January 20, 2006

Mr. Fred Dacimo
Site Vice President
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
295 Broadway, Suite 1
Post Office Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT 2 - SUPPLEMENTAL INSPECTION FOR A WHITE FINDING, INSPECTION REPORT NO. 05000247/2005013

Dear Mr. Dacimo:

By letter dated August 30, 2005, you were informed that the U.S. Nuclear Regulatory Commission (NRC) would conduct a supplemental inspection at Indian Point Nuclear Generating Unit 2 for a White inspection finding in the mitigating systems cornerstone. On December 8, 2005, the NRC completed this inspection. The enclosed report documents the inspection results, which were discussed on December 8, 2005, with Mr. Paul Rubin and other members of your staff.

The NRC performed this supplemental inspection to assess your activities that addressed the White inspection finding in the mitigating systems cornerstone, which involved the failure to adequately evaluate and correct nitrogen gas accumulation in portions of the safety injection system in the second quarter of calendar year 2005. This issue was initially discussed in the 2005 Safety System Design and Performance Capability Inspection Report 05000247/2005006 and, subsequently, resulted in a violation of White significance documented in a letter to you dated August 1, 2005. The purpose of this inspection was to examine your problem identification, root cause and extent of condition evaluation, and corrective actions. This supplemental inspection was performed in accordance with Inspection Procedure 95001, "Inspection For One Or Two White Inputs In A Strategic Performance Area."

Based upon the results of this inspection, the NRC determined that the problem identification, root and contributing cause evaluation, extent of condition assessment, and corrective actions for the underlying causes to prevent recurrence for the White finding were adequate. No findings of significance were identified. Based on Entergy's acceptable performance in addressing the nitrogen gas accumulation issue, the White finding will no longer be considered in assessing plant performance after the first calendar quarter of 2006 in accordance with the guidance in Inspection Manual Chapter (IMC) 0305, "Operating Reactor Assessment Program."

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 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/

Lawrence T. Doerflein Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-247
License No. DPR-26

Enclosures: Inspection Report No. 05000247/2005013
Attachment: Supplemental Information

cc w/encl:
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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No:	50-247
License No:	DPR-26
Report No:	050000247/2005013
Licensee:	Entergy Nuclear Northeast, LLC
Facilities:	Indian Point Nuclear Generating Unit 2
Location:	Buchanan, New York 10511
Dates:	December 5 - December 8, 2005
Inspectors:	Kevin Mangan, Senior Reactor Inspector Amar Patel, Reactor Inspector
Approved by:	Lawrence T. Doerflein, Chief Engineering Branch 2 Division of Reactor Safety

SUMMARY OF FINDINGS

IR 05000247/2005013; 12/05/2005-12/08/2005; Indian Point Nuclear Generating Unit 2 (IP2); Supplemental Inspection for the White finding associated with nitrogen gas accumulation in the safety injection system.

This inspection was conducted by two regional inspectors and included four days of onsite inspection. No findings of significance were identified. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

Cornerstone: Mitigating Systems

The NRC performed a supplemental inspection, in accordance with Inspection Procedure 95001, to assess Entergy's evaluation and corrective actions for a White finding (IR 05000247/2005006). The finding related to Entergy's failure to identify and correct the accumulation of nitrogen gas in portions of the safety injection system caused by leakage from a safety injection accumulator. During the supplemental inspection the inspectors determined that Entergy performed a comprehensive evaluation of the gas accumulation issue. The evaluation concluded the primary root cause of the event was the organization was narrowly focused on correcting the leakage from the No. 24 accumulator and the initial evaluation by Engineering and Operations departments did not consider the potential impact of accumulator leakage on other systems. As a result, gas accumulated in the No. 23 safety injection pump and the system suction piping. The inspectors agreed with this assessment. Additionally, the inspectors determined that the completed and proposed corrective actions, including actions to prevent recurrence, have adequately addressed the root and contributing causes identified in Entergy's evaluation.

Based on Entergy's acceptable performance in addressing the nitrogen gas accumulation issue, the White finding will no longer be considered in assessing plant performance after the first calendar quarter of 2006 in accordance with the guidance in IMC 0305, "Operating Reactor Assessment Program."

REPORT DETAILS

01 INSPECTION SCOPE (IP 950001)

This supplemental inspection was performed by the NRC to assess Entergy's evaluation and corrective actions associated with a finding of low-to-moderate risk significance (White) applicable to Unit 2. The White finding was in the Mitigating Systems Cornerstone in the reactor safety strategic performance area. The performance issues associated with this finding were characterized in NRC Inspection Report (IR) 05000247/2005006 as preliminarily White, and later issued as a White finding in the NRC Final Significance Determination letter (ML052130518), dated August 1, 2005. The inspection involved a review of the licensee's problem identification, root cause analysis, and corrective actions associated with this White finding.

The inspectors assessed the adequacy of the licensee's initial evaluation of the issue, the thoroughness of the licensee's root cause analyses, and whether the corrective actions specified were sufficient to prevent recurrence. This assessment included a review of the licensee's Condition Reports (CR), root cause analyses, completed and scheduled corrective actions, procedures, additional related documents, and interviews with key plant personnel.

This supplemental inspection was conducted in accordance with the requirements of NRC Inspection Procedure (IP) 95001. Consequently, the following report details are organized by the specific inspection requirements of IP 95001.

02 EVALUATION OF INSPECTION REQUIREMENTS

02.01 Problem Identification

a. Determination of who identified the issue and under what conditions.

The inspectors determined that on January 26, 2005, while investigating continuing level and pressure losses in the No. 24 SI accumulator, Entergy personnel discovered that nitrogen gas had accumulated in portions of the safety injection (SI) system. This discovery was made through ultrasonic test (UT) examination and venting operations. The UT activity was one of the corrective actions to address CRs written to assess leakage from the No. 24 SI accumulator.

b. Determination of how long the issue existed, and prior opportunities for identification.

The inspectors reviewed CRs related to the issue and developed the following timeline. On November 21, 2004, the unit was placed on line following a refueling outage. On that day, the Operations department submitted CR-IP2-2004-06364 which identified that the No. 24 accumulator was leaking. On December 1, 2004, Operations personnel issued CR-IP2-2004-06531, which identified that the No. 24 accumulator was leaking at

a calculated leak rate of 0.14 gallons per minute. Operability evaluations were performed for both of these CRs; however, the operability discussion was limited to the accumulator's ability to meet its design basis function and the licensee concluded the accumulators remained operable. Although the inspectors agreed with the operability assessment of the accumulator, they noted that this was the first opportunity to evaluate the possible affects of gas migration from the accumulators to other systems.

Engineering and Operations departments performed troubleshooting of the system throughout December and January to identify the leak path from the accumulator. On December 1, 2004, Operations determined valve 839H, "24 Accumulator Test Valve," was leaking. Between January 12-22, 2005, additional troubleshooting was performed by the licensee that identified leakage through SI test line check valves 858A and 858B and the No. 23 SI pump discharge check valve 849B. These valves are located in emergency core cooling system (ECCS) piping between the No. 24 accumulator and the SI pumps, and leakage past these valves represents a path of back-leakage between the No. 24 accumulator and the SI system.

Additionally, the inspectors noted that on January 12, 2005, the system engineer had written two work orders to perform UT examinations on piping in the SI system. The purpose of the UT examination was to identify if gas pockets had formed in piping systems that could affect the operability of the SI pumps. However, the priority of the work orders was downgraded from Priority 2 to Priority 4 and the work was not performed until January 26, 2005. On January 26, 2005, the UT examinations were completed indicating the presence of gas in the suction and discharge piping of the SI system. The licensee began venting nitrogen gas from various locations including the No. 23 SI pump casing and the common suction piping for the three SI pumps.

The inspectors agreed with the licensee's root cause evaluation that found many opportunities to identify the gas migration issue. Multiple levels of the organization reviewed the associated CRs but failed to evaluate the global affect of the degraded condition, and the licensee failed to use industry operating experience related to gas migration to assist in the assessment of the accumulator leakage. The phenomenon of nitrogen saturated water leaking from accumulators and subsequently releasing the gas in low pressure sections of piping was a well documented industry issue. Although Entergy was aware of information from previous industry events, NRC Generic correspondence, and industry correspondence related to this issue, the organization failed to evaluate the potential impact of gas migration on connected systems when the issue was first identified.

c. Determination of the plant-specific risk consequences and compliance concerns associated with the issue.

The NRC Inspection Report 05000247/2005006, dated June 17, 2005, identified this issue as a violation of 10 CFR 50, Appendix B, Criterion XVI (Corrective Action) for the failure to evaluate and correct a condition adverse to quality. The inspection report determined that the amount of gas in the SI pump and suction header could cause the

SI pumps to gas bind during a design basis event. This would make them unavailable to meet their design basis function. The report analyzed the change in core damage frequency (ΔCDF) for this finding. The NRC calculated this to be an increase of low-E-6, using a modified Simplified Plant Analysis Risk (SPAR) Probabilistic Risk Assessment (PRA) model under a Phase III Significance Determination Process analysis. This ΔCDF was characterized as White risk significance.

02.02 Root Cause, Extent of Cause, and Extent of Condition Evaluation

a. Evaluation of methods used to identify root causes and contributing causes.

The inspectors reviewed the methodology and results of the licensee's root cause analyses as documented in the CR-IP2-2005-00370, "Unit 2 Gas Build-up in Safety Injection Piping." The analyses used several formal systematic processes to identify root and contributing causes.

Per EN-LI-118, "Root Cause Analysis Process," the licensee formed a root cause team consisting of a system engineer as the lead, supported by site system engineering, design engineering, maintenance, training, operations, and human performance personnel. Time line Analysis, Barrier Analysis, Task Analysis, Error Review Form, and Five-Why's Analysis methodologies were utilized. The root cause team evaluated information including past history and industry experience along with conducting interviews of personnel.

The inspectors reviewed the methodology and results to assess the adequacy of the resultant licensee's root cause and contributing cause evaluation. The inspectors' review found that the licensee had adequately determined the root and contributing causes for the event.

b. Level of detail of the root cause evaluation.

Overall, the inspectors found the level of detail of the Root Cause Analysis to be thorough and acceptable. The licensee identified both a root cause and several contributing causes. However, the inspectors identified one observation associated with the root cause evaluation. The inspectors noted that in early January 2005, the system engineer had requested a high priority (Level 2) work order to perform UT examination of the SI suction and discharge piping. Subsequently, the work control group lowered the priority of the work order (Level 4). This resulted in a delay in the time of discovery of nitrogen in the system by two weeks, and increased the unavailability exposure time of the SI system. The root cause report did not have corrective action assigned to address this issue. Further information related to this issue is discussed in Section 02.03.a of this report.

c. Consideration of prior occurrences of the problem and knowledge of prior operating experience.

The inspectors determined that in the root cause analyses the licensee reviewed a significant amount of information for both industry and in-house operating experience to determine if any similar problems had been previously identified. Specifically, the licensee's review of external operating experience found numerous industry operating experience (OE) and NRC documents, such as NRC Information Notice 88-23 Supplement 1-5 and Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 97-1, which identified the migration of nitrogen saturated liquid at other sites. The root cause team identified that this information had been previously reviewed by IP2 but the site had concluded that it was not applicable. Additionally, the licensee found internal OE related to the issue. At Indian Point Nuclear Generating Unit 3 (IP3), gas had accumulated in portions of the SI system following leakage from similar SI accumulators.

Finally, the root cause team determined that other site Operations departments and IP3 were conducting routine UT and venting (monthly or quarterly) of safety systems to ensure that the system piping was full of water. This procedure was not performed at IP2. The inspectors noted that one of the contributing causes identified by the licensee was "Industry and internal OE was not effectively used to prevent this issue nor was it relayed as an issue. Specifically, gas intrusion events were widely known issues to the industry and accumulator leakage was known to cause gas accumulation in the SI system at Indian Point Unit 3." The inspectors agreed with this assessment.

d. Consideration of potential common causes and extent of condition of the problem.

The inspectors reviewed the actions taken by the licensee to evaluate extent of condition in ECCS systems. The inspectors determined the licensee's actions, including evaluating the potential locations of gas pockets in all ECCS piping, and implementing procedures to perform routine UT and venting of piping to verify all ECCS piping full of water, identified and addressed potential common causes and extent-of-condition. This evaluation was performed at both IP2 and IP3. Additionally, the licensee implemented changes to closely monitor for leakage from the nitrogen-saturated accumulators at both units.

The inspectors concluded the actions taken by the licensee were effective at addressing any potential concerns for gas entrapment in the SI piping and that the monitoring of SI accumulators would allow for identification of leaking accumulators. However, the inspectors noted two sections of ECCS piping where gas could accumulate and potentially cause safety-related systems to be inoperable (either by air binding of the pumps or causing water hammer events) that had not been addressed in the corrective actions described in the report. They were:

- Residual Heat Removal (RHR) discharge line to the RHR heat exchangers near the containment penetration (IP2 and IP3).
- RHR suction from the containment sump for external recirculation (IP2 and IP3).

In both cases, the licensee acknowledged the inspectors' concerns, performed UT examinations on the piping in question, and added the points to the monthly UT and venting procedures. The UT examinations subsequently performed determined that the piping was full of water.

02.03 Corrective Actions

a. Appropriateness of corrective actions.

As a result of the root cause evaluation, the inspectors found that Entergy identified and performed over 80 specific corrective actions to address both the equipment and programmatic issues identified. Additionally, the licensee had completed a variety of corrective actions to address the immediate operability of the SI system upon discovery of the gas accumulation.

The inspectors determined that Entergy took prompt, intermediate and long term corrective actions to address the equipment deficiencies identified subsequent to the identification of the gas void. The inspectors determined that once nitrogen gas was discovered in the SI piping, Entergy immediately vented the pump casings, suction piping and discharge piping to restore the system to an operable status. The inspectors also reviewed modifications performed on the SI system, which effectively stopped the leakage from the No. 24 accumulator. Additionally, the inspectors reviewed the procedures developed to perform monthly comprehensive UT examination of ECCS piping and increased monitoring of accumulator leakage to detect potential additional challenges concerning gas accumulation.

The inspectors also reviewed the licensee actions to address the organizational weaknesses identified in the root cause report. The inspectors determined the licensee had taken a variety of corrective actions, including training of staff on the root cause report results, updating training plans to discuss gas entrainment issues, and implementing procedures to assure OE consideration by the staff when evaluating degraded conditions. The inspectors determined the corrective actions were appropriate and had been performed.

The inspectors determined Entergy's proposed and completed corrective actions were acceptable overall. However, the inspectors discuss several enhancements to the licensee's corrective actions. Section 02.02.b discussed the inspector's observation that the work order to perform UT examinations SI piping was changed from a priority 2 to a priority 4. The change was made because the work control group did not believe that this work order (WO) met the proceduralized classification requirements. The inspectors determined that the work control group did not discuss the priority change with the system engineer prior to or after this decision was made. This caused a delay of two weeks in the identification of gas in the SI piping. Although this issue was not addressed in the root cause report, the inspectors found that as a result of similar problems with other WOs, a process has been developed to incorporate engineering priorities in the WOs. The process ensures that engineering is contacted if work control

need to change WO priorities. The inspectors determined that the process would be effective at addressing this issue but it has not been proceduralized and, therefore, was not institutionalized by the licensee. The licensee agreed with the observation and intends to address the concern in the stations work control process.

The inspectors identified a similar process issue related to incorporating OE in training plans. The training department uses a review checklist to verify training modules are updated prior to their use. The inspectors noted that although the checklist does ensure that trainers review OE, the checklist itself is not part of any training department procedure.

A similar issue was identified related to the UT examination procedure developed to identify the presence of gas. The inspectors walked down the system to observe the multiple locations where UT checks are performed. The inspectors noted that there was not specific guidance on where to take the UT, nor are the locations clearly marked in the plant. The inspectors also noted that a CR had been written which identified that UT examinations had been taken at the wrong location. Entergy entered the issue into the corrective action program to enhance the procedure based on the inspectors' observations.

The inspectors concluded that these examples showed that different departments have developed a process in lieu of procedures to address site issues.

b. Prioritization of corrective actions.

The inspectors determined that the corrective actions have been appropriately prioritized.

c. Establishment of schedule for implementing and completing the corrective actions.

The inspectors determined that all but two of the recommended corrective actions have been completed. The remaining corrective actions associated with this finding were captured in the electronic corrective action program system with associated individuals assigned, due dates, and were of sufficient detail to ensure they will be tracked and completed commensurate with their relative priority.

d. Measures to determine effectiveness of the corrective actions to prevent recurrence.

The inspectors determined that Entergy plans to perform a focused self-assessment to determine the effectiveness of the corrective actions for this issue in 2006. The results of the effectiveness review will be presented to the site corrective action review board.

03 MANAGEMENT MEETINGS

03.01 Exit Meeting Summary

The inspectors presented the inspection results to Mr. P. Rubin, General Manager Plant Operations, and other members of licensee staff on December 8, 2005. The Inspectors verified the report does not contain proprietary information.

03.02 Regulatory Performance Meeting

In accordance with the requirements of Manual Chapter 0305, the exit meeting also served as a Regulatory Performance meeting between Mr. Lawrence T. Doerflein, Engineering Branch 2 Chief, NRC Region I, and Mr. P. Rubin, General Manager Plant Operations, and other members of the licensee staff.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

P. Rubin, General Manager Plant Operations
T. Vitale, Operations Manager
T. Orlando, System Engineering Manager
T. Jones, Licensing Supervisor
A. Small, PS & O Manager
J. Reynolds, CA and A
W. Bloss, Licensing
L. Lee, Nuclear Steam Supply System Supervisor
D. Shah, System Engineer

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

AV 50-247/05-06-02	VIO	Failure to Adequately Evaluate and Correct Nitrogen Gas Migration and Accumulation in Portions of the Safety Injection System

LIST OF DOCUMENTS REVIEWED

Calculations

IP-CALC-05-00125, Acceptance Criteria for Maximum Gas Void Height in the Safety Injection Suction Pipe Header, Rev. 4
IP-CALC-05-00133, Seismic Analysis for Line No. 31 due to Leakage of Valve No. 839H
IP-CALC-05-00193, Operabillity Assessment of HHSI Piping with As-found Gas Voids in SI Pump Suction and Discharge Piping – IPEC Unit 2

Procedures

0-VLV-423-VCK, The Inspection and Maintenance of Velan Swing Check Valves, Rev. 1
2-PT-M108, RHR/SI System Venting, Rev. 2
2-PT-Q029A, 21 Safety Injection Pump, Rev. 17
2-PT-Q029B, 22 Safety Injection Pump, Rev. 15
2-PT-Q029C, 23 Safety Injection Pump, Rev. 16
2-SOP-10.1.1, Safety Injection Accumulators and Refueling Water Storage Tank Operations, Rev. 48

3-PT-M108, RHR/SI System Venting, Rev. 3
EN-OP-104, Operability Determinations, Rev. 1
IP-SMM-AD-102, IPEC Implementing Procedure Prep, Review, and Approval, Rev. 2

Work Orders/Modifications

IP2-04-35256, Repair Leak-by of 839H
IP2-05-13272, Repair or Replace SI Check Valve 858B
IP2-05-13585, Check Valve 858A leaks by… Repair or Replace
IP3-05-12484, Install Isolation Valve in ¾" SI-1501R Line #31, Rev. 0
IP3-05-14390, Installation of Manual Isol Valve for SI Accumulator Test Valves, Rev. 0
IP3-05-16680, Install Isolation Valve In ¾" SI-1501R Line #31, Rev. 0
IP3-05-17169, Installation of Vents on all SI pump Casings, Rev. 0

Drawings

9321-F-55143, Pipe Trench Area Restraint & Support Design Line 10, Rev. 8
9321-F-55403, Primary Aux Bldg Restraint & Support Design Line 60, Rev. 8
9321-F-55323, Primary Aux Bldg Restraint & Support Design Line 56, Rev. 7
9321-F-55333, Primary Aux Bldg Restraint & Support Design Line 189, Rev. 5
9321-F-27503, IP3 Flow Diagram Safety Injection System Sheet 1, Rev. 39
9321-F-27503, IP3 Flow Diagram Safety Injection System Sheet 2, Rev. 44
9321-F-2735, IP2 Safety Injection System, Rev. 136
A206670, IP2 Isometric of Auxiliary Coolant Line No. 10, Rev. 7
A235296, IP2 Safety Injection System, Rev. 65
A251783, IP2 Auxiliary Coolant System - Residual Heat Removal Pumps, Rev. 28
B206704, IP2 Isometric of Safety Injection Line No 60 - Sheet 1, Rev. 9
B206705, IP2 Isometric of Safety Injection Line No 60 - Sheet 2, Rev. 6
B206706, IP2 Isometric of Safety Injection Line No 60 - Sheet 3, Rev. 7
B206724, IP2 Isometric of Safety Injection Line No 155 - Sheet 1, Rev. 5
B206725, IP2 Isometric of Safety Injection Line No 155 - Sheet 2, Rev. 6
B206727, IP2 Isometric of Safety Injection Line No 189, Rev. 5

Condition Reports

IP2-2004-00629
IP2-2004-01207
IP2-2004-06364
IP2-2004-06531
IP2-2005-00370
IP2-2005-00398
IP2-2005-02167
IP2-2005-02197

Training Modules

Lesson Plan Review Checklist
LOER035SOER Student Handout
MMC-SER-04, Potential Loss of High Pressure Injection from Gas Intrusion
SYS-C-101, Safety Injection System

Miscellaneous

839H Troubleshooting Plan for WO# IP2-04-35313
ACT-99-41826, IP3 Response to NRC IN 88-23 – Potential Gas Binding for SI Pumps
FAI/05-39, Evaluation of Nitrogen Accumulation In The Indian Point Unit 2 Pump Suction Piping
IP-RPT-05-00110, Past Operability Evaluation Summary – Nitrogen Gas Intrusion Event
LTR-SEE-05-55, Indian Point Unit 2 Safety Injection Pump Gas Evaluation, Rev. 3
Unit 2 Gas Build-up in Safety Injection Piping Root Cause Analysis Report

LIST OF ACRONYMS

ΔCDF	Delta (increase) in Core Damage Frequency
CFR	Code of Federal Regulations
CR	Condition Report
ECCS	Emergency Core Cooling System
GSI	Generic Safety Issue
IMC	Inspection Manual Chapter
INPO	Institute of Nuclear Power Operations
IP	Inspection Procedure
IP2	Indian Point Nuclear Generating Unit No. 2
IP3	Indian Point Nuclear Generating Unit No. 3
IR	Inspection Report
NCV	Non-Cited Violation
NRC	Nuclear Regulatory Commission
OE	Operating Experience
PRA	Probabilistic Risk Assessment
SDP	Significance Determination Process
SI	Safety Injection
SPAR	Simplified Plant Analysis Risk
SOER	Significant Operating Event Report
SRA	Senior Risk Analyst
UT	Ultrasonic Test