either qualitative or quantitative measures for determining the effectiveness of the corrective actions to prevent recurrence. Consequently, the NRC did not have assurance that planned corrective actions were sufficient to address the causes for the performance deficiencies associated with the violations.

As a result of the current inspection, the NRC concluded that the licensee's evaluations adequately addressed issues remaining open from IR 05000305/2006007. Additionally, the revised individual root cause evaluations and the associated revised common cause evaluation appeared thorough and these evaluations appropriately evaluated the root and contributing causes, addressed the extent of condition/cause, assessed safety culture, and established

corrective actions for risk significant performance issues that were sufficient to address the causes and prevent recurrence. However, the inspectors identified during the inspection that tools were not established to measure the success of the related corrective actions. As a result, the licensee revised procedures and corrective actions to provide assurance that the corrective actions would be measurable and successful. Consequently, the NRC concluded that the Yellow finding for flooding (05000305/2004009-03) and the White finding for auxiliary feedwater (05000305/2005002-05) are closed.

REPORT DETAILS

01 INSPECTION SCOPE

This inspection was conducted in accordance with Inspection Procedure (IP) 95002, "Inspection for One Degraded Cornerstone or any Three White Inputs in a Strategic Performance Area," to assess the licensee's evaluation of one White and one Yellow inspection finding in the Mitigating Systems cornerstone. The inspection objectives were to assess, per the requirements of IP 95002:

- deficiencies identified in May 2006, during a previous inspection and documented in Inspection Report (IR) 05000305/2006007
- the corrected root causes for the related White and Yellow findings
- the combined root cause evaluation that was re-performed as a result of the deficiencies identified during the May 2006 inspection

Kewaunee entered the Degraded Cornerstone column of the NRC's Action Matrix in the fourth quarter of 2005, as a result of a Yellow inspection finding related to turbine building flooding. At the time, the licensee was in the Regulatory Response column of the action matrix due to a White inspection finding related to possible air entrainment in the auxiliary feedwater pumps. These findings were discussed in detail in IRs 05000305/2005010 (Auxiliary Feedwater) and 05000305/2005011 (Flooding); the final regulatory significance was documented in IRs 05000305/2005014 (Auxiliary Feedwater) and 05000305/2005018 (Flooding); and IR 05000305/2006007 documented the results of the NRC's first review of the licensee's evaluation and corrective actions associated with these findings.

02 EVALUATION OF INSPECTION REQUIREMENTS

Yellow Finding: Turbine Building Flooding of Safety and Risk Significant Components

02.01 Problem Identification

- a. *Determination whether the licensee's root cause evaluation specified who identified the issue and under what conditions*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors reviewed Root Cause Evaluation (RCE) 685, "Kewaunee Power Station Flooding Mitigation/Control Systems Root Cause Evaluation," Revision 4, and reached the same conclusion.

- b. *Determination whether the licensee's root cause evaluation documented how long the issue existed, and whether there were any prior opportunities for identification*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors reviewed RCE-685, Revision 4, and reached the same conclusion.

- c. *Determination whether the licensee's root cause evaluation documented the plant-specific risk consequences and compliance concerns associated with the issue*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors reviewed RCE-685, Revision 4, and reached the same conclusion. Section 2.3 of RCE-685, Revision 4, satisfactorily documented the plant-specific risk consequences and compliance concerns associated with the issue.

02.02 Root Cause and Extent of Condition Evaluation

- a. *Determination whether the licensee's root cause evaluation applied systematic methods in evaluating the issue in order to identify root causes and contributing causes.*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors reviewed RCE-685, Revision 4, and reached the same conclusion. RCE-685 applied the following systematic methods: event and causal factor charting, comparative time-line, barrier analysis, and 'why staircase.'

- b. *Determination whether the licensee's root cause evaluation was conducted to a level of detail commensurate with the significance of the problem*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- the RCE was not conducted to a level of detail commensurate with the significance of the problem and that systematic root cause methods failed to drive the licensee to more fully evaluate several types of issues
- the licensee's procedures did not always require independent verification of engineering products, such as calculations and operability determinations;
- the licensee frequently relied upon personnel who did not have demonstrated engineering knowledge, training, or abilities to perform engineering tasks
- schedule and budget pressures frequently played a role in engineering decisions
- the licensee did not probe why the operating experience assessments for flooding, or any other issue, failed to identify the issue
- the RCE did not explore what deficiencies in the operating experience program resulted in opportunities to identify issues being missed
- the RCE did not address why the inaccuracies were repeatedly identified without corrective actions being taken
- the RCE failed to address why the 2004 Probabilistic Risk Assessment (PRA) still used flawed information

- the licensee did not review the corrective action program document CAP016375 for the 2003 safeguards alley flooding event to determine why the actual flooding event failed to identify the larger problem
- any perceived inadequacies in the operating experience program were overshadowed by the other contributing causes which were not identified by the licensee

For the current inspection, the inspectors concluded that RCE-685, Revision 4, adequately addressed the observations identified in IR 05000305/2006007. Additionally, the new root causes, contributing causes, and the corrective actions identified in RCE-685, Revision 4, appropriately bounded/enveloped the above issues. The revised RCE identified three root causes (RCs): RC-1 discussed that the site established a low priority to issues that were not regulatory driven or required for continued plant operation; RC-2 discussed that design basis documents were not definitive about what was considered protection from flooding events; and RC-3 discussed the lack of knowledge in engineering/licensing/management on the elements of design basis/design basis events/design basis analysis methodology due to insufficient training. The contributing causes (CCs) identified were: CC-1, inadequate implementation of the corrective action program, and CC-2, station personnel did not recognize the risk associated with the flooding issue. Other low-level causes considered were the failure to hold people accountable, schedule and budget pressure, management oversight and expectations, staffing, use of operating experience (OE), and engineering rigor.

Section 1.4 of the revised RCE discussed the above low level causes in detail and ruled out some of them with appropriate justifications. Section 2.2.7.5 provided a more detailed discussion regarding the potential correlation of budget issues. The inspectors reviewed selected corrective actions listed in Sections 1.4.1 through 1.4.6, which included effectiveness reviews, and they appeared to be appropriate.

- c. *Determination whether the licensee's root cause evaluation included consideration of prior occurrences of the problem and knowledge of prior operating experience*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors reviewed RCE-685, Revision 4, and reached the same conclusion. Section 2.4 of the revised RCE discussed in detail both internal and external operating experience. A prior occurrence of turbine building flooding was discussed under Section 2.5 (extent of condition/cause) regarding flooding due to AFW lube oil cooler discharge where the turbine building sump pump could not keep up with the discharge rate.

- d. *Determination whether the licensee's root cause evaluation addressed extent of condition and extent of cause of the problem*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- a lack of engineering rigor combined with a schedule pressure to complete the corrective action assignment for CAP032809 by the prescribed due date led to the issues not being evaluated thoroughly
- the licensee's extent of cause failed to look further than previously identified problems to identify new issues resulting from an identified low level of engineering design basis knowledge

For the current inspection, the inspectors concluded that RCE-685, Revision 4, adequately addressed the observations identified in IR 05000305/2006007. Section 02.02.b above, discussed these observations.

02.03. Corrective Actions

- a. *Determine whether the licensee specified appropriate corrective actions for each common or root cause or that the licensee evaluated why no actions were necessary*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- several corrective actions to prevent recurrence corrected problems that were not identified as either a root cause or contributing causes
- because the inspectors were unable to conclude that the stated root cause was correct, the inspectors were unable to conclude that the stated corrective actions to prevent repetition would actually prevent recurrence of the problem

For the current inspection, the inspectors concluded that RCE-685, Revision 4, adequately addressed the observations identified in IR 05000305/2006007. Section 02.02.b above, discussed these observations indicating that the root causes were appropriately identified. The inspectors found that issues identified in RCE-685, Revision 4, including the root and contributing causes, were entered into the licensee's corrective action program.

- b. *Determine whether the licensee prioritized the corrective actions with consideration of the risk significance and regulatory compliance*

IR 05000305/2006007 concluded that this area was satisfactory; therefore, no further review was performed for the current inspection.

- c. *Determine whether the licensee established a schedule for implementing and completing the corrective actions*

IR 05000305/2006007 concluded that this area was satisfactory; therefore, no further review was performed for the current inspection.

- d. *Determine whether the licensee developed quantitative or qualitative measures of success for determining effectiveness of corrective actions to prevent recurrence*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- the licensee did not develop either quantitative or qualitative measures to determine the effectiveness of all of the corrective actions to prevent recurrence.

For the current inspection, the inspectors determined that the licensee had not developed quantitative or qualitative measures for all corrective actions established, nor were barriers consistently established to ensure that corrective actions were adequately evaluated. The inspectors determined that interim measures to evaluate effectiveness did not exist for long-term corrective actions to prevent recurrence. Additionally, the tools to measure effectiveness, which were often scheduled months or years after the corrective actions were implemented, did not have standards or criteria that would ensure that the corrective actions were effective nor that interim measures to prevent recurrence were evaluated.

The licensee agreed with the inspectors' observations and revised General Nuclear Procedure (GNP) GNP-11.08.01, "Action Request Process," Revision AA, to include requirements for corrective action monitoring and effectiveness reviews. The inspectors found that this revision included elements necessary to measure success. Additionally, the licensee initiated CAP036027 and CAP036028 to update/revise the related root cause analysis and corrective actions to include the requirements established by the GNP-11.08.01, Revision AA, and to incorporate any lessons-learned from the current inspection into the RCEs. The licensee completed the majority of these actions prior to the completion of the inspection and the inspectors concluded that barriers were established that should ensure the corrective actions to prevent recurrence are realistic, timely, measurable, incorporate feedback, and have appropriate standards/criteria to measure effectiveness.

03 EVALUATION OF INSPECTION REQUIREMENTS

White Finding: Auxiliary Feedwater (AFW) Pumps Susceptible to Damage from Air Entrainment

03.01. Problem Identification

- a. *Determination whether the licensee's root cause evaluation specified who identified the issue and under what conditions*

IR 05000305/2006007 concluded that sufficient information was available outside the root cause evaluation such that no further inspection of this area was necessary. For the current inspection, the inspectors noted that RCE-0677, "AFW Pumps Susceptible to Damage from Air Entrainment," Revision 7, provided a discussion concerning the identification of the issue in Section 1.1. Additionally, Section 1.3 for contributing cause CC-4 also pointed out that NRC-prompting had resulted in further investigation which led to the discovery that the pressure switches installed at the discharge of the AFW pumps were inoperable. The event time-line in the RCE and Section 2.2.3.2 also contained references to NRC-prompting as the means by which the condition was discovered.

- b. *Determination whether the licensee's root cause evaluation documented how long the issue existed, and whether there were any prior opportunities for identification*

IR 05000305/2006007 concluded that there was no need for further NRC inspection into this area. For the current inspection, the inspectors verified that Section 2.4 of the revised RCE discussed operating experience applicable to the issue. Section 2.2.4 discussed the causes of the site's failure to recognize the issue at an earlier date. The applicable generic communications were also listed in the "event time line" section.

- c. *Determination whether the licensee's root cause evaluation documented the plant-specific risk consequences and compliance concerns associated with the issue*

IR 05000305/2006007 concluded that this area was considered satisfactory; therefore, no further review was performed for the current inspection.

03.02. Root Cause and Extent of Condition Evaluation

- a. *Determination whether the licensee's root cause evaluation applied systematic methods in evaluating the issue in order to identify root causes and contributing causes.*

IR 05000305/2006007 concluded that this area was unsatisfactory and that additional inspection was needed to determine why the licensee failed to use a systematic root cause methodology. The RCE did not adequately address related actions issues between January 1994 and January 2005 or a Severity Level III violation issued in 1997 related to the pump discharge switch setpoint.

For the current inspection, the inspectors verified that Revision 7 of RCE-0677 used systematic root cause methodologies. The methods used in the RCE were interviewing, event and causal factors chart, comparative time-line, and barrier analysis. The event and causal factors chart in the revised RCE contained a discussion of the 1997 inspection results and the related violation. The comparative time-line also contained several items related to the 1997 violation.

- b. *Determination whether the licensee's root cause evaluation was conducted to a level of detail commensurate with the significance of the problem*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- the licensee's RCE was not conducted to a level of detail commensurate with the significance of the problem
- the root causes were narrowly focused on the engineering department
- after questioning by the inspectors, the licensee added a 'why staircase' to address the identified performance deficiencies; however, the conclusions of the 'why staircase' were not factored back into the root causes
- the licensee did not address whether a poor modification process was indeed a root cause

- the licensee did not probe the root cause to a sufficient depth to determine why a lack of engineering rigor did contribute to the event when engineering rigor was more likely a symptom of a more fundamental root cause such as a management philosophy that accepted low engineering rigor
- the licensee provided no justification why failure to track a commitment in the corrective action program was a root cause for failing to provide adequate AFW pump protection

For the current inspection, the revised RCE provided a more detailed description of the AFW pump issue and of the related causal factors. Additionally, RCE-0677, Revision 7, provided a more thorough review of potential low-level causes, a basis for elimination of these causes as root or contributing causes, and listed better defined corrective actions. This RCE also included a more detailed description of extent of condition and cause. The causes no longer focused solely on engineering. The following are the root causes and contributing causes identified in the revised RCE:

- RC-1, management had inadequate expectations and standards for modification and supporting engineering documentation quality
- CC-1, weak procedural guidance related to modifications
- CC-2, lack of knowledge by personnel concerning the level of detail required when working in knowledge-based mode in developing testing, analysis, and effects analysis and second level reviews
- CC-3, inadequate administrative procedural requirements existed to ensure that special test procedures contained acceptance criteria and to provide sufficient technical guidance for content development and review
- CC-4, the Operability Review (OPR) process and implementation was inadequate
- CC-5, a lack of design basis information availability made it difficult to find and review design basis information. Other low-level causes considered were accountability of personnel, inadequate training and qualifications, schedule and budget pressure, staffing and use of operating experience (OE)

In the revised RCE, a lack of engineering rigor was deleted as a cause. Section 2.2.3.1 of the RCE provided a summary of human error failure modes seen when the AFW issue was discovered by NRC. Section 2.2.3.2 provided a summary of programmatic failure modes and Section 2.2.3.3 provided a summary of the organizational failure modes seen during this time frame. These evaluations considered deficiencies over a long period of time, including the related 2005 inadequate operability determination and the factors that contributed to the 2005 deficiency. Additionally, the revised RCE explored past and current modification deficiencies including those noted during the May 2006 inspection.

This revision of the RCE deleted the “failure to track a commitment in the corrective action program,” as a cause. Similarly, the current revision of the RCE eliminated the

'why staircase' as a root cause evaluation tool and used only methodologies consistent with the Dominion RCE Handbook. A poor modification process was not considered as a cause in the previous revision of the RCE; however, Revision 7 of the RCE identified weak procedural guidance related to modifications as a contributing cause.

- c. *Determination whether the licensee's root cause evaluation included consideration of prior occurrences of the problem and knowledge of prior operating experience*

IR 05000305/2006007 concluded that no further inspection of this area was necessary. For the current inspection, the inspectors identified that Section 1.4 of Revision 7 of the RCE identified the lack of use of OE as a potential cause, Section 2.4 reviewed OE and discussed how the OE was dispositioned and why it did not facilitate identification of the AFW issue, and Section 2.2.4 discussed the causes related to the failure of the licensee to recognize the issue at an earlier date. The applicable generic communications were also listed in the event time-line section.

- d. *Determination whether the licensee's root cause evaluation addressed extent of condition and extent of cause of the problem*

Inspection Report 05000305/2006007 concluded that no further inspection of this area was necessary; therefore, no further review was performed for the current inspection.

03.03 Corrective Actions

- a. *Determine whether the licensee specified appropriate corrective actions for each common or root cause or that the licensee evaluated why no actions were necessary*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- the licensee's root cause process took credit for processes implemented prior to the AFW issue being identified as corrective actions for preventing recurrence
- the licensee's RCE credited commitments not being tracked in the corrective action program
- the inspectors were unable to assess whether the designated corrective actions would prevent recurrence of this issue because the RCE lacked the depth necessary to identify the actual root cause

For the current inspection, the inspectors concluded that RCE-0677, Revision 7, adequately addressed the observations identified in IR 05000305/2006007. Section 03.02.b above, discussed these observations indicating that the root causes were appropriately identified. The inspectors found that issues identified in RCE-0677, Revision 7, including the root and contributing causes, were entered into the licensee's corrective action program.

- b. *Determine whether the licensee prioritized the corrective actions with consideration of the risk significance and regulatory compliance*

IR 05000305/2006007 concluded that this area was satisfactory; therefore, no further review was performed for the current inspection.

- c. *Determine whether the licensee established a schedule for implementing and completing the corrective actions*

IR 05000305/2006007 concluded that this area was satisfactory; therefore, no further review was performed for the current inspection.

- d. *Determine whether the licensee developed quantitative or qualitative measures of success for determining effectiveness of corrective actions to prevent recurrence*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- the licensee developed qualitative measures for determining the effectiveness of the corrective actions to prevent recurrence. However, none of the effectiveness reviews have been completed, even though several of the corrective actions were implemented prior to the issue being identified
- the three qualitative measures, listed below, were not adequate to ensure that the corrective actions taken were effective:
 - no repeat findings from the industry-audit organization in engineering or configuration control
 - the 2007 engineering effectiveness assessment did not find issues with current products related to inadequate level of rigor
 - implementation of quality grading scale/criteria for engineering products indicated improved engineering quality and rigor

For the current inspection, the inspectors found that the licensee had not developed quantitative or qualitative measures for all corrective actions established, nor were barriers consistently established to ensure that corrective actions were adequately evaluated. The inspectors found that interim measures to evaluate effectiveness did not exist for long-term corrective actions to prevent recurrence. Additionally, the tools to measure effectiveness, which were often scheduled months or years after the corrective actions were implemented, did not have standards or criteria that would ensure that the corrective actions were effective nor that interim measures to prevent recurrence were evaluated.

The licensee agreed with the inspectors' observations and revised GNP-11.08.01, "Action Request Process," Revision AA, to include requirements for corrective action monitoring and effectiveness reviews. The inspectors concluded that this revision included elements necessary to measure success. Additionally, the licensee initiated CAP036027 and CAP036028 to update/revise the related root cause analysis and corrective actions to include the requirements established by the GNP-11.08.01, Revision AA, and to incorporate any lessons-learned from the current inspection into the RCEs. The licensee completed the majority of these actions prior to the completion of

the inspection and the inspectors concluded that barriers were established that should ensure the corrective actions to prevent recurrence are realistic, timely, measurable, incorporate feedback, and have appropriate standards/criteria to measure effectiveness.

04 EVALUATION OF INSPECTION REQUIREMENTS

Common Cause Evaluation for Degraded Cornerstone

For the purposes of identifying possible common issues, causes, and corrective actions, the licensee performed common cause evaluation, RCE K-2005-0701, "Common Cause Evaluation," Revision 2. Collective significance analysis was the method the licensee used to determine common elements within the root and common causes.

04.01 Problem Identification

- a. *Determination whether the licensee's root cause evaluation specified who identified the issue and under what conditions*

This objective was not applicable to the common cause evaluation. The evaluation of who, and under what condition each assessed issue was identified, was discussed in the individual RCEs and is addressed in the above report sections. This area was satisfactory.

- b. *Determination whether the licensee's root cause evaluation documented how long the issue existed, and whether there were any prior opportunities for identification*

This objective was not applicable to the common cause evaluation. The evaluation of how long the issues existed, and any prior opportunities for identification, was discussed in the individual RCEs and is addressed in the above report sections. This area was satisfactory.

- c. *Determination whether the licensee's root cause evaluation documented the plant-specific risk consequences and compliance concerns associated with the issue*

IR 05000305/2006007 determined that no additional inspection of this area was necessary to support NRC decision-making regarding the findings; therefore, no further review was performed for the current inspection.

04.02 Root Cause and Extent of Condition Evaluation

- a. *Determination whether the licensee's root cause evaluation applied systematic methods in evaluating the issue in order to identify root causes and contributing causes*

The licensee used a collective significance analysis to determine the common causes identified in the individual RCEs. However, the inspectors noted that the licensee's root cause guidance document identified a collective significance analysis as one designed to identify a trend from lower-level issues/events to preclude the occurrence of a higher-level event. The analysis did not address why this method was acceptable for use when the initiating issues were high level and the reason for doing the evaluation was to

determine common themes across the events. During discussions, the licensee stated that the collective significance analysis was believed to be the most appropriate method within the root cause guidance document because it enabled the evaluators to look at behaviors common to each issue, regardless of the significance of the issue. The inspectors reviewed the licensee's approach and concluded that the individual RCE provided sufficient detail to ensure that the use of a collective significance determination would be effective in addressing the common aspects. Additionally, the licensee revised the collective significance analysis to include appropriate justification for the use of a common cause evaluation for this event. This area was satisfactory.

b. *Determination whether the licensee's root cause evaluation was conducted to a level of detail commensurate with the significance of the problem*

Inspection Report 05000305/2006007 concluded that this area was considered satisfactory. However, because the licensee's revision to the common cause analysis resulted in identification of new common causes, the inspectors elected, for the current inspection, to review the common causes.

The licensee identified the following common causes:

- design basis information quality and availability did not support station personnel arriving at the right conclusion
- standards issues were identified for modification quality and engineering documentation in the AFW root cause, and in the Flooding root cause, standards for operating philosophy and inadequate management safety culture
- programs were not implemented as intended. The OPR program, a subset of the corrective action program (AFW and Flooding), indicated program implementation gaps
- lack of knowledge in engineering, licensing, and management of design basis document information was identified for the Flooding issue. Lack of knowledge in developing testing, analysis and design change documentation items existed for the AFW issue

The inspectors reviewed Revision 2 to the common cause analysis and came to the same conclusion in IR 05000305/2006007 that the common cause evaluation appeared to effectively probe the behavioral and cultural issues discussed in the individual in-scope RCEs. The common cause evaluation was shown to be a relatively detailed method to summarize the behaviors within each individual in-scope RCE, and the associated common causes were then logically drawn from this information.

c. *Determination whether the licensee's root cause evaluation included consideration of prior occurrences of the problem and knowledge of prior operating experience*

IR 05000305/2006007 concluded that this area was satisfactory. For the current inspection, the inspectors noted that Revision 2 to the licensee's common cause evaluation identified that, "numerous opportunities existed for the station to recognize

and act on internal and external OE,” and that “the lack of understanding of design basis information and design basis event analysis allowed personnel to arrive at inappropriate conclusions. The inspectors concluded that the licensee’s evaluation of use of OE was satisfactory.

- d. *Determination whether the licensee’s root cause evaluation addressed extent of condition and extent of cause of the problem*

Inspection Report 05000305/2006007 concluded that this area was considered satisfactory and that the extent of condition section in the common cause evaluation report essentially summarized the extent of condition and extent of cause results from the individual in-scope RCEs. For the current inspection, the inspectors found that Revision 2 to the common cause analysis similarly summarized assessments in the individual RCEs. This area was satisfactory.

04.03 Corrective Actions

- a. *Determine whether the licensee specified appropriate corrective actions for each common or root cause or that the licensee evaluated why no actions were necessary*

IR 05000305/2006007 concluded that this area was unsatisfactory because the licensee revised the common cause evaluations as a result of inspector identified issues and the NRC team was unable to review the newly established corrective actions with the time allotted for the inspection.

For the current inspection, the inspectors found that Revision 2 to the common cause analysis established corrective actions for each cause or provided a discussion and justification for no corrective actions required. This area was satisfactory.

- b. *Determine whether the licensee prioritized the corrective actions with consideration of the risk significance and regulatory compliance*

IR 05000305/2006007 concluded that this area was satisfactory; therefore, no further review was performed. For the current inspection, the inspectors reviewed the licensee’s corrective actions and found that they were entered into the corrective action program and the prioritization was established and monitored by this process.

- c. *Determine whether the licensee established a schedule for implementing and completing the corrective actions*

IR 05000305/2006007 concluded that this area was satisfactory, therefore no further review was performed. For the current inspection, the inspectors reviewed the licensee’s corrective actions and found that they were entered into the corrective action program and the schedule was established and monitored by this process.

- d. *Determine whether the licensee developed quantitative or qualitative measures of success for determining effectiveness of corrective actions to prevent recurrence*

IR 05000305/2006007 concluded that this area was unsatisfactory and:

- six of ten corrective actions to prevent recurrence for the last common root cause did not yet have effectiveness review plans in place or scheduled
- effectiveness reviews were not yet created; therefore, the inspectors could not review whether the measures of success would be appropriately quantitative or qualitative in scope

During that inspection, the inspectors found that the licensee had not developed quantitative or qualitative measures for all corrective actions established, nor were barriers consistently established to ensure that corrective actions were adequately evaluated. The inspectors found that interim measures to evaluate effectiveness did not exist for long-term corrective actions to prevent recurrence. Additionally, the tools to measure effectiveness, which were often scheduled months or years after the corrective actions were implemented, did not have standards or criteria that would ensure that the corrective actions were effective nor that interim measures to prevent recurrence were evaluated.

The licensee agreed with the inspectors' observations and revised GNP-11.08.01, "Action Request Process," Revision AA, to include requirements for corrective action monitoring and effectiveness reviews. The inspectors concluded that this revision included elements necessary to measure success. Additionally, the licensee initiated CAP036027 and CAP036028 to update/revise the related root cause analysis and corrective actions to include the requirements established by the GNP-11.08.01, Revision AA, and to incorporate any lessons-learned from the current inspection into the RCEs. The licensee completed the majority of these actions prior to the completion of the inspection and the inspectors concluded that barriers were established that should ensure the corrective actions to prevent recurrence are realistic, timely, measurable, incorporate feedback, and have appropriate standards/criteria to measure effectiveness.

05 INDEPENDENT EVALUATION OF LICENSEE ROOT CAUSE

Independent Root Cause Evaluation

The inspectors did not perform an independent root cause evaluation during this inspection due to the limited nature of this inspection. Instead, the inspectors reviewed the corrective actions taken by the licensee in response to the initial findings identified during independent root cause evaluation in May 2006. The inspectors verified that the subject corrective actions captured the deficiencies identified by the inspection findings accurately and appropriately, the analyses performed within the corrective action program documents were appropriate, and the corrective actions taken or proposed were appropriate. No findings were identified as a result of this inspection.

06 INDEPENDENT EVALUATION OF LICENSEE EXTENT OF CONDITION AND EXTENT OF CAUSE

Independent Extent of Condition/Cause Evaluation

The inspectors did not perform an independent extent of condition/cause evaluation for the Yellow flooding performance deficiency and the White AFW pump protection

performance deficiency. Instead, the inspectors verified that the concerns and findings identified in May 2006 (IR 05000305/2006007) which related to the extent of condition and extent of cause were adequately addressed by the licensee in its revised RCEs for the Turbine Building flooding issue and the AFW pump protection issue. Also, the inspectors verified that the licensee's corrective actions for these issues were adequate and appropriate. The inspectors also reviewed a recently completed RCE for the cross-cutting issues identified by the NRC related to problem identification and resolution (RCE-0717, "NRC Identified Cross-Cutting Issue - Problem Identification and Resolution," Revision 1) to verify the quality, completeness, level of detail, and the appropriateness of the extent of condition/extent of cause evaluation. No findings were identified as a result of this inspection

07 INDEPENDENT DETERMINATION OF SAFETY CULTURE CONSIDERATIONS

The inspectors reviewed the licensee's root and common cause analyses to determine that the evaluations appropriately considered whether any safety culture component caused or significantly contributed to any risk significant performance issue. The licensee's Flooding RCE and the common cause analysis both indicated that elements of safety culture were contributors to these issues. The licensee had performed an independent assessment of safety culture and the Flooding RCE incorporated all elements from this survey into their corrective action program. The inspectors verified that multiple corrective actions to prevent recurrence related to all of the identified safety culture elements were included in the corrective action program. Additionally, corrective action to prevent recurrence Number 1 from RCE-0685, "Flooding," established a corrective action to assess safety culture every year for three years through 2009.

08 Exit Meeting

The inspectors presented the inspection results to Ms. L. Hartz, Site Vice-President, and other members of licensee management on August 18, 2006. The licensee acknowledged the findings presented. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

L. Hartz, Site Vice-President
K. Hoops, Nuclear Specialist
L. Armstrong, Site Engineering Director
T. Breene, Regulatory Affairs Manager

Nuclear Regulatory Commission

J. Lara, Chief, Engineering Branch 3
S. Burton, Senior Resident Inspector
P. Higgins, Resident Inspector

NRC Exit Meeting Attendance Roster

A. Boland, RIII/DRS, Deputy Director
J. Lara, RIII/DRS, Chief, Engineering Branch
P. Loudon, RIII/DRP, Branch Chief
B. Jose, RIII/DRS,
S. Burton, Senior Resident Inspector
L. Hartz, Kewaunee Site Vice-President
M. Hicks, Organizational Effectiveness Manager
J. Owens, Organizational Effectiveness Human Performance Supervisor
W. Henry, Maintenance Manager
R. Repshas, Licensing Engineer
K. Hoops, Nuclear Specialist
L. Armstrong, Engineering Director
G. Duffy, Organizational Effectiveness
T. Webb, Site Safety and Licensing Director
T. Breene, Licensing Manager
K. Peckham, Nuclear Oversight Manager
P. Phelps, Design Engineering Manager
B. Koehler, Engineering, Design Manager
K. Davison, Operations and Maintenance Director

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

05000305/2004009-03	VIO	Potential Flooding in the Turbine Building Basement (Yellow)
05000305/2005002-05	VIO	Potential Common Mode Failure of Auxiliary Feedwater (White)

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections or portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection reports.

Corrective Action Program Documents

Corrective Action CA018151; Re-Verify Flooding Model to Bring It Up to the Standards of the Rest of PRA; dated February 7, 2005
CA018700; Operability Determination/Recommendation Request for Training (CACC - RCE 677); dated March 19, 2005
CA018765; RC1 CATPR1; Risk Training for Management Staff - Containment Hatch Closure; dated March 22, 2005
CA018770; RC1 CATPR6; Containment Hatch Closure Interference - NRC Significant Issue; dated March 22, 2005
CA018849; Validate and Improve Documentation of Design Bases (CACC/RCE 677 CAPR RCE 685); dated March 24, 2005
CA018890; Improve the Quality of Engineering Products - Establish IRG (CA - RCE 677); dated March 26, 2005
CA018891; Improve the Quality of Engineering Products (CAPR - RCE 677); dated March 27, 2005
CA019093; Implement Engineering Product Quality Guide (CACC - RCE 677); dated April 7, 2005
CA019479; Revise GNP-11.08.01; dated May 5, 2005
CA020984; PRA Date Update not Performed within Three Years as Required by Procedure; September 29, 2005
CA021481; Mark Existing Procedural Guidance on Quality (CACC - RCE677) dated November 29, 2005
CA023296; RCE 685; Add "Risk" Topic to Fleet Based Leadership Training Program; dated April 27, 2006
CA023513; Institutionalize Controls for Maintaining and Training on DBD Documents (CACC - RCE 677); dated May 8, 2006
CA023551; CAPR - Conduct Team Building Session; dated May 9, 2006
CA023663; Develop Process to Reinforce Nuclear Safety Policy; dated May 10, 2006
CA024229; Higher Than Expected Flooding Risk; dated June 14, 2006
CA024236; Review OPS Procedures - TDAFW Pump Flooding Risk ODM Action Plan Item; June 14, 2006
CA024863; CA Revision to 3 RCE 685; dated July 21, 2006
CA024864; CAPR 3-RC1; Revision 3; RCE 685; dated July 21, 2006
CA024865; CAPR 4-RC1; Revision 3; RCE 685; dated July 21, 2006
CA024866; CAPR 5-RC1; Revision 3; RCE 685; dated July 21, 2006
CA024872; CAPR 1-RC3; Revision 3; RCE 685; dated July 21, 2006
CA024874; CAPR 2-RC3; dated July 21, 2006
CA024875; Determine OE Process Properly Addressed (RCE 685); dated July 21, 2006
CA024876; Revise IRG Charter; dated July 21, 2006
CA024877; Tech Review of Design Basis Calcs/Analysis (CA - RCE 677, RCE 685); July 21, 2006

CA024878; Revise Modification Process Procedures to Enhance Quality (CAPR - RCE 677); dated July 23, 2006
CA024879; Professional Training for PORC Engineer Managers and Supervisors; dated July 23, 2006
CA024880; Conduct Training on Common Errors for Modifications (CACC - RCE 677); dated July 23, 2006
CA024881; Update Engineering Quality Metrics for Engineering Products (CACC - RCE 677); dated July 23, 006
CA024882; Conduct Training for Revisions to Mod Document Review Requirements (CACC - RCE 677); dated July 23, 2006
CA024883; Modify Quality Review Team (QRT) Structured Product Reviews (CACC - RCE 677); dated July 23, 2006
CA024884; Develop Guidance for Vintage Calculation Use as a Design Input (CACC - RCE 677); dated July 23, 2006
CA024885; Upgrade the Kewaunee QPR Process to Dominion Fleet Process (CACC - RCE 677); dated July 23, 2006
CA024886; Revise Administrative Requirements for Special Test Procedures (CACC - RCE 677); dated July 23, 2006
CA024887; Revise Test Procedure Requirements for Modifications (CACC - RCE 677); dated July 23, 2006
CA025059; Update PRA Model with MDAFW Pump Room Heatup Calculation Results; dated August 1, 2006
CA025344; Conduct Monthly Review of Actions Associated with NRC 95002 Inspection; dated August 11, 2006
CA025346; Conduct a Safety Culture Assessment; dated August 12, 2006
CA025347 - CA025359; Conduct a Safety Culture Assessment; dated August 12, 2006
CAP029365; PRA Date Update not Performed Within Three Years as Required by Procedure; dated September 26, 2005
CAP032809; Extent of Condition Concerning Flooding Study/PRA; dated April 10, 2006
CAP034012; Programmatic Weaknesses; dated May 19, 2006.
CAP033997; Sump A&B Volume Error in C10984; dated May 18, 2006
CAP033998; ICS System Flow Calculations Contain Non-Conservative Assumptions and Methods; dated May 18, 2006
CAP034000; Lack of Documented Basis for SI Pump Minimum Flow Recirculation; dated May 18, 2006
CAP033870; NRC Inspection 95002; Root Cause Reports Required Revision; dated May 15, 2006
CAP032872; NRC Identified Cross-Cutting Issue - PI&R; dated April 12, 2006
CAP032809; Extent of Condition Concerning Flooding Study/PRA; dated April 10, 2006
CAP035363; Evaluate Documents That May Have Used Flawed Flooding Study; dated July 21, 2006
CAP035974; CAP035363 Screening Incomplete; dated August 14, 2006
CAP036012; Commitment Letter to the NRC; 95002 Root Cause Actions Inconsistency; dated August 16, 2006
CAP036027; Compare RCEs to New 11.08.01 EFR Rules and Identify Necessary Changes; dated August 16, 2006
CAP036028; Review RCEs to Ensure Any Learning Did or Did not Impact the Completed Actions; dated August 16, 2006
CAP036029; No EFR for Short Term CAs is Required; dated August 16, 2006

CAP036030; Process to Provide Corrective Action Monitoring Needed in GNP-11.08.01; dated August 16, 2006
CAP036032; Differences in the DNAP 1604 and NRC 95002 Collective Root Cause Criteria; dated August 16, 2006
RCE K-2005-0685; Revision 3; Kewaunee Power Station Flooding Mitigation/Control Systems Root Cause Evaluation; dated July 21, 2006
RCE K-2005-0685; Revision 4; Kewaunee Power Station Flooding Mitigation/Control Systems Root Cause Evaluation; dated August 17, 2006
RCE K-2005-0677; Revision 6; Kewaunee Power Station AFW Pumps Susceptible to Damage from Air Entrainment; dated July 22, 2006
RCE K-2005-0677; Revision 7; Kewaunee Power Station AFW Pumps Susceptible to Damage from Air Entrainment; dated August 17, 2006
RCE K-2005-0701; Revision 2; Kewaunee Power Station Common Cause Evaluation for Degraded Corner Stone; dated July 23, 2006
RCE K-2005-0701; Revision 3; Kewaunee Power Station Common Cause Evaluation for Degraded Corner Stone; dated August 16, 2006
RCE K-2005-0701; Revision 4; Kewaunee Power Station Common Cause Evaluation for Degraded Corner Stone; dated August 17, 2006
Effective Review EFR025166; Common Cause Evaluation Performance - Review of the DSEM/SSEM; dated August 7, 2006
EFR025167; Common Cause Evaluation Performance - Report to C ARB; dated August 7, 2006
RCE 000717; NRC Identified Cross-Cutting Issue - Problem Identification and Resolution; dated July 6, 2006
RCE 000717; Revision 1; NRC Identified Cross-Cutting Issue - Problem Identification and Resolution; dated July 27, 2006

Procedures and Documents

GNP-04.08.01; Independent Review Group Feedback
GNP-11.08.01; Action Request Process; Revision Z
GNP-11.08.01; Action Request Process; Revision AA
50.59 Applicability Review of GNP-11.08.01; August 16, 2006
NAD-04.08; Charter - Independent Review Group; Revision A

Other Documents

Kewaunee Power Station Excellence Plan; A Passion for Excellence; dated August 2006
Project Personnel Resumes; DBD Project; Calculation Reconstitution Project; IRG;

LIST OF ACRONYMS USED

ADAMS	Agencywide Documents Access and Management System
AFW	Auxiliary Feedwater
CA	Corrective Action
CAP	Correction Action Program Document
CARB	Corrective Action Review Board
CC	Contributing Cause
CE	Condition Evaluation
CFR	Code of Federal Regulations
DBD	Design Basis Document
EFR	Effectiveness Review
GNP	General Nuclear Procedure
IP	Inspection Procedure
IR	Inspection Report
MORT	Management and Oversight Risk Tree
NCV	Non-Cited Violations
NRC	Nuclear Regulatory Commission
OE	Operating Experience
OPR	Operability Review
PARS	Publically Available Records System
PRA	Probabilistic Risk Assessment
RC	Root Cause
RCE	Root Cause Evaluation
VIO	Violation