



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 11, 2010

Vice President, Operations
Entergy Nuclear Operations, Inc.
Indian Point Energy Center
450 Broadway, GSB
P.O. Box 249
Buchanan, NY 10511-0249

SUBJECT: INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 - REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR EXEMPTION (TAC NOS. ME0798 AND ME0799)

Dear Sir or Madam:

By two letters dated March 6, 2009, and two letters dated October 1, 2009, Entergy Nuclear Operations, Inc. (Entergy) submitted to the Nuclear Regulatory Commission (NRC) requests for exemptions from Title 10 of the *Code of Federal Regulations*, Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," Paragraph III.G.2, for Indian Point Nuclear Generating Unit Nos. 2 and 3. The letters are available in the NRC's Agencywide Documents Access and Management System (ADAMS), Accession Nos. ML090770151, ML090760993, ML092810230, and ML092810231. The request was made to allow the use of operator manual actions in lieu of meeting the separation requirements contained in Paragraph III.G.2.

By letter dated January 20, 2010, ADAMS Accession No. ML100150128, the NRC staff requested additional information. Entergy submitted a response in two letters dated May 4, 2010, ADAMS Accession Nos. ML101320230 and ML101320263. The NRC staff is reviewing the responses and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The NRC staff has discussed with Entergy staff that a response to the RAI is needed within 45 days of the date of this letter.

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Please contact me at (301) 415-2901 if you have any questions on this issue.

Sincerely,

A handwritten signature in black ink that reads "John P. Boska". The signature is fluid and cursive, with the first letters of each name being capitalized and prominent.

John P. Boska, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosure:
RAI

cc w/encl: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION (RAI)
REGARDING APPENDIX R EXEMPTION REQUEST
ENERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3
DOCKET NOS. 50-247 AND 50-286

By two letters dated March 6, 2009, and two letters dated October 1, 2009, Entergy Nuclear Operations, Inc. (Entergy) submitted to the Nuclear Regulatory Commission (NRC) requests for exemptions from Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," Paragraph III.G.2, for Indian Point Nuclear Generating Unit Nos. 2 and 3 (IP2 and IP3). The letters are available in the NRC's Agencywide Documents Access and Management System (ADAMS), Accession Nos. ML090770151, ML090760993, ML092810230, and ML092810231. The request was made to allow the use of operator manual actions (OMAs) in lieu of meeting the separation requirements contained in Paragraph III.G.2.

By letter dated January 20, 2010, ADAMS Accession No. ML100150128, the NRC staff requested additional information. Entergy submitted a response in two letters dated May 4, 2010, ADAMS Accession Nos. ML101320230 and ML101320263. The NRC staff is reviewing the responses and has the following questions:

Questions Related to IP2

RAI-01 OMAs Relied On To Restore Operation of Reactor Coolant System Makeup Capability

RAI-11.1 of the NRC staff's January 20, 2010, request for additional information (RAI) requested that critical details or assumptions of the analysis be provided which demonstrate that the required safe shutdown (SSD) equipment or component located within the area is maintained free of fire damage and remains accessible and operable following the fire event.

Entergy's May 4, 2010, response indicates that control cables associated with charging supply valve, LCV-112C, located in the outlet of the Volume Control Tank (VCT) are located in 10 fire zones outside of the main control room. The 10 fire zones include: Fire Zones 5A, 6, 22A, and 27A located in Fire Area F (the Primary Auxiliary Building and Fan House), and Fire Zones 19, 39A, 43A, 45A, 46A, and 50A located in Fire Area J (Unit 1 Turbine Building, Unit 2 Turbine Building, Super-heater Building, Nuclear Service Building, Chemical Systems Building, Administration Building, Screenwell House, and Unit 1 Control Room).

To prevent damage to the charging pumps due to air/gas binding, the normally open charging supply valve LCV-112C must be closed and charging suction realigned to the alternate source Refueling Water Storage Tank (RWST). Both the October 1, 2009, request and the May 4, 2010, RAI response describe the OMAs needed to manually align charging pump suction to the RWST by closing LCV-112C and opening either RWST supply valve LCV-112B or RWST manual bypass valve 288. The May 4, 2010, response further states that these actions have

Enclosure

been demonstrated to be feasible and reliable and are capable of being performed well within required time frames. However, in both documents the discussion of the potential effects of fire damage to cables associated with LCV-112C is limited to LCV-112C remaining in the open position. In addition, the May 4, 2010, response only describes the effects of fire damage to LCV-112C in general terms and does not identify the specific failure modes that may occur as a result of fire in each of the 10 fire zones.

For example, the discussion of SSD performance goals for Fire Zone J states that fire-induced cable damage could "render both LCV-112C and LCV-112B inoperable" without any description of the specific types of failure modes. As a result, it is not clear how fire damage that could cause LCV-112C to fail to the closed position was addressed. For cases where the operating charging pump is also the pump credited for safe shutdown, spurious closure of LCV-112C, due to fire-induced faults in its control circuits, could cause a loss of charging pump suction that would result in pump cavitation and inoperability. Depending on the plant-specific design and configuration, additional scenarios may exist, such as the case where fire damage causes both a spurious start of the credited charging pump and forces LCV-112C to close. Note that spurious starting of idle charging pump(s) can occur for several reasons, including fire damage to control circuitry or a spurious engineered safety features actuation system (ESFAS) signal.

RAI-01.1: Provide additional information to clarify the intent of the request with regard to LCV-112C. Specifically, if the request is seeking NRC staff approval of only those OMAs required to align the RWST in the event of fire damage that causes LCV-112C to fail in the open position (i.e., by closing LCV-112C and opening LCV-112B), describe the fire protection features which prevent a fire from causing LCV-112C to fail in the closed position. If the request is seeking staff approval of the use of OMAs as a means of mitigating all potential failure modes of LCV-112C (including spurious closure), more detailed information is needed. Specifically, for each Fire Zone where cables associated with VCT supply valve LCV-112C are located, provide information which describes:

1. the specific cables that could cause LCV-112C to fail in an undesired manner for safe shutdown (e.g., spuriously close, remain open).
2. the type of cable, its construction and insulation; how the cables are routed in the area [trays or conduit]; and circuit failure modes [conductor-to-conductor shorts in a single cable or two separate cables, cable-to-cable faults etc.].
3. the specific cable failure scenarios required to cause LCV-112C to fail in an undesired manner for safe shutdown (e.g., short to ground, conductor-to-conductor [intra-cable] fault in multi-conductor cable, cable-to-cable [inter-cable] fault between two separate cables).
4. separation distance (in feet or inches) between cables having the potential to cause LCV-112C to fail in an undesired manner and any ignition sources located within the fire zone (Table RAI-06.1-1 states that cables associated with LCV-112C are located on the south end of Fire Zone 6 and the charging pump is located at the "mid-point" of the zone but does not provide a specific distance).
5. the features provided to prevent or mitigate each undesired failure mode (fire barriers, OMAs, etc.) and a technical justification to support the adequacy of those features.

6. a summary of the evaluation including critical details and assumptions performed to demonstrate that OMAs relied on to mitigate the effects of spurious closure of LCV-112C have been demonstrated to be feasible and reliable and are capable of being performed within required time frames identified in the supporting thermal-hydraulic analysis.

7. an analysis or technical justification including critical details and assumptions that demonstrates that the ability to detect a fire is sufficient to provide notification of a postulated event before damage to charging pumps occurs or provide an analysis or technical justification to evaluate scenarios where LCV-112C spuriously closes before a fire has been reported.

In addition, Table 3 of the October 1, 2009, request states that the basis for aligning the charging pump suction to the RWST is to maintain pressurizer level within indicating range of the level instrumentation. As discussed in the May 4, 2010, response, fire damage is assumed to occur at the onset of fire but the requested OMAs will not be initiated until operating abnormalities or failures occur.

RAI-01.2: If OMAs are relied on to mitigate the effects of a spurious closure of LCV-112C, provide an analysis or technical justification that demonstrates the ability to maintain pressurizer level within the indicating range, assuming that LCV-112C has closed at the onset of fire.

RAI-02 Separation Distances

RAI-06.1 of the staff's January 20, 2010, RAI requested that the spatial relationship be defined between in situ hazards and the equipment that if damaged by fire would require the implementation of the requested OMAs for each fire zone. The licensee's response to RAI-06.1 does not provide the requested information. None of the tables discussed in the response to RAI-06.1 define the requested separation distances in quantifiable terms. As another example, the description of separation distances provided in the response to RAI-11.1 states that manually-operated valve 288 and motor-operated valve LCV-112B are not "immediately adjacent" to Charging Pump motor 22 but does not provide a specific separation distance.

RAI-02.1: Wherever separation distances are provided, indicate specific quantifiable data, (e.g., inches or feet), so the actual separation distances are readily discernable.

RAI-03 Fire Spread Beyond Fire Zone 6

The May 4, 2010, response states that for a fire in Fire Zone 6, fire damage can be expected to be confined to the zone of origin, despite the lack of a door enclosing the room fully at the south end. The lack of a door does not appear to be addressed by the engineering evaluations or exemptions described in the response.

RAI-03.1: Describe the evaluation performed to support the assertion that fire damage can be expected to be confined to the zone of origin, despite the lack of a door enclosing the room. In addition, provide a more detailed explanation of why fires occurring in the adjacent fire zone are not expected to spread into Fire Zone 6.

RAI-04 TABLE RAI-GEN-3

The licensee's May 4, 2010, response to RAI-03.1 states that approved exemptions, engineering evaluations (i.e., 86-10 evaluations), and Fire Hazards Evaluations applicable to each fire zone are identified in Tables RAI-GEN-1 through RAI-GEN-27. In addition, the response provides a summary discussion of the applicable reports or engineering evaluations. Although Table RAI-GEN-3 indicates that there is an exemption for Fire Area F/Zone 6 (Safety Evaluation Report letter dated March 4, 1987) the response does not include a summary discussion of the exemption for this area.

RAI-04.1: Clarify the apparent inconsistency between the RAI-03.1 response text and Table RAI-GEN-3.

RAI-05 Use of Self Contained Breathing Apparatus

The licensee's May 4, 2010, response to RAI-10.1 states that the post-fire safe-shutdown procedures do not include instructions for operators to don Self Contained Breathing Apparatus (SCBAs) if post-fire entry into affected plant areas is required. Other sections of the response indicate that SCBAs may be needed for operators to re-enter certain fire areas.

RAI-05.1: Provide a justification for not identifying the potential need for the use of SCBAs in post-fire safe-shutdown procedures.

RAI-06 Clarification of OMAs to Mitigate Spurious Closure of Valves 204A and 204B

The description of OMAs required in the event of fire in Containment, Fire Area H (page 5 of the licensee's May 4, 2010, RAI response) states that normal reactor coolant makeup air-operated charging system valves 204A and 204B, must be failed open by deenergizing 125VDC control power in the central control room (CCR) or by closing pneumatic supply isolation valve IA-501. This statement infers that the actions needed to mitigate a spurious closure of valves 204A and 204B may be performed in the main control room or at pneumatic supply isolation valve IA-501. This statement (ability to open the valves at either location) is not consistent with Table 4 of the October 1, 2009, request, which states that although the control room actions are an "Allowed" action, they do not meet the OMA screening criteria of IP-RPT-08-00072. Additionally, Table RAI-08.1-3 of the May 4, 2010, response indicates that manual valve IA-501 must be closed locally.

RAI-06.1: With regard to the above, provide:

1. information to clarify the apparent discrepancy regarding where performance of the OMA is credited;
2. information (if available), which illustrates the likelihood of circuit failures needed to cause both valves to spuriously close as a result of fire in Fire Area H. Examples include but are not limited to: the type of cable, its construction and insulation; how the cables are routed in the area [trays or conduit]; separation distance between cables of concern; and circuit failure modes [conductor-to-conductor shorts in a single cable or two separate cables, cable-to-cable faults etc.].

3. information which clarifies the effect of removing DC power in the control room after the valves spuriously close and if this strategy had been considered in the analysis.

4. Engineering Report IP-RPT-08-00072; which describes the screening criteria that were applied and the resultant tabulation of the OMAs of concern.

RAI-07 Time Available to Align Charging

Table RAI-08.1 of the licensee's May 4, 2010, response indicates that 75 minutes would be available to align charging pump suction from the VCT to the RWST.

RAI-07.1: Provide a technical justification for this time period, including any assumptions and criteria used in the evaluation.

RAI-08 Available Diagnostic Instrumentation

The licensee's October 1, 2009, request states that key instrumentation, including indicators that trigger the need for local operator intervention for the credited set of OMAs, "can be expected to remain available in the CCR."

RAI-08.1: For each OMA, identify the specific indicators that trigger the need to initiate the action and provide information to confirm that this instrumentation has been assured to remain free of fire damage.

RAI-09 Spurious Closure of Normal Charging Makeup Path Valve HCV-142

The response states that cables associated with normal charging makeup path valve HCV-142 are subject to fire damage in several locations which could cause the valve to spuriously close. To mitigate this event, motor-operated valve 227 is required to be manually opened to support establishment of a makeup path to the reactor coolant system.

RAI-09.1: Provide a more detailed description of the operational requirements of HCV-142, including the potential impact, if any, that a spurious valve closure could have on an operating charging pump.

RAI-10 Glass Braid Jacketed Thermoplastic Cable

The licensee's May 4, 2010, response states that the performance of glass-braid jacketed / thermoplastic insulated cables can be expected to approximate that of a thermoset cable construction. Since this cable type was not included in the fire tests performed by the Electric Power Research Institute (EPRI), it is difficult to make a direct comparison between its presumed performance and the performance of thermoset cables that were tested.

RAI-10.1: Provide a technical justification (e.g., fire test data, or analysis) to support the assertion that the glass braid jacketed cable should be considered in the same manner as the thermoset cable included in the industry fire tests.

Questions Related to IP3

RAI-01 OMAs Relied On To Restore Operation of Reactor Coolant System Makeup Capability

RAI-11.1 of the staff's January 20, 2010, RAI requested that critical details or assumptions of the analysis be provided which demonstrate that the required SSD equipment or component located within the area is maintained free of fire damage and remains accessible and operable following the fire event.

Entergy's May 4, 2010, response indicates that control cables associated with charging supply valve, LCV-112C, located in the outlet of the Volume Control Tank (VCT) are located in fire Zone 60AS (Fire Area ETN-4{1}), Zone 6 (Fire Area PAB-2{3}), and Zones 21A, 27A, 30A (Fire Area PAB-2{5}).

To prevent damage to the charging pumps due to air/gas binding, the normally open charging supply valve LCV-112C must be closed and charging suction realigned to the alternate source, the Refueling Water Storage Tank (RWST). Both the October 1, 2009, request and the May 4, 2010, RAI response describe the OMAs needed to manually align charging pump suction to the RWST by closing LCV-112C and opening either RWST supply valve LCV-112B or RWST manual bypass valve 288. The May 4, 2010, response further states that these actions have been demonstrated to be feasible and reliable and are capable of being performed well within required time frames. However, in both documents the discussion of the potential effects of fire damage to cables associated with LCV-112C is limited to LCV-112C remaining in the open position. In addition, the May 4, 2010, response only describes the effects of fire damage to LCV-112C in general terms and does not identify the specific failure modes that may occur as a result of fire in each of the 5 fire zones.

For example, the discussion of SSD performance goals for Fire Area ETN-4{1} states that fire-induced cable damage could "render both LCV-112C and LCV-112B inoperable" without any description of the specific types of failure modes. In addition, the response to RAI-7.1 states, in part:

fire damage is assumed to occur to the cables/components of concern, and

no credit has been taken for immediate and proactive OMA response by plant operators upon the receipt of a fire detection alarm in any of the identified fire areas or fire zones, and

OMA responses are initiated upon the detection of operating abnormalities or failures caused by the postulated fire.

As a result, it is not clear how fire damage that could cause LCV-112C to fail to the closed position was addressed. For cases where the operating charging pump is also the pump credited for safe shutdown, spurious closure of LCV-112C, due to fire-induced faults in its control circuits, could cause a loss of charging pump suction that could result in pump cavitation and inoperability. Depending on the plant-specific design and configuration, additional scenarios may exist, such as the case where fire damage causes both a spurious start of the credited charging pump and forces LCV-112C to close. Note that spurious starting of idle charging

pump(s) can occur for several reasons, including fire damage to control circuitry or a spurious ESFAS signal.

RAI-01.1: Provide additional information to clarify the intent of the request with regard to LCV-112C. Specifically, if the request is seeking NRC staff approval of only those OMAs required to align the RWST in the event of fire damage that causes LCV-112C to fail in the open position (i.e., by closing LCV-112C and opening LCV-112B), describe the fire protection features which prevent a fire from causing LCV-112C to fail in the closed position. If the request is seeking staff approval of the use of OMAs as a means of mitigating all potential failure modes of LCV-112C (including spurious closure), more detailed information is needed. Specifically, for each Fire Zone where cables associated with VCT supply valve LCV-112C are located, provide information which describes:

1. the specific cables that could cause LCV-112C to fail in an undesired manner for safe shutdown (e.g., spuriously close, remain open).
2. the cable function (power, control, instrument).
3. cable size (e.g., 7 conductor / 14 American wire gauge (AWG)).
4. the type of cable, its construction and insulation; how the cables are routed in the area [trays or conduit]; and circuit failure modes [conductor-to-conductor shorts in a single cable or two separate cables, cable-to-cable faults etc.].
5. the specific cable failure scenarios required to cause LCV-112C to fail in an undesired manner for safe shutdown (e.g., short to ground, conductor-to-conductor [intra-cable] fault in multi-conductor cable, cable-to-cable [inter-cable] fault between two separate cables).
6. separation distance (in feet or inches) between cables having the potential to cause LCV-112C to fail in an undesired manner and any ignition sources located within the fire zone (Table RAI-06.1-1 states that cables associated with LCV-112C are located on the south end of Fire Zone 6 and the charging pump is located at the "mid-point" of the zone but does not provide a specific distance).
7. the features provided to prevent or mitigate each undesired failure mode (fire barriers, OMAs, etc.) and a technical justification to support the adequacy of those features.
8. a summary of the evaluation including critical details and assumptions performed to demonstrate that OMAs relied on to mitigate the effects of spurious closure of LCV-112C have been demonstrated to be feasible and reliable and are capable of being performed within required time frames identified in the supporting thermal-hydraulic analysis.
9. an analysis or technical justification including critical details and assumptions that demonstrates that the ability to detect a fire is sufficient to provide notification of a postulated event before damage to charging pumps occurs or provide an analysis or technical justification to evaluate scenarios where LCV-112C spuriously closes before a fire has been reported.

In addition, the October 1, 2009, request states that the basis for aligning the charging pump suction to the RWST is to maintain pressurizer level within indicating range of the level

instrumentation. As discussed in the May 4, 2010, response, fire damage is assumed to occur at the onset of fire but the requested OMAs will not be initiated until operating abnormalities or failures occur.

RAI-01.2: If OMAs are relied on to mitigate the effects of a spurious closure of LCV-112C, provide an analysis or technical justification that demonstrates the ability to maintain pressurizer level within the indicating range, assuming that LCV-112C has closed at the onset of fire.

RAI-02 Separation Distances

RAI-06.1 of the NRC staff's January 20, 2010, RAI requested that the spatial relationship be defined between in situ hazards and the equipment that if damaged by fire would require the implementation of the requested OMAs for each fire zone. The licensee's response to RAI-06.1 does not provide the requested information. None of the tables discussed in the response to RAI-06.1 define the requested separation distances in quantifiable terms. As another example, the description of separation distances provided in the response to RAI-11.1 states that manually-operated valve 288 and motor-operated valve LCV-112B are not "immediately adjacent" to Charging Pump motor 22 but does not provide a specific separation distance.

RAI-02.1: Wherever separation distances are provided, indicate specific quantifiable data, (e.g., inches or feet), so the actual separation distances are readily discernable.

RAI-03 Fire Spread Beyond Fire Zone 6

The May 4, 2010, response states that for a fire in Fire Zone 6, fire damage can be expected to be confined to the zone of origin, despite the lack of a door enclosing the room fully at the south end. The lack of a door does not appear to be addressed by the engineering evaluations or exemptions described in the response.

RAI-03.1: Describe the evaluation performed to support the assertion that fire damage can be expected to be confined to the zone of origin, despite the lack of a door enclosing the room. In addition, provide a more detailed explanation of why fires occurring in the adjacent fire zone are not expected to spread into Fire Zone 6.

RAI-04 TABLE RAI-GEN-5

The licensee's May 4, 2010, response to RAI-03.1 states that approved exemptions, engineering evaluations (i.e., 86-10 evaluations), and Fire Hazards Evaluations applicable to each fire zone are identified in Tables RAI-GEN-1 through RAI-GEN-27. In addition, the response provides a summary discussion of the applicable reports or engineering evaluations. Although Table RAI-GEN-5, "Characteristics of PAB-2-1 SSA FIRE/ANALYSIS AREA PAB-2{3} / FIRE ZONE 6" indicates that there is an exemption for Fire Zone 6 (Safety Evaluation Report letter dated January 7, 1987) the response does not include a summary discussion of the exemption for this area.

RAI-04.1: Clarify the apparent inconsistency between the RAI-03.1 response text and Table RAI-GEN-5.

RAI-05 Use of Self Contained Breathing Apparatus

The licensee's May 4, 2010, response to RAI-10.1 states that the post-fire safe-shutdown procedures do not include instructions for operators to don Self Contained Breathing Apparatus (SCBAs) if post-fire entry into affected plant areas is required. Other sections of the response indicate that SCBAs may be needed for operators to re-enter certain fire areas.

RAI-05.1: Provide a justification for not identifying the potential need for the use of SCBAs in post-fire safe-shutdown procedures.

RAI-06 Glass Braid Jacketed Thermoplastic Cable

The licensee's May 4, 2010, response to RAI-05.1 states that the performance of glass-braid jacketed / thermoplastic insulated cables can be expected to approximate that of a thermoset cable construction. Since this cable type was not included in the fire tests performed by EPRI, it is difficult to make a direct comparison between its presumed performance and the performance of thermoset cables that were tested.

RAI-06.1: Provide a technical justification (e.g., fire test data, or analysis) to support the assertion that the glass braid jacketed cable should be considered in the same manner as the thermoset cable included in the industry fire tests.

RAI-07 Time Available to Align Charging

Table RAI-08.1-2 of the licensee's May 4, 2010, response indicates that 75 minutes would be available to align charging pump suction from the VCT to the RWST.

RAI-07.1: Provide a technical justification for this time period, including any assumptions and criteria used in the evaluation.

RAI-08 Available Diagnostic Instrumentation

The licensee's May 4, 2010, response states that OMA responses are initiated upon the detection of operating abnormalities or failures caused by the postulated fire.

RAI-08.1: For each OMA, identify the specific indicators that trigger the need to initiate the action and provide information to confirm that this instrumentation has been assured to remain free of fire damage.

RAI-09 Spurious Closure of Normal Charging Makeup Path Valve HCV-142

The response states that cables associated with normal charging makeup path valve HCV-142 are subject to fire damage in several locations which could cause the valve to spuriously close. To mitigate this event, motor-operated valve 227 is required to be manually opened to support establishment of a makeup path to the RCS.

RAI-09.1: Provide a more detailed description of the operational requirements of HCV-142, including the potential impact, if any, that a spurious valve closure could have on an operating charging pump.

Please contact me at (301) 415-2901 if you have any questions on this issue.

Sincerely,

/RA/

John P. Boska, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosure:
RAI

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