Entergy

Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, N.Y. 10511-0249
Tel (914) 734-6700

J. E. Pollock
Site Vice President

October 9, 2008
Indian Point Unit Nos. 2 and 3
Docket Nos. 50-247 and 50-286
NL-08-136

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, D.C. 20555-0001

Subject: Indian Point Entergy Center (IPEC) Units 2 and 3
Nine Month Response to NRC Generic Letter 2008-001,"Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

References:
1. NRC Generic Letter 2008-001,"Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems" dated January 11, 2008.
2. Three Month Response to Generic Letter 2008-001, Dated April 11, 2008.
3. INPO SOER 97-1, "Potential Loss of High Pressure Injection and Charging Capability from Gas Intrusion"
4. NRC Letter dated September 15, 2008, "Indian Point Generating Unit No. 3-RE: Generic Letter 2008-001, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems", Proposed Alternative Course of Action.

Dear Sir or Madam:

The Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 2008-001 (Reference 1), to request that each licensee evaluate the licensing basis, design, testing, and corrective action programs for the Emergency Core Cooling Systems (ECCS), Residual Heat Removal (RHR) System (RHRS), and Containment Spray System (CSS), to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate actions are taken when conditions adverse to quality are identified.

GL 2008-001 requested each licensee to submit a written response in accordance with 10 CFR 50.54(f) within 9 months of the date of the GL to provide the following information:

a. A description of the results of evaluations that were performed pursuant to the requested actions;
b. A description of all corrective actions, including plant, programmatic, procedure, and licensing basis modifications that were determined to be necessary to assure compliance with the quality assurance criteria in Sections III, V, XI, XVI, and XVII of

A134
NRR

Appendix B to 10 CFR Part 50 and the licensing basis and operating license as those requirements apply to the subject systems; and,

c. A statement regarding which corrective actions were completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

Additionally, the NRC requested that if a licensee cannot meet the requested response date, the licensee "shall provide a response within 3 months of the date of the GL." In the 3 month response, the licensee was requested to describe the alternate course of action that the licensee proposes to take, including the basis for the acceptability of the proposed alternative course of action.

On April 7, 2008, Entergy Nuclear Operations, Inc. (Entergy) notified Mr. Jerry Wermiel of your staff that Indian Point Unit No. 3 could not complete all the requested actions required by the GL within 9 months and submitted the required 3 month letter via Reference 2.

In summary, Entergy has concluded that the subject systems/functions at Indian Point Units 2 and 3 are in compliance with the Technical Specification definition of Operability, and that Indian Point Unit 2 and Unit 3 are in compliance with 10 CFR 50, Appendix B, Criterion III, V, XI, XVI and XVII, with respect to the concerns outlined in GL 2008-001 regarding gas accumulation in the accessible portions of these systems/functions. As committed in Reference 2, Entergy will complete its assessments of those inaccessible portions of these systems/functions during the next Unit 3 Refuel Outage currently scheduled for the Spring of 2009 and provide a supplement to this report with those results within 90 days after startup from that outage.

Attachment 1 provides the details of the nine month response for both Unit 2 and Unit 3 to the subject Generic Letter. Attachment 2 provides a list of commitments.

Should you have any questions regarding this matter, please contact Mr. Robert Walpole, Manager, Licensing, Indian Point Energy Center at (914) 734-6710.

The requested information is being provided pursuant to the requirements of 10 CFR 50.54(f). I declare under the penalty of perjury that the foregoing information is true and correct. Executed on October 9th, 2008.

Sincerely,

Patrick W. Conway for

J. E. Pollock
Site Vice President
Indian Point Energy Center

Attachment: 1. IPEC Units 2 and 3 Nine Month Response to NRC Generic Letter 2008-001,"Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"
2. Commitment(s)

cc: Mr. Samuel J. Collins, Region I Administrator, U.S. Nuclear Regulatory Commission
Mr. John P. Boska, Senior Project Manager, U.S. Nuclear Regulatory Commission
NRC Resident Inspectors, Indian Point Units 2 and 3.
Mr. Paul Eddy, New York State Department of Public Service
Mr. Robert Callender, Vice President for Programs, NYSERDA

Attachment 1 to NL-08-136

IPEC Units 2 and 3 Nine Month Response to NRC Generic Letter 2008-001,
"Managing Gas Accumulation in Emergency Core Cooling,
Decay Heat Removal and Containment Spray Systems"

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 and 3
DOCKET NO. 50-247 and 50-286

Nine Month Response to NRC Generic Letter 2008-001, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems"

This attachment contains the nine month response to Generic Letter (GL) 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems," dated January 11, 2008. In GL 2008-001, the NRC requested "that each addressee evaluate its ECCS, DHR system and containment spray system (CSS) licensing basis, design, testing, and corrective actions to ensure that gas accumulation is maintained less than the amount that challenges operability of these systems, and that appropriate action is taken when conditions adverse to quality are identified."

The following information is provided in this response:

a. A description of the results of evaluations that were performed pursuant to the requested actions,
b. A description of the corrective actions determined necessary to ensure compliance with the quality assurance criteria in Sections III, V, XI, XVI, XVII of Appendix B to 10 CFR Part 50 and the licensing basis and operating license with respect to the subject systems, and
c. A statement regarding which corrective actions have been completed, the schedule for completing the remaining corrective actions, and the basis for that schedule.

The following systems were determined to be within the scope of GL 2008-01 for Indian Point Units 2 and 3:

- High Pressure Safety Injection (SI) System (SIS)
- Recirculation System (a low head ECCS subsystem used during recirculation)
- Residual Heat Removal (RHR) System (RHRS) [ECCS and shutdown cooling modes]
- Containment Spray (CS) System (CSS)

A. EVALUATION RESULTS

Licensing Basis Evaluation

The Indian Point Units 2 and 3 licensing basis was reviewed with respect to gas accumulation in the High Pressure Safety Injection System (SIS), Recirculation System, Residual Heat Removal System (RHRS), and Containment Spray System (CSS). The review included the Technical Specifications (TS), TS Basis, Technical Requirements Manual (TRM) and TRM Basis, Updated Final Safety Analysis Report (UFSAR), responses to NRC generic communications, Regulatory Commitments and License Conditions.

1. A summary of the results of the licensing basis review:

The above documents and regulatory commitments were evaluated for compliance with applicable regulatory requirements. The following are the results of the review:

- The TS, TS Basis, TRM, TRM Basis, and Operating License Conditions contained no requirements for filled components or piping, or venting of accumulated gases. The original TS for Units 2 and 3 did not contain any requirement to verify that ECCS piping was full of water when the operating licenses were issued. As a consequence, when Unit 2 and 3 converted to the improved Standard Technical Specifications (STS), in accordance with conversion criteria, the filled ECCS piping verification requirement of STS SR 3.5.2.3 was not incorporated. Both Units contain TS 5.4.1 which specifies that written procedures be established, implemented, and maintained covering activities of the applicable requirements and the recommendations of Sections 5.2 and 5.3 of ANSI N18.7 and Appendix A of Regulatory Guide 1.33, Revision 2. The referenced Regulatory Guide includes a requirement for written procedures covering instructions for filling, and venting of the ECCS and Containment Cooling System.

  Both Units 2 and 3 have periodic monthly testing procedures controlled by the Work Management Process for inspecting and venting select ECCS locations to prevent the accumulation of gas per the recommendations of SOER 97-1. The procedures provide void acceptance criteria and venting requirements including venting of the SI pumps. The scope of the procedures does not include the CSS or Recirculation Subsystem. Applicable portions of the CSS systems will be added to the monitoring procedures. The Recirc subsystem need not be monitored. The Recirc Pumps are deep well pumps with suction from the Recirc Sump and discharge into RHR system. The pumps are started only after the minimum submergence requirements in the sump are satisfied. On this basis, appropriate suction head will be available to ensure operation of the pumps. The pumps are equipped with check valves (886A/B) at the discharge of each pump, and normally closed motor operated valves (MOV-1802A/B) to preclude draining the system. Each pump discharge is also equipped with a normally open mini recirc line. As the discharge piping is pressurized during the sump water level rise and pump start, most of the air will discharge through the pump recirc line back to the sump. The remaining trapped air if any will not impact the subject system operability

  Background

  Based on the potential for gas intrusion problems from industry events described in INPO SOER 97-1 and NRC Information notice 88-23 Supplement 5, a procedure (3-PT-Q127) for Indian Point Unit 3 was issued in 2000 to monitor and vent selected Unit 3 ECCS piping locations. In 2003, Indian Point Unit 3 recorded several condition reports (CR) concerning adverse trends in accumulator level which were determined to be a result of leakage past valves in the ECCS. In 2004, Indian Point Unit 2 issued a CR recording loss of water from the 24 SI accumulator due to valve leakage. Subsequent CRs recorded gas in SI piping as a result of extent of condition ultrasonic testing (UT). The leakage was through check valves in ECCS piping between the 24 SI accumulator and the SI pumps. It was recognized that the leakage could result in gas binding and/or water hammer therefore, a corrective action was initiated to establish a periodic venting and UT

program for testing and venting selected portions of the SIS for Unit 2. In January 2005, UT examinations were completed of SI piping and the presence of gas was identified in the suction and discharge piping of the SIS. After analysis of the condition, the 23 SI pump was determined to be inoperable due to the pump casing being filled with gas.

The NRC performed a special inspection and reported in Inspection Report 50-247/2005-006 dated June 17, 2005, a White finding and an apparent violation of 10CFR Part 50, Appendix B, Criterion XVI (Corrective Action) for Unit 2 for failure to adequately evaluate and correct nitrogen gas migration and accumulation in portions of the SIS. The Inspection Report determined that Entergy had developed and implemented a program to perform periodic UT examinations and venting of selected SI piping locations, which provided sufficient monitoring to detect potential additional challenges concerning gas accumulation. Also noted was that there were no TS requirements or limits for gas content in SI piping.

A supplemental inspection was performed for the White finding (50-247/2005-013 dated January 20, 2006), to examine Entergy's problem identification, root cause and extent of condition evaluation, and corrective actions. The report determined 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. The report indicated that Unit 2 and 3 licensee 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 ECCS piping is full of water, were effective at addressing any potential concerns for gas entrapment in the SI piping and that monitoring of SI accumulators would allow for identification of leaking accumulators. The Inspection Report noted two sections of ECCS piping where gas could accumulate and potentially cause safety-related systems to be inoperable that had not been addressed; 1) The RHR discharge line to the RHR heat exchangers near the containment penetration (Units 2 and 3), and 2) RHR suction from the containment sump for external recirculation (Units 2 and 3). These identified lines were added to the monthly UT and venting procedures and UT exams subsequently performed determined these piping locations to be full of water. The report determined Entergy's proposed and completed corrective actions were acceptable.

- The UFSAR for both Unit 2 and 3 includes statements of filled lines for ECCS piping. ECCS suction piping is not specifically identified but SI piping is stated to be full of water. The SI and CS headers are referenced as lines filled with water. Unit 2 has a discussion of the RHR loop which provides operator aids to avoid air entrainment into the RHR pump suction. Both Units 2 and 3 discuss sump strainers that have design features that include an internal vortex suppressor which prevents air ingestion into the piping (RHR and Recirculation pump suction).

a. Unit 2 UFSAR Section 1.3, "General Design Criteria," Subsection 1.3.7,"Engineered Safety Features (GDC 37 and GDC 65)," "The accumulators and the safety injection piping up to the final isolation valve are maintained full of borated water at refueling water concentration while the plant is in operation."

b. Unit 2 UFSAR Section 6.2,"Safety Injection System," Subsection 6.2.2,"System Design and Operation," 6.2.2.1.1,"Injection Phase," "... all pipes are kept filled with water before recirculation is initiated."
c. Unit 2 UFSAR Section 6.5,"Isolation Valve Seal Water System," Subsection 6.5.2, "System Design and Operation," 6.5.2.2, "Seal Water Actuation Criteria," "Remote manual isolation and remote manual seal water injection are provided for lines that are normally filled with water and will remain filled following the loss-of-coolant accident and for lines that must remain in service for a time following the accident. The remote manual seal water injection ensures a long term seal. For example, these lines include: 1. Reactor coolant pump seal-water supply lines, 2. Chemical and volume control system charging line, 3. Safety Injection Headers, 4. Containment Spray Headers."
d. Unit 2 UFSAR Section 6.2, "Safety Injection System," Subsection 6.2.2, "System Design and Operation," "The Recirculation and Containment Sumps strainers consist of a matrix of multi-tube top hat modules, which are fabricated from perforated stainless steel plate and mounted in the horizontal position. The top hat modules feature an internal vortex suppressor which prevents air ingestion into the piping."
e. Unit 2 UFSAR Section 9.3.2.2,"Residual Heat Removal Loop," "The RHR pump monitors, along with the narrow range level and flow instrumentation assists the operators in avoiding air entrainment in the RHR pump suction line during periods when the reactor is shut down and water level has been lowered."
f. Unit 3 UFSAR Section 1.3,"General Design Criteria," Subsection 1.3.4,"Fluid Systems (Criterion 30 to 46)," The accumulators and the injection piping up to the final isolation valve are maintained full of borated water while the plant is in operation. The accumulators and the high head injection lines are refilled with borated water as required by using the safety injection pumps to recirculate refueling water through the injection lines."
g. Unit 3 UFSAR Section 6.2, "Safety Injection System," Subsection 6.2.1, "Design Basis," Criterion 47, "Testing of the Emergency Core Cooling System," "The accumulators and the safety injection piping up to the final isolation valve are maintained full of borated water at boron concentrations consistent with the accident analysis while the plant is in operation. The accumulators and the injection lines are refilled with borated water as required by using the safety injection pumps to recirculate refueling water through the injection headers."
h. Unit 3 UFSAR Section 6.2, "Safety Injection System," Subsection 6.2.2, "System Design and Operation," "Because the injection phase of the accident is terminated before the refueling water storage tank is completely emptied, all pipes are kept full of water before recirculation is initiated."
i. Unit 3 UFSAR Section 6.2,"Safety Injection System," Subsection 6.2.2, "System Design and Operation," "The Recirculation and Containment Sumps strainers consist of a matrix of multi-tube top hat modules, which are fabricated from perforated stainless steel plate and mounted in the horizontal position. The modules feature an internal vortex suppressor which prevents air ingestion into the piping."
j. Unit 3 UFSAR Section 6.2, "Safety Injection System," Subsection 6.2.5, "Inspections and Tests," "The accumulators and the safety injection piping up to the final isolation valve are maintained full of borated water at boron concentrations consistent with the accident analysis while the plant is in

operation. The accumulators and the high head injection lines are refilled with borated water as required by using the safety injection pumps to recirculate refueling water through the injection lines."

k. Unit 2 UFSAR Section 6.5, "Isolation Valve Seal Water System," Subsection 6.5.2, "System Design and Operation," "Manual containment isolation and manual seal water injection are provided for lines that are normally filled with water and will remain filled following the loss-of-coolant accident, and for lines that must remain in service for a time following the accident. The manual seal water injection ensures a long term seal. These lines include: 1. Reactor coolant pump seal-water supply lines, 2. Chemical and volume control system charging line, 3. Safety Injection Headers, 4. Containment Spray Headers."

- A key word search of the IPEC commitment database identified commitments for docketed correspondence associated with filled lines, vortexing, ingestion, voiding for the SI System, RHR System, Recirc System, CS System and accumulators and is summarized as follows: Administrative controls and monitoring capability for mid-loop, RCS partially filled operations per response to GL 87-12 "Loss of Residual Heat Removal While Reactor Coolant System is Partially Filled," and GL 88-17 "Loss of Decay Heat Removal," RHR suction valve changes to address piping thermal over pressurization per GL 96-06; procedure changes for RWST refill to address an Independent Safety Assessment concerning severe accident mitigation program; enhanced administrative controls and training for recirculation alignment and RWST refill per IE Bulletin 80-06.
- The search of responses to NRC generic communications on issues concerning gas accumulation, filled piping, and gas intrusion did not identify any statement related to filled lines for SI, RHR, Recirculation or CS. The responses to GL 88-12 and GL 88-17 included statements that monitoring capability and administrative controls for reactor coolant system partially filled and mid-loop operation will maintain level and limit potential vortexing or air ingestion into the RHR pump suction. Plant procedures include requirements for monitoring RHR pumps for cavitation and venting if needed.

2. Corrective Actions Determined Necessary to Ensure Compliance with Appendix B to 10 CFR Part 50, the Licensing Basis and Operating License:

- The Unit 2&3 UFSAR ECCS section will be revised to state that the subject systems are kept sufficiently filled with water to ensure the system remains operable and performs properly. A similar statement will be added to the UFSAR section for the Containment Cooling System but will reflect the wording in the industry effort to revise TS Basis 3.6.6; "The CSS suction piping and the CS pumps up to the first closed discharge line isolation valve will be maintained sufficiently full of water to ensure the system remains operable and performs properly."
- An industry effort to revise the TS and TS Basis for TS 3.5.2 for clarification using the TSTF process is being performed. Indian Point Energy Center (IPEC) will review the results of this effort to determine if any changes will be implemented. Currently the approved Indian Point Unit 2 and 3 TS does not include STS SR 3.5.2.3. IPEC will also monitor the industry effort to revise TS

3.6.6,"Containment Spray and Cooling Systems," to determine if any changes will be implemented.

- The Unit 2 and 3 periodic testing procedures (2-PT-M108 and 3-PT-M108) for inspection and venting select SI and RHR piping locations will be revised to include the CSS. Applicable portions of this system will be added to the monitoring procedures.
- The Unit 2 and 3 periodic testing procedures (2-PT-M108 and 3-PT-M108) for inspection and venting select piping locations will be revised to provide a grace period consistent with the STS (SR 3.0.2).

3. Corrective Action Status and Schedule

- UFSAR changes will be prepared and included in the next regularly scheduled UFSAR update submittal. The next UFSAR update will be for Unit 3 and is currently scheduled six months after the Unit 3 cycle 15 Refueling Outage in the spring of 2009.
- After NRC approval of the TSTF Traveler for ECCS, IPEC will evaluate its applicability and determine what changes will be proposed within 90 days of NRC approval of the TSTF.
- After NRC approval of the TSTF Traveler for CSS, IPEC will evaluate its applicability and determine what changes will be proposed within 90 days of NRC approval of the TSTF.
- The revisions of the Unit 2 and 3 periodic testing procedures (2-PT-M108 and 3-PT-M108) are scheduled to be completed by January 11, 2009.

Design Evaluation

1. Design Basis Review:

The Indian Point Unit 2 and 3 design basis was reviewed with respect to gas accumulation in the subject systems.

This review included applicable design basis documents, design drawings, calculations, engineering evaluations and design change packages. Design drawings provide high point vent locations that are used for systems fill and vent as well as for periodic venting of gas accumulation during normal operation. Design changes issued for modification of the plant are independently verified to meet the requirements of the design standards and the design change procedure.

Design change packages for recently added new vent valves and supporting design basis calculations for evaluating operability are in place to ensure that the ECCS is in compliance and maintained operable. Design change packages were implemented per established procedures/processes and applicable procedures were revised.

Indian Point does not employ "Keep Full Systems" to automatically maintain the subject systems in a filled and vented configuration. The design of the subject systems does not include specific voided piping as part of the design, except for RHR pump suction piping from the containment sump (VC Sump), Containment Recirculation System from Containment Recirc Sump (Recirc Sump) to normally closed valves, the CSS pump discharge piping downstream of the normally closed valves up to and including the CSS spray ring headers inside containment, and the Recirc spray piping downstream of the normally closed valves up to and including the CSS Recirc spray headers. All of the above lines have been evaluated to be acceptable.

ECCS realignments during design basis events have been evaluated to be acceptable for system operability. Sump strainers have been evaluated for vortex and air entrainment. This evaluation concluded that no air entrainments will occur at the worst case conditions postulated. The Refueling Water Storage Tanks (RWSTs) have been evaluated for minimum submergence to prevent unacceptable vortexing and potential air entrainment.

Design features and water level set points are controlled by design and operating procedures to prevent vortex effects that can potentially ingest gas into the system during design basis events.

2. Gas Volume Acceptance Criteria:

a. Pump Suction Piping

The allowable gas accumulation in the pump suction piping is based on limiting the gas entrainment to the pump after a pump start. A Pressurized Water Reactor Owners Group (PWROG) program established interim pump gas ingestion limits

to be employed by the member utilities. The interim criteria address pump mechanical integrity only and are as follows:

	Single-Stage	*Multi-Stage*	*Multi-Stage*
		Stiff shaft	Flexible shaft
Steady-State	2%	2%	2%
Transient*	5% for 20 sec.	20% for 20 sec.	10% for 5 sec.
Q(B.E.P) Range	70%-120%	70%-140%	70%-120%
Pump Type (transient data)	WDF	CA	RLIJ, JHF
* The transient criteria are based on pump test data and vendor supplied information			
Q(B.E.P): Best efficiency flow			
WDF, CA, RLIJ, and JHF are pump designations used by pump manufacturers.			

IPEC procedures and design features provide assurance that the volume of gas in the pump suction piping for the subject systems is limited such that pump gas ingestion is within the above PWROG program established interim criteria.

The ECCS and CSS pumps have been evaluated for NPSH margin. These evaluations show that adequate NPSH margin exists for these pumps.

b. Pump Discharge Piping Which is Susceptible to Pressure Pulsation After a Pump Start

The joint PWR and BWR Owners Groups program evaluated pump discharge piping gas accumulation. Gas accumulation in the piping downstream of the pump to the first closed isolation valve or the RCS pressure boundary isolation valves will result in amplified pressure pulsations after pump start. The subsequent pressure pulsation may cause relief valves in the subject systems to lift, or result in unacceptable pipe loads. The joint Owners Group program establishes a method to determine the limit for discharge line accumulation to be utilized by the member utilities.

Indian Point Units 2 and 3 have implemented this methodology and established the applicable limits for gas accumulation in the discharge piping of the subject systems. IPEC procedures provide assurance that any gas in the subject systems' discharge piping is limited to within the acceptance criteria determined by the Indian Point Unit 2 and 3 specific application of the joint Owners Group program method.

c. Pump Discharge Piping Which is not Susceptible to Water Hammer or Pressure Pulsation Following a Pump Start

1. The PWROG methodology for CSS evaluates the piping response as the containment spray header is filled and compares the potential force imbalances with the weight of the piping. The net force resulting from the pressurization of the containment spray header during the filling transient is

a small fraction of the dead weight of the filled piping, and therefore the filling transient is well within the margin of the pipe hangers.

The Indian Point CSS discharge header piping including the Recirc Spray piping was evaluated using the PWROG methodology described above. Using this methodology it was determined that the force imbalances on this piping are within the margin of the pipe hangers.

2. A PWROG methodology has been developed to assess when a significant (gas-water) waterhammer could occur during switchover to hot leg recirculation. The methodology concludes that: If the upstream valve has an opening time of approximately 10 seconds and the downstream path to the Reactor Coolant System (RCS) is only restricted by check valve(s), no significant waterhammer would occur, i.e., none of the relief valves in the subject systems would lift, and none of the piping restraints would be damaged.

   The Indian Point ECCS flow path for switchover to hot leg recirculation has an upstream motor operated valve that has an opening time of more than 10 seconds and the downstream path to the RCS is only restricted by check valves. Therefore, consistent with the PWROG program methodology, no significant waterhammer will occur.

d. RCS Allowable Gas Ingestion

   The PWROG qualitatively evaluated the impact of non-condensible gases entering the RCS on the ability of the post-accident core cooling functions of the RCS. This evaluation assumed that 5 cubic feet of non-condensible gas at 400 psig was present in the SI discharge piping concurrent with 5 cubic feet of non-condensable gas at 100 psig in the RHR discharge piping. The evaluation concluded that the quantities of gas will not prevent the ECCS from performing its core cooling function.

   The acceptance criteria used for Indian Point procedures provide assurance that the gas accumulation in any sections of the Indian Point Unit 2 and 3 SI and RHR system will not exceed the void entering the RCS assumed in the above evaluation. The acceptance criteria were developed by scaling the above voids using the Indian Point plant specific pressure in SI and RHR systems.

3. Summary of Changes to Design Basis Documents, Corrective Actions and the Schedule for Completion of Corrective Actions.

   Changes to the existing Design Basis Documents are not required.

4. Discussion of the Results of the System P&ID and Isometric Drawing Reviews to Identify All System Vents and High Points.

The PI&D, the piping layout and isometric drawings for the subject systems were reviewed to identify vents and high points. Specifically, the following flow paths were reviewed:

1) SI system flow path
   - RWST to SI Pump suction
   - Alternate suction to SI Pumps
   - SI Pumps to RCS cold legs
   - SI pumps to RCS hot legs

2) Recirculation System flow path
   - Recirc Sump to Recirc Pumps
   - Recirc Pumps to RCS cold legs (Recirc Pumps do not feed to hot legs)
   - Recirc Pump discharge to normally closed CS isolation valves MOV-889A/B (Recirc Spray function)
   - Recirc Pump discharge to SI Pumps suction (hi head SI recirc function)
   - VC Sump to RHR Pump suction
   - RHR Pump to RCS cold legs (RHR pumps do not feed to hot legs)
   - RHR Pump discharge to normally closed CS isolation valves MOV-889A/B (Recirc Spray function)
   - RHR Pump discharge to SI Pumps suction (hi head SI recirc function)

3) RHR System flow path
   - RWST to RHR Pump suction
   - RHR Pump discharge to RCS cold legs
   - RCS hot leg to RHR Pump suction (RHR for normal shutdown or decay heat removal)

4) Containment Spray flow path
   - RWST to CS Pump suction
   - CS Pump discharge to the motor operated isolation valves

   Note: CS Pumps at Indian Point do not provide Recirc Spray function.

Each flow path was reviewed line by line to identify system vents and high points. Locations that could not be effectively vented with existing system venting configurations were identified for further evaluation. Horizontal line slope, horizontal line local high point information, and vent location details were obtained from field walkdowns, with the exception of the pipes in the Unit 3 containment. Analytical assessments were performed on the unventable segments of the system to determine if the quantity of unventable gas could adversely impact system function. Any segment discovered which is not part of the monthly UT inspection were examined using the UT method. The results of this UT inspection indicated all segments were water solid except one location in Unit 2 SI system. This was documented in the Corrective Action Program (CAP) and evaluated to be acceptable.

As identified in Entergy's 3-month response to NRC GL 2008-01, Entergy will perform necessary walkdowns of piping in the Indian Point Unit 3 containment during Unit 3 cycle 15 Refueling Outage currently scheduled for spring 2009.

5. Identification of New Vent Locations, Modifications to Existing Vent Valves, or Utilization of Existing Vent Valves Based on Drawing Review, and Summary of Corrective Actions and the Schedule for Completion of Corrective Actions.

   Entergy has completed several past plant modifications based on past gas intrusion events, and the results of past plant walkdowns and evaluations pertaining to gas intrusion concerns. These modifications include adding new vent valves in SI and RHR systems at both Units.

   This GL 2008-01 evaluation indicated that the subject systems at both plants remain operable without a need to implement any new plant modifications. There is no need to add any new high point vents. However, as an enhancement, Entergy plans to schedule the following plant modifications to mitigate any future gas accumulation in the subject systems. Entergy plans to add seven (7) new vent valves which include three (3) new vent valves at Unit 3 and four (4) new vent valves at Unit 2. The design change process will determine the exact locations and configuration of the vent valves.

   The three (3) new vent valves at Unit 3 listed below will be added during a future outage.

   - A new vent valve on 31 SI pump suction
   - A new vent valve on 33 SI pump suction and
   - A new vent valve on alternate suction line to 32 SI pump

   The four (4) new vent valves at Unit 2 listed below will be added during a future outage.

   - A new vent valve on 21 SI pump suction
   - A new vent valve on 23 SI pump suction
   - A new vent valve on alternate suction line to 22 SI pump
   - A new vent valve downstream of valve 732 in RHR suction line (Note: similar valve was previously added at Unit 3)

6. Discussion of the Results (including the scope and acceptance criteria used) of System Confirmation Walkdowns that Have Been Completed for the Portions of the Systems that Require Venting to Ensure that they are Sufficiently Full of Water.

   The subject systems were walked down by a qualified team of people including a system engineer. The scope of walkdowns included determining the slope of the piping and the potential to accumulate gas pockets within the piping. It also included identifying the location and configuration of the existing vents.

   Walkdowns inside and outside containment of piping sections susceptible to gas intrusion have been performed for Indian Point Unit 2.

Walkdowns outside containment of piping sections susceptible to gas intrusion have been performed for Indian Point Unit 3. Entergy will perform necessary walkdowns of piping inside containment at Unit 3 during the upcoming Unit 3 cycle 15 Refueling Outage currently scheduled for Spring 2009.

The acceptability of applicable systems for Unit 3 that are not accessible during power operation and are being delayed to the next refueling outage is based on the following as previously discussed in reference 2 of the cover letter:

- The design drawings for the subject systems are controlled drawings that are regularly updated in accordance with plant procedures. Engineering is confident that these design drawings adequately reflect the current design configuration.
- Gas accumulation can result in water hammer or pressure transients particularly in the pump discharge piping following a pump start. The majority of the non-accessible piping, which is located in Containment, is piping from the pump discharge side. Due to a past gas void found in the Unit 3 RHR pump discharge piping, the RHR system was analyzed for water hammer. An acceptable size void was evaluated and demonstrated that this piping remained operable. Similarly, the Unit 2 SI System was also analyzed for water hammer based on an evaluated void size and demonstrated that the system remained operable. Although the SI System water hammer analysis performed for Unit 2 was not specific for Unit 3, it provides reasonable confidence that the Unit 3 SI System will remain operable if such a void were present due to the similarity of piping and system design between Unit 2 and Unit 3.
- The accessible portions of both the SI and RHR systems are inspected every month for gas voids using the UT method. These inspections are designed to detect the presence of gas voids. Condition Reports are entered into the CAP and corrective actions as appropriate (e.g., increased venting, UTs) are generated if a void is discovered.
- The SI, RHR and CS pumps are tested quarterly as required by Technical Specifications in accordance with approved plant surveillance procedures. Pump performance data from the testing includes vibration and pump head that is trended to identify any adverse condition.
- The evaluations of the inspection performed during the last outage for Unit 2 for inaccessible SI and RHR piping determined there were no conditions that resulted in operability impacts. Similar inaccessible Unit 3 applicable SI and RHR piping are expected to result in no operability impact.

Some sections of the piping were excluded from the plant walkdown scope. These include:

- Portions of piping associated with SI, RHR and CSS suction from RWST at Unit 3 that are buried and cannot be walked down. However, the tank is located at a higher elevation than the SI, RHR and CSS pumps. This provides a positive slope from the pumps to the tank which is open to atmosphere.
- Portions of the piping associated with SI/RHR suction from RWST at Unit 2 located in Primary Auxiliary Building Pipe Chase which is a high dose area and

not easily accessible. However, the tank is located at a higher elevation than the SI and RHR pumps. This provides a positive slope from the pumps to the tank which is open to atmosphere.

- Sections of piping evaluated to be acceptable with the voids within the sections. This includes CS system downstream of the normally closed isolation valves and RCS Hot Leg connection piping.

7. Identification of New Vent Locations, Modifications to Existing Vent valves, or Utilization of Existing Vent Valves that Resulted From the Confirmatory Walkdowns, Summary of Corrective Actions (walkdowns that have been completed, and the walkdowns not yet complete).

   Identification of new vent locations is provided in item # 5 above. There is no need to modify any existing vent valves. Existing vent valves per drawings and the confirmatory walkdowns were used to identify un-ventable segments for the subject systems for further evaluation. All walkdowns have been completed with the exception of the piping in the Unit 3 containment building and the portions of piping excluded from scope identified in item 6 above. The Unit 3 containment building walkdowns are scheduled for the upcoming Unit 3 cycle 15 Refueling Outage in Spring 2009.

8. Discussion of the Results of the Fill and Vent Activities and Procedure Reviews for Each System (Note that routine periodic surveillance testing is addressed in the Testing Evaluation Section).

   Following outages and significant maintenance activities, operating procedures are used to refill the subject systems. These procedures provide the means to fill and vent the subject systems as well as purge air and other non condensible gases from associated piping and components. In addition, vent and UT procedures are used to verify systems are full of water. Venting and UT activities for the subject systems are controlled by approved procedures.

   A review was performed for procedures used to vent the subject system piping susceptible to void formation attributable to fill and vent activities. This review indicated that these procedures adequately fill and vent the subject system piping and components using existing vents. However, they can be improved by incorporating the recent lessons learned from GL 2008-01 work such as changing the sequence of steps which will provide more effective venting. The current fill and vent procedures do not require verification of no voids in the system.

   Indian Point Unit 2 and 3 have been using the vacuum refill method for fill and vent of the RCS. This method has been effective in removing the voids from RCS as well as RHR systems.

9. Identification of the Procedure Revisions, and New Procedures Resulting From the Fill and Vent Activities and Procedure Reviews that Need to be Developed and Summary of Corrective Actions and the Schedule for Completion of the Corrective Actions.

Entergy will revise the fill and vent procedures for the subject systems by changing the sequence of the steps to provide more effective venting. Entergy will also incorporate within these procedures the requirement of performing UT's after the fill and vent is completed, to provide adequate assurance that systems are sufficiently full of water. These procedures will be revised prior to their required use.

10. Discussion of Potential Gas Intrusion Mechanisms into Each System for Each Piping Segment that is Vulnerable to Gas Intrusion.

    Upon review of the subject system piping and past experience, Entergy has identified the following credible gas sources and potential gas intrusion flow paths:

    a. RCS leakage.

       As RCS fluid leaks into connected SI and RHR systems through the isolation valves, its pressure drop would result in degassing. Although possible, Indian Point has not experienced gas intrusion from this source. The RCS interface valves are leak tested per the existing surveillance procedures per TS. This gas intrusion flow path is not expected to challenge ECCS operation.

    b. Leakage from the accumulators

       Nitrogen entrained water leaking from accumulators into tie-in systems could result in gas intrusion into connected systems. Because of the past experience of gas intrusion at both units due to accumulator leakage into SI/RHR systems, all tie-in points from the accumulators into the subject systems were identified and were reviewed in detail. The SI/RHR systems are part of the monthly UT and venting program. This program requires any void detected by UT to be vented. The accumulator levels are monitored and the existing procedures require informing the System Engineer to evaluate for potential gas intrusion any time accumulators are topped off.

    c. Gas accumulated in the RHR heat exchangers

       The RHR heat exchangers at Indian Point are vertical heat exchangers with inverted U-tubes. Since the top portion of the tubes is at a higher elevation with no vents, gas could accumulate there. However, experience has shown that the vacuum refill method used for RCS system refill eliminates most of the gas from the connected RHR system.

    d. Vortexing in RWST

       Indian Point licensing basis requires a minimum remaining water volume at completion of manual switchover to recirculation mode of operation such that the SI and RHR pumps would no longer be taking suction from the RWST or would be turned off. Therefore, gas intrusion from the RWST to SI and RHR pump suctions is not credible. One of the two CS pump continues to draw the water from the RWST after switchover to recirculation. However, that pump is also shutdown when RWST water level is about 2 feet. This is evaluated to be acceptable for

vortex prevention. The CS pumps at Indian Point are not used for recirculation spray.

e. Vortexing in the Sumps

Recirculation Sump and VC Sump strainers used at Indian Point have been evaluated for vortexing. It was concluded that no air entrainment will occur during the ECCS realignments. Therefore, gas intrusion from the Sumps to the ECCS pump suctions is not credible.

11. Ongoing Industry Programs

Ongoing industry programs are planned in the following areas which may impact the conclusions reached during the Design Evaluation of Indian Point Units 2 and 3 relative to gas accumulation. The activities will be monitored to determine if additional changes to Indian Point Unit 2 and 3 designs may be required or desired to provide additional margin.

a. Gas Transport in Pump Suction Piping

The PWROG has initiated testing to provide additional information relative to gas transport in large diameter piping. One program performed testing of gas transport in 6-inch and 8-inch piping. Another program will perform additional testing of gas transport in 4-inch and 12-inch low temperature systems and 4-inch high temperature systems. This program will also integrate the results of the 4-inch, 6-inch, 8-inch and 12-inch testing.

b. Pump Acceptance Criteria

Long-term industry tasks were identified that will provide additional tools to address GL 2008-001 with respect to pump gas void ingestion tolerance limits.

These longer term industry programs will be monitored to determine if changes to the allowable gas accumulation in the pump suction piping are necessary.

12. A Detailed List of Items That Have Not Been Completed, the Schedule for Their completion, and the Basis for the Schedule

a. Indian Point will revise the monthly test procedure 2-PT-M108 and 3-PT-M108 prior to January 11, 2009.
b. Indian Point 3 will complete the walkdown for the subject systems located inside the Containment during Unit 3 cycle 15 Refueling Outage scheduled for the spring of 2009.
c. Indian Point will submit a supplement response to NRC to include Unit 3 walkdown evaluation results. This report will be submitted within 90 days after the plant startup from the Unit 3 cycle 15 Refueling Outage scheduled for the spring of 2009.

Additionally Indian Point will consider the following corrective actions as enhancements:

i. Indian Point will revise the fill and vent procedures for the subject systems prior to startup from the refueling outages; spring of 2010 for Unit 2 and Spring of 2009 for Unit 3.
ii. Indian Point will add 7 new vent valves as an enhancement to prevent future gas accumulation as per work management process.

Testing Evaluation

1. Discussion of the Results of the Periodic Venting or Gas Accumulation Surveillance Procedure Review.

   Indian Point uses monthly test procedure 2-PT-M108 and 3-PT-M108 for periodic ultrasonic testing to identify gas accumulation in the subject systems. These procedures also require venting the SI pump casings.

   The CSS and Recirc Systems are currently not included in the periodic testing. The CSS on the pump discharge side down stream of the normally closed valves and the portion of the Recirc subsystem from the Recirc pumps to the normally closed discharge valves (MOV 1802A/B) have been evaluated and need not be added to the test procedure. Once the system is filled, there is no source for new gas voids in the CSS. The accessible portion of the suction side of the CSS and the CSS discharge piping up to the normally closed valves will be added in the test procedure, and UT's will be performed at appropriate locations prior to startup after a plant outage as well as after any fill and vent. The basis for excluding the portion of the Recirc subsystem identified above is explained in section A.1.

   UT provides a consistent process to identify and quantify gas accumulation. The test procedure also requires instances of gas accumulation detected in the subject systems to be entered into the corrective action program (CAP) for further evaluation and trending.

2. Identification of Procedure Revisions, or New Procedures Resulting From the Periodic Venting or Gas Accumulation Surveillance Procedure Review That Needs to be Developed.

   Entergy will revise PT-M108 procedure to include CSS. No new procedures are required. UT inspections were performed on CSS and confirmed a water solid condition.

3. Discussion of How Procedures Adequately Address the Manual Operation of the RHR System in Its Decay Heat Removal Mode of Operations.

   The RHRS is normally pressurized at approximately 45 psig from the RWST static pressure. Once the RCS pressure is decreased to less than 400 psig, the RHR isolation valves from the RCS are then opened without starting the RHR pump. RHRS is therefore pressurized to the RCS pressure. Any postulated pre-existing void in the

system will then be compressed based on the ratio of the above pressures. RHR is placed in service by starting an RHR pump and slowly opening the discharge valves. At this time, any remaining void volume is not expected to challenge pump operation. During startup after a plant outage, the RCS is typically vacuum refilled to minimize air presence in the system. The monthly test procedure measures the RHR pump suction piping high point outside of the containment by using UT. Should any void be detected it is quantified, vented and evaluated for operability impact.

4. Summary of the Results of Procedure Reviews Performed to Determine That Gas Intrusion does not occur as a Result of Inadvertent Draining Due to Valve Manipulations Specified in the Procedures, System Realignments, or Incorrect Maintenance Procedures.

   Procedures related to the subject systems for operation, maintenance and testing were reviewed. This review did not identify potential valve manipulation that can result in inadvertent draining or gas Intrusion.

5. Description of How Gas Voids are Documented, Dispositioned, and Trended, If Found in Any of the Subject Systems.

   Gas voids found during periodic testing are documented in the CAP. Void size is determined by UT. All voids that are found are vented or evaluated for acceptability and post venting UT is performed. Voids found during periodic testing are evaluated for as-found operability and trended to determine frequency of development and possible sources.

6. A Detailed List of Items That Have Not Been Completed, the Schedule for Their completion, and the Basis for the Schedule.

   All engineering calculations and evaluations are completed. Corrective actions required that have not been completed along with the associated schedule and basis are described below in Section C (Corrective Actions).

Corrective Actions

1. Summary of the Results of the Reviews Regarding How Gas Accumulation Has Been Addressed at Indian Point Units 2 and 3.

   The IPEC CAP is used to document gas intrusion/accumulation issues as potential nonconforming conditions. Existing procedures 2-PT-M108 and 3-PT-M108 require a condition report (CR) to be initiated and the Operations Shift Manager or Designee notified, if the accumulated gas volume acceptance criteria specified in the procedures are exceeded. As part of the IPEC CAP, CRs related to plant equipment are evaluated for potential impact on operability and reportability. Therefore, IPEC's review concluded that issues involving gas intrusion/accumulation are properly prioritized and evaluated under the CAP.

2. A Detailed List of Items That Have Not Been Completed, a Schedule for Their Completion, and the Basis for That Schedule

   The remaining items to be completed are listed in section B and C.2 below. These items are entered in the Indian Point CAP for tacking.

Conclusion

Based upon the above, Entergy has concluded that Indian Point Unit 2 and 3 is in conformance with its commitments to 10 CFR 50, Appendix B, Criterion III, V, XI, XVI, and XVII, as described in the Entergy Quality Assurance Program Manual (QAPM) and any identified deviations that have not been corrected are entered into the IPEC CAP for tracking and final resolution, as described in Sections B and C of this Attachment. Our evaluation concluded all ECCS systems, including Containment Spray, remain operable.

B. DESCRIPTION OF NECESSARY CORRECTIVE ACTIONS

The following corrective actions were determined to be necessary to assure compliance with applicable regulations:

a. Indian Point will revise the monthly test procedures 2-PT-M108 and 3-PT-M108 prior to January 11, 2009, to add applicable portions of the CSS and specify appropriate grace periods.
b. Indian Point 3 will complete the walkdown for the subject systems located inside the Containment during Unit 3 cycle 15 Refueling Outage scheduled for the spring of 2009.
c. Indian Point will submit a supplement response to NRC to include Unit 3 walkdown evaluation results. This report will be submitted within 90 days after the plant startup from Unit 3 cycle 15 Refueling Outage.
d. UFSAR changes will be prepared and included in the next regularly scheduled UFSAR update submittal. The next UFSAR update will be for Unit 3 and its submittal is currently scheduled six months after the Unit 3 cycle 15 Refueling Outage in the spring of 2009.
e. After NRC approval of the TSTF Traveler for ECCS, IPEC will evaluate its applicability and determine what changes will be proposed within 90 days of NRC approval of the TSTF.
f. After NRC approval of the TSTF Traveler for CSS, IPEC will evaluate its applicability and determine what changes will be proposed within 90 days of NRC approval of the TSTF.

C. CORRECTIVE ACTIONS

1. Summary of the corrective actions that have been completed as a result of the evaluations discussed above.

No immediate corrective actions are required to maintain the subject systems operable.

2. Summary of the corrective actions to be completed including the scope, schedule, and basis for the schedule.

   The corrective actions determined to be necessary to assure compliance with applicable regulations are listed in above section B.

   Additionally Indian Point will consider the following corrective actions as enhancements:

   a. Indian Point will revise the fill and vent procedures for the subject systems prior to startup from the refueling outages; Spring of 2010 for Unit 2 and Spring of 2009 for Unit 3.
   b. Indian Point will add 7 new vent valves as enhancement to prevent future gas accumulation as per work management process.

CONCLUSION

Entergy has evaluated the accessible portions of those Indian Point Unit 2 and 3 systems that perform the functions described in this GL and has concluded that these systems are operable, as defined in the Indian Point Unit 2 and Unit 3 TS, and are in conformance to our commitments to the applicable General Design Criteria, as stated in the Indian Point Unit 2 and Unit 3 UFSAR.

As committed in Reference 2 of the cover letter, Entergy will complete its evaluation of the subject systems located inside Containment at Indian Point Unit 3 by startup from cycle 15 Refueling Outage scheduled for the spring of 2009, and will provide a supplement to this response within 90 days after the startup from the outage.

Attachment 2 to NL-08-136

Commitment(s)

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 and 3
DOCKET NO. 50-247 and 50-286

Commitment(s)

Commitment Number	Commitment	Due
NL-08-136-01	Indian Point 3 will complete the walk down of the inaccessible portions of the subject systems piping inside containment.	Spring 2009 scheduled refueling outage
NL-08-136-02	Indian Point 3 will supplement the 9 month response to the GL.	Within 90 days after plant startup from the outage
NL-08-136-03	The monthly test procedures 2-PT-M108 and 3-PT-M108 will be revised to add applicable portions of the CSS and specify appropriate grace periods.	January 11, 2009
NL-08-136-04	UFSAR changes will be prepared and included in the next regularly scheduled UFSAR update submittal.	Six months after the Unit 3 refueling outage scheduled in the Spring of 2009
NL-08-136-05	After NRC approval of the TSTF Traveler for ECCS, IPEC will evaluate its applicability and determine what changes will be proposed.	Within 90 days of NRC approval of the TSTF
NL-08-136-06	After NRC approval of the TSTF Traveler for CSS, IPEC will evaluate its applicability and determine what changes will be proposed.	Within 90 days of NRC approval of the TSTF