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

NL-10-101

September 29, 2010

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Response to August 11, 2010 Request for Additional Information Regarding Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions for Indian Point Unit No. 3 (TAC No. ME0799)
Indian Point Unit No. 3
Docket No. 50-286
License No. DPR-64

References:

1. NRC letter dated August 11, 2010, "Indian Point Nuclear Generating Unit Nos. 2 and 3 – Request for Additional Information Regarding Request for Exemption (TAC Nos. ME0798 and ME0799)"

2. Entergy letter NL-10-043, "Response to January 20, 2010 Request for Additional Information Regarding Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions for Indian Point Unit No. 3 (TAC No. ME0799)," dated May 4, 2010

3. NRC letter dated January 20, 2010, "Indian Point Nuclear Generating Unit Nos. 2 and 3 – Request for Additional Information Regarding Request for Exemption (TAC Nos. ME0798 and ME0799)

4. Entergy letter NL-09-117, "Revision to Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions for Indian Point Unit No. 3," dated October 1, 2009

5. Entergy letter NL-09-032, "Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions for Indian Point Unit No. 3," dated March 6, 2009

4006
NRR

Dear Sir or Madam:

By letter dated March 6, 2009 (Reference 5), Entergy Nuclear Operations, Inc, (Entergy) requested exemptions from the requirements of 10 CFR 50, Appendix R in accordance with the guidance contained in NRC Regulatory Issue Summary 2006-010 (Regulatory Expectations with Appendix R Paragraph III.G.2 Operator Manual Actions), and in accordance with 10 CFR 50.12, "Specific exemptions." A revision to the exemption request was submitted by letter dated October 1, 2009 (Reference 4). Responses to the Request for Additional Information contained in letter dated January 20, 2010 (Reference 3) were provided by letter dated May 4, 2010 (Reference 2). The purpose of this letter is to provide responses to the Request for Additional Information contained in letter dated August 11, 2010 (Reference 1). Note that Reference 1 indicated that a response would be provided within 45 days – an extension until September 29, 2010 was granted based on a discussion with the NRC Senior Project Manager.

As discussed in the response to RAI-09.1, the May 4, 2010 letter incorrectly identified valve 227 as a motor-operated valve where in actuality it is a manual valve. Subsequent to the submittal dated May 4, 2010, corrections to a number of other pages in that submittal have also been determined to be required. All of the revised pages are included in Enclosure 1, along with a summary table.

There are no new commitments being made in this submittal. If you have any questions or require additional information, please contact Mr. Robert W. Walpole, IPEC Licensing Manager at (914) 734-6710.

Sincerely,

D. Mayer for

JEP/gd

Attachment:

1. Response to August 11, 2010 Request for Additional Information Regarding Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions

Enclosure:

1. Required Changes to May 4, 2010 Entergy Letter NL-10-043

cc: Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. Marc Depas, Acting Regional Administrator, NRC Region I
NRC Resident Inspector's Office, Indian Point Energy Center
Mr. Paul Eddy, New York State Department of Public Service
Mr. Francis J. Murray, Jr., President and CEO, NYSERDA

ATTACHMENT 1

Response to August 11, 2010 Request for Additional Information Regarding
Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for
Use of Operator Manual Actions

ENTERGY NUCLEAR OPERATIONS, INC.
Indian Point Nuclear Generating Unit No. 3
Docket No. 50-286
License No. DPR-64

Response to August 11, 2010 Request for Additional Information Regarding Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions

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 [Refueling Water Storage Tank] 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 [Volume Control Tank] 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.

RAI-01.1 RESPONSE

1. Potential fire-induced failures of normally-open VCT outlet valve LCV-112C are summarized as follows:

LCV-112C failure mode	**Status of redundant charging suction valve LCV-112B**	**Comments**
Spuriously closes	Automatically opens per design	Charging pump suction source remains unaffected.
Spuriously closes	Fails to open per design	All charging pump suction is isolated; a running positive displacement charging pump may experience damage due to loss of suction, within a relatively short time. If, however, the required/credited charging pump has been shut down proactively, no damage to the pump will occur, and up to 75 minutes are available to restore charging flow to the Reactor Coolant System (RCS), after aligning a reliable suction flow path.
Remains open, despite a command signal to close	Remains closed (normal status) or spuriously opens	If charging system letdown has been isolated and other makeup sources to the VCT have been isolated, the VCT inventory will be drawn down, and gas binding of the running charging pump (if any) may occur as hydrogen cover gas from the tank vapor space is drawn into the pump suction.

The following cables, as shown on drawings 9321-F-36013, Sh. 5, Rev. 6, 9321-F-36023, Sh. 5, Rev. 7, and 9321-F-31863, Rev. 21, present the potential for spurious operation or maloperation of LCV-112C, in areas outside the Control Building (i.e., in III.G.2 fire areas):

DD4-VN5/1: 3-phase power cable to LCV-112C operator. Fire-induced failures of this cable may render the LCV-112C operator nonfunctional, or could cause spurious movement of the operator, in the unlikely event of a three-phase, inter-cable hot short. This cable is routed through III.G.2 Fire Area PAB-2{5}, Fire Zones 27A and 30A. Both Fire Zones 27A and 30A contain widely spaced ignition sources and low (Zone 27A) and moderate (Zone 30A) fixed combustible loading content, consisting primarily of electrical cables in trays.

DD4-VN5/2: Control cable that interfaces between the LCV-112C actuator limit/torque switches and the motor control center (MCC-36A, Compt. 1RH). This cable presents the potential for blowing the control power fuse in the MCC compartment, if shorted to ground as the result of fire-induced cable damage. In this case, LCV-112C would remain OPEN, with no impact on the safe-shutdown function. This cable is routed through III.G.2 Fire Area PAB-2{5}, Fire Zones 27A and 30A. Both Fire Zones 27A and 30A contain widely spaced ignition sources and low (Zone 27A) and moderate (Zone 30A) fixed combustible loading content, consisting primarily of electrical cables in trays.

DD4-VN3: Interlock cable that interfaces with RWST outlet valve LCV-112B. Fire-induced failures of this cable present the potential to present a spurious "close" permissive signal to LCV-112C. This cable is routed through III.G.2 Fire Area PAB-2{3}, Fire Zone 6. Fire Zone 6 is provided with a smoke detection system, and the sole credible ignition source is the 32 charging pump motor, located in the approximate center of the room.

DD4-JB5: Control cable to Central Control Room (CCR) control panel SB1. This cable presents the potential for spurious actuation of the OPEN or CLOSE contactor on MCC 36A, Compt. 1RH, causing LCV-112C to be spuriously closed or potentially energized in the OPEN direction. Note that LCV-112C has been previously analyzed and confirmed to be NOT susceptible to the potential "weak link" structural failure mode described by IN 92-18, hence it can be expected to remain operable by local manual action following a fire that may cause damage to this cable. This cable is routed through III.G.2 Fire Area ETN-4{1}, Fire Zone 60A. Fire Zone 60A is provided with a smoke detection system and a preaction water spray system for cable trays throughout the zone.

2. Cables DD4-JB5, DD4-VN3, and DD4-VN5/2 are classified as control cables. Cable DD4-VN5/1 is classified as a power cable. These classifications are as given by the IP3 Electrical Cable and Raceway Information System (ECRIS).

3. The number and size of the conductors in each of the cables of concern is provided in the response to (4) below.

4. The cable type/construction for the three cables listed below are as follows (the "cable mark number" is the IPEC code corresponding to the discrete cable type, inclusive of materials of construction, number, and size of conductors).

   DD4-JB5: Cable Mark Number GL12; 12/C # 12 AWG; PVC-insulated conductors, with an asbestos-glass braid outer jacket.

DD4-VN3: Cable Mark Number GB12; 2/C # 12 AWG; PVC-insulated conductors, with an asbestos-glass braid outer jacket.

DD4-VN5/1: Cable Mark Number GE12; 3/C # 12 AWG; PVC-insulated conductors, with an asbestos-glass braid outer jacket.

DD4-VN5/2: Cable Mark Number GC12; 5/C # 12 AWG; PVC-insulated conductors, with an asbestos-glass braid outer jacket.

The above cables are routed in cable trays throughout most of their route through the III.G.2 fire zones of concern, transitioning to conduit at the endpoints of the route. Consequently, these cables can be expected to be in contact with or in proximity to other energized cables in the cable tray routes, at similar operating voltages, and with similar insulation and jacket characteristics. The specific potential fire-induced failure modes and effects are discussed in the response to question (3) below.

5. Cable **DD4-JB5** as shown on wiring diagram 9321-F-31863, Rev. 21 and interfaced with elementary wiring diagram 500B971, Sheet 133, Rev. 9 is the control cable between the controls on CCR panel "SF" and the MCC compartment serving LCV-112C (480V MCC 36A, Compt. 1RH).

   During normal plant operation, with LCV-112C fully open, cable DD4-JB5 contains two normally energized (120VAC) conductors. The potential failures include conductor-to-conductor, open circuit, and conductor to ground. As this cable contains normally energized conductors, the effects of the conductor-to-conductor shorts as discussed below are considered to bound the application of inter-cable hot shorts to this cable. The range of failures of the conductors includes:

   1. Short to ground on energized conductor, or short between energized and grounded conductor; MCC compartment control power fuse blown, LCV-112C remains OPEN.

   2. Short between normally energized conductor and normally deenergized conductor: LCV-112C CLOSE contactor is energized, moving LCV-112C toward CLOSED position, or the OPEN contactor may be energized, attempting to move LCV-112C further in the OPEN direction.

      Open-circuit failure of any conductor(s) would result in LCV-112C failing as-is, in the normally open position, and may also disable the ability to close the valve on command.

   3. All conductors fused together and/or shorted to ground – control power fuse blown as in (1). LCV-112C remains OPEN.

   Cable **DD4-VN5/1** as shown on schematic 9321-F-36013, Sh. 5, Rev. 6 is the three-phase power cable between 480V MCC 36A, Compt. 1RH and the motor operator of LCV-112C. This cable is normally deenergized other than while LCV-112C is traveling in the open or close direction. Therefore, during normal plant operation, all three conductors are normally deenergized, with LCV-112C in the full open position. Fire-induced conductor-to-conductor

faults, conductor-to-ground faults, or open circuits will have no effect on LCV-112C, and it will remain open as required. A properly phase-oriented three-phase hot short resulting from contact with exposed conductors (due to fire damage) of a cable in the same tray containing an energized three-phase circuit could cause the LCV-112C operator to be energized, and move in either the open or close direction. Per Regulatory Guide 1.189, Rev. 2, Section 5.4.2, the likelihood of such a circuit failure is exceedingly small, and does not require consideration except in cases of high-to-low pressure interfaces. LCV-112C is not part of a high-to-low pressure interface, and therefore the inter-cable three-phase hot short failure mode is excluded from consideration. An open-circuit failure on any conductor of this cable will render the valve inoperable, but it will remain in the normal (open) position.

Cable **DD4-VN5/2** as shown on schematic 9321-F-36013, Sh. 5, Rev. 6 is the control cable that interfaces between the LCV-112C actuator limit/torque switches and the motor control center (MCC-36A, Compt. 1RH). This cable presents the potential for blowing the control power fuse in the MCC compartment, if shorted to ground as the result of fire-induced cable damage. In this case, LCV-112C would remain OPEN, with no impact on the safe-shutdown function. A conductor-to-conductor short or external hot short to any conductor does not present the potential for energization of the valve close contactor. Open-circuit failure of any conductor would prevent the valve operator from moving in either the open or close direction. Inter-cable hot shorts to any conductors in this cable will not cause spurious valve operation without concurrent faults in other cables associated with LCV-112C.

Cable **DD4-VN3** as shown on wiring diagram 9321-F-31863, Rev. 21 provides the interlock circuit between the redundant charging suction valve LCV-112B limit switch and the LCV-112C auto-close circuit. A conductor-to-conductor short within the two conductors of this cable connected to the LCV-112C control circuit would have no effect on LCV-112C position. An open-circuit failure or short to ground may prevent the auto-closure of LCV-112C on demand. An external inter-cable hot short to conductors of this cable may energize the "close" contactor and cause LCV-112C to close.

6. The cables associated with valve LCV-112C and redundant charging pump suction valve LCV-112B as discussed above are routed and separated from ignition sources as follows, presented by fire zone location within Fire Areas ETN-4{1}, PAB-2{3}, and PAB-2{5}.

   Fire Zone 60A – Upper Electrical Tunnel

   Cable DD4-JB5 is routed in cable trays through this zone, which is devoid of ignition sources or combustibles, other than the cable trays routed through the zone. Adjacent cable trays to those containing cable DD4-JB5 are located within several inches of the subject trays. However, cable trays throughout this area are provided with an automatic preaction water spray system.

   Fire Zone 6 – 32 Charging Pump Room

   Cable DD4-VN3 enters the south end of the zone at the ceiling in conduit located approximately 14 ft above the floor. The cable terminates at LCV-112B located in the south end of the zone approximately 7.5 ft above the floor. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of the charging pump motor and a

transfer switch (alternate safe-shutdown power supply for the charging pump). The motor is separated from the cable by approximately 13.8 ft horizontally. The transfer switch is separated from the cable by approximately 16 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cable.

Fire Zone 27A, PAB 73' Corridor and Fire Zone 30A, VCT Room Valve Corridor

Cable DD4-VN5/2 is located in these adjoining zones. The cable enters Zone 27A in the southeast quadrant in conduit located approximately 12 ft above the floor and traverses the zone from south to north for approximately 7.4 ft before entering tray located approximately 12 ft above the floor, then turning west for approximately 55 ft. The cable then exits the tray in conduit traversing the zone from south to north for approximately 19.5 ft and enters zone 30A. In zone 30A the cable is routed in rigid steel conduit for approximately 19 ft from the south end of the room to the north end, terminating at LCV-112C. Ignition sources in the zones located less than 20 ft horizontally from the cables consist of three electrical cabinets and one dry transformer. One electrical cabinet is located under the tray, separated from the cable route by approximately 6.8 ft vertically. The remainder of the electrical cabinets are separated from the cable route by approximately 11.9 ft horizontally. The dry transformer is located under the tray routing separated from the cable by approximately 3.5 ft vertically. There are no intervening combustibles between the identified ignition sources and the cable.

Cable DD4-VN5/1 is also located in these zones. The cable enters the northwest quadrant of zone 27A from the floor in rigid steel conduit rising approximately 13.3 ft and entering zone 30A. In zone 30A the cable traverses the zone from south to north for approximately 15.1 ft, then turns east for approximately 9.7 ft, then turns down and terminates at LCV-112C approximately 2.5 ft above the floor. Ignition sources in the zones located less than 20 ft horizontally from the cables consist of two electrical cabinets and one dry transformer. The electrical cabinets are separated from the cable by approximately 1.8 ft horizontally or greater. The dry transformer is separated from the cable by approximately 0.1 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cable.

7. As discussed above in the response to RAI-01.1 (5), only circuits DD4-JB5 and DD4-VN3 present a credible potential for spurious mispositioning of valve LCV-112C, thereby potentially challenging the suction path for a running charging pump, within Fire Areas ETN-4 and PAB-2. These cables are routed through Fire Zones 6 and 60A. Fire Zone 60A, which contains high-density cable tray routing, is equipped with a smoke detection system and an automatic preaction water spray system for the cable trays in the zone. Fire Zone 6 is equipped with a smoke detection system, providing assurance of early annunciation of any credible fire occurring in the 32 charging pump room. The remaining cables, DD4-VN5/1 and DD4-VN5/2, are routed through Fire Zones 27A and 30A, which are not equipped with automatic fire detection or suppression systems, but their low (Zone 27A) and moderate (Zone 30A) combustible loading and minimal/widely spaced ignition sources, provide reasonable assurance that a credible fire scenario in either zone would be minimal in severity and scope of potential damage to surrounding structures, systems, and components (SSCs). Physical and spatial separation between the zones, as well as widely

spaced ignition sources and concentrations of combustibles, makes migration of a single fire between these zones an unlikely occurrence.

To reiterate the potential fire-induced failure modes for the cables associated with valves LCV-112B and LCV-112C are routed through the above listed fire areas:

- DD4-JB5: Control cable; failure can cause LCV-112C to spuriously CLOSE or fail as is (OPEN).

- DD4-VN3: Interlock cable with redundant charging suction valve LCV-112B; failures within this cable will have no effect on the position of valve LCV-112C, unless a concurrent LCV-112C "close" signal is received from VCT level controller LC-112C. Cables associated with level controller LC-112C outputs for this function remain within Fire Area CTL-3 (a III.G.3 fire area), and cannot be impacted by a fire in any of the III.G.2 fire areas, including Fire Area ETN-4{1}, PAB-2{3}, or PAB-2{5}. However, an inter-cable hot short on conductors of cable DD4-VN3 could energize the "close" contactor and close LCV-112C.

The features that serve to prevent or mitigate the above described circuit failure modes – that could cause valve LCV-112C to fail in an undesired position are as follows:

- Minimal or low-significance ignition sources located within 20 feet of the cable routing paths

- Ionization smoke detection systems are installed in those fire zones traversed by the subject cables that do contain significant combustibles or ignition sources

A postulated fire in Fire Area ETN-4{1}, Fire Zone 60A, or Fire Area PAB-2, Fire Zone 6, or Fire Area PAB-2{5}, Fire Zone 27A or 30A, whether detected and suppressed prior to the occurrence of fire damage to these specific cables, would present the potential for at most incurring prompt damage to one charging pump, as during normal plant operation, only one of three charging pumps is running at any given time. For that damage scenario to occur, valve LCV-112C must be spuriously commanded closed by fire-induced circuit failures, while simultaneously valve LCV-112B must fail to automatically open, also due to fire-induced circuit failures.

For damage to be incurred to additional charging pumps as the result of loss of all pump suction capability, additional charging pumps would need to be spuriously started by fire-induced cable faults (Multiple Spurious Operation scenario), to potentially result in damage to more than the single charging pump running at the onset of the scenario.

To provide an additional layer of defense in depth, post-fire safe-shutdown procedure 3-ONOP-FP-1 has been revised to include a CCR preemptive action to secure the 31 and 32 Charging Pumps, to ensure they are not impacted by a potential loss-of-suction event caused by spurious actuation of LCV-112C as discussed herein. The pumps are secured by placing the CCR control switches in OFF and pullout. This action will stop the charging pumps, to protect against any damage that could be caused by a spontaneous loss of all suction paths. Despite placing the CCR control switches in "OFF," certain conductors within

the charging pump control cables routed through the fire areas of concern will remain energized with 125VDC. Consequently, an internal conductor-to-conductor fault on the charging pump control cable could result in a spurious start of the charging pump, as the conductor-to-conductor fault could cause the charging pump circuit breaker closing coil to be energized. However, this spurious actuation would require additional independent cable failures/faults beyond those necessary to cause the spurious closure of LCV-112C.

Later in the post-fire scenario and consistent with the post-fire safe-shutdown timeline, either 31 or 32 Charging Pump would be placed into service, in accordance with existing procedures, once a reliable suction source is aligned to the pump.

8. Fire-induced circuit failures may cause the spurious closure of LCV-112C and also the failure of redundant charging pump suction valve LCV-112B to automatically open in response to the LCV-112C closure. The credited OMA to manually establish a reliable charging pump suction path by opening manual bypass valve 288 is focused on ensuring that a charging pump can be restored to operation within the nominal 75-minute limit prescribed by the thermal-hydraulic analysis that supports the IP2 post-fire safe-shutdown timeline. The associated OMA has been benchmarked by timed field exercises, which consistently demonstrate that the OMA can be reliably completed within the required time limit. It is this OMA that is the focus of the request for exemption for actions associated with LCV-112C in response to a Fire Area ETN-4{1} or PAB-2{3} or PAB-2{5} fire, as enumerated in the Entergy submittals dated March 6, 2009, October 1, 2009, and May 6, 2010.

   In the unlikely event of early and undetected closure of LCV-112C during a fire scenario, the single positive-displacement charging pump in operation could be damaged as the result of loss of all suction sources, before any credible operator intervention could be performed. During plant power operation, only one charging pump is selected for operation at any given time. The spontaneous loss of all charging pump suction sources is considered to be of low likelihood, based on the minimal hazards of the area, separation from hazards as discussed herein, and the installed fire detection capability. However, to provide additional assurance of sustained function of at least one charging pump to support the post-fire shutdown model, a preemptive step has been incorporated into procedure 3-ONOP-FP-1, to provide guidance for shutdown of the appropriate charging pump, in the event of fire detected in Fire Area ETN-4 or PAB-2. This CCR action does not require any supporting operator field actions, and therefore is not classified as an OMA in the context of SECY 08-0092.

   The identified OMA to locally establish an alternate charging pump suction path in response to spurious closure of LCV-112C has been demonstrated to be a feasible manual action, capable of effective and consistent performance within the time available to restore charging (RCS makeup) and comply with Appendix R performance goals. The added aspect of potential LCV-112C spurious closure, i.e., that of a dynamic scenario in which LCV-112C closure occurs while a charging pump is in operation, has been addressed through defense-in-depth measures:

   - Minimal hazards and ignition sources in the fire zones of concern capable of creating a fire condition sufficient to induce the necessary cable failures to cause the spurious operation of LCV-112C.

- Separation between significant hazards and ignition sources and the cable routes associated with LCV-112C in Fire Areas PAB-2{3} (Fire Zone 6) and PAB-2{5} (Fire Zones 27A and 30A).

- Smoke detection systems in the fire zones of concern containing substantive ignition sources (Fire Zone 60A; high-density cable tray routes; Fire Zone 6; charging pump motor) containing the subject LCV-112C cables ensures rapid detection, supporting prompt manual suppression and extinguishment, limiting the scope and severity of damage to safe-shutdown related SSCs. For the remaining fire zones (Fire Zones 27A and 30A) forming the routing path for the LCV-112C cable of concern, postulation of a significant fire scenario capable of causing significant cable damage is not consistent with the configuration and character of the existing fire hazards in these zones.

- Preemptive proceduralized CCR action (which is therefore not classified as an OMA in the context of SECY 08-0093) to secure the credited charging pump early in the scenario, to preclude damage in the event that LCV-112C does spuriously close, and redundant suction valve LCV-112B concurrently fails to automatically open.

9. In Fire Zones 6 and 60A, which contain cables associated with valve LCV-112C, ionization smoke detection is installed, providing assurance of early detection of any fire of sufficient magnitude to challenge the electrical integrity of any of the subject cables. Further, as noted herein, Fire Zone 60A, which contains high-density cable tray routing, is equipped with an automatic preaction water spray system for the cable trays in the zone, as well as adjoining zones throughout the Electrical Tunnels. In Fire Zones 27A and 30A, no smoke detection systems are installed, but combustible loading is low, concentrations of combustibles are not significant in proximity to the cable routes of concern, and credible ignition sources in the zones are minimal. Therefore, while detection of any fire in Fire Zone 27A or 30A would be significantly delayed, the severity and scope of impact of any credible fire in these zones is expected to be sharply limited.

   The LCV-112C cables of concern, as discussed herein, contain thermoplastic insulated conductors, with an outer asbestos-glass braid jacket. With minimal credible ignition sources and concentrations of fixed combustibles within 20 ft of the cable routing paths, the credibility of a fire scenario of sufficient heat release rate and geometry to challenge the nominal 400°F cable damage limit for thermoplastic conductors – without being detected and annunciated by the installed smoke detectors where provided – is exceedingly low. For those zones without smoke detection systems (27A and 30A), the anticipated fire scenario to be considered is more appropriately one involving transient combustibles, given the minimal fire hazard presented by in-situ combustibles. Any introduction of transient combustibles into these zones, above minimal quantities, is controlled by IPEC transient combustible control procedure EN-DC-161. This procedure invokes involvement by site fire protection engineering prior to introduction of transient combustibles exceeding specified limits, and provides for compensatory measures, where deemed necessary, to maintain adequate fire protection defense in depth while the transient combustible materials are in place. As such, postulation of a significant and undetected fire occurring in Fire Zone 27A or 30A, capable of causing damage to the LCV-112C cables located in these zones, is not

supported by the in-situ combustibles and hazards, nor by administrative transient combustible control requirements.

Where ionization smoke detection systems are installed, they are designed consistent with NFPA 72E selection and spacing guidance, and routine surveillance testing provides assurance of smoke detection functionality. Consequently, there is reasonable assurance that the smoke detection system will detect and annunciate developing fire conditions in a responsive and effective manner, allowing sufficient time for fire brigade response and fire extinguishment before any significant damage is incurred.

Table 3 of the October 1, 2009 letter 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 letter, 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.

The analyzed delay in restoration of charging makeup flow to the RCS (of up to approximately 75 minutes as previously stated) is based on the static condition of loss of all charging capability at the start of the fire event. The calculated value of 75 minutes therefore reflects the worst-case time period available before RCS inventory can be expected to decrease to a level that would constitute failure to meet Appendix R performance goals.

The calculated allowable time of approximately 75 minutes to restore charging makeup flow to the RCS, based on prompt loss of charging capability (e.g., loss of power to charging pump, or receipt of spurious stop signal) is contrasted with the more dynamic failure scenario in which the credited charging pump remains in operation, but may be subjected to a spontaneous loss of suction due to spurious closure of LCV-112C and concurrent failure of LCV-112B to open in accordance with its design function.

During the implementation of post-fire safe-shutdown procedural measures, charging pump suction is aligned to the RWST through a manual bypass valve, before placing the selected charging pump in service. The thermal-hydraulic analysis for the IP2 Appendix R scenario has determined that RCS inventory will be preserved – to the point of remaining within the indicating range of the wide-range pressurizer channel – for approximately 75 minutes from the start of the event. This assumes that at the outset of the event, the reactor is tripped and charging system letdown is isolated a relatively short time thereafter, via actions taken in the CCR. It should be noted that the bounding scenario addressed by the referenced thermal-hydraulic analysis is that for an alternate shutdown event, which anticipates a spurious or manual reactor trip early in the scenario, and the securing of letdown to preserve RCS inventory, pending restoration of a charging pump to service.

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-01.2 RESPONSE

Thermal-hydraulic analysis IP-CALC-05-01034 Revision 2 (Appendix R Cooldown and Benchmark and Sensitivity Analysis Using RETRAN-3D) models the post-fire natural circulation shutdown/cooldown scenario. No credit is taken in the model for sustained flow from the VCT, and therefore the effects on pressurizer level of closure of LCV-112C at the outset of the fire event is bounded by the existing model. With the loss of all charging makeup to the RCS, combined with isolation of letdown early in the scenario, the thermal-hydraulic model establishes that pressurizer level will be maintained within the indicating range of the wide-range level channel for approximately 75 minutes. To the extent that charging makeup is restored to the RCS within this time frame, the Appendix R performance goals will be met. The feasibility of performing the required OMA to align an alternate suction source to the charging pump has been verified through timed walkdowns, and can readily be accomplished within the allotted 75-minute window, as documented in the Entergy letters dated October 1, 2009 and May 4, 2010.

It is noted that loss of charging makeup can be the result of a spurious stop signal or loss of power to the selected charging pump, as well as spurious closure of the charging pump suction path. As noted in the response to RAI-01.1 (7), a preemptive CCR action has been added to the post-fire shutdown procedure (3-ONOP-FP-1) to secure the charging pump credited for the Fire Area ETN-4{1}, PAB-2{3} or PAB-2{5} scenario, to protect it against potential damage caused by a spurious loss of suction failure.

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-02.1 RESPONSE

Field walkdowns were performed to obtain measurements of the separation distances requested. The focus of these walkdowns was to identify the horizontal and, where applicable, vertical separation distances between ignition sources and the cable trays or conduits containing the cable(s) of concern or the component of concern, where it is located within the fire zone of concern (those zones for which OMAs are required to be implemented). The focus on dimensioning distances from target cables/components to ignition sources was placed predominantly on those ignition sources located 20 ft or less from the target cables/raceways or components, based on clarification received in a telecon between NRR Staff and Entergy staff. As such, the separation distances presented below (which are formulated for each fire zone containing cables and/or components of concern) do not reflect any ignition sources or hazards located greater than 20 ft from the targets of concern.

The information presented below is intended to be used in conjunction with the tabulation of safe-shutdown features presented in Table RAI-06.1-1 of Entergy's May 4, 2010 letterl. Several additional clarifications are provided to help coordinate the review of the material presented in Entergy's May 4, 2010 letter and the plant physical arrangement information presented below.

1. Where reference is made to cables or OMAs associated with "LCV-112C" or "LCV-112B/C," these should be treated interchangeably, since the cable analyses and routing include consideration of the interlock circuits between these valves, and the OMA associated with these valves is the local opening of RWST outlet bypass manual valve 288.

2. Where reference is made to cables or OMAs associated with "HCV-142," "valve 227," or "HCV-142/227," these should be treated interchangeably, since the cable analysis and routing performed by Entergy includes consideration of the cables associated with both valves, where applicable, and focuses on the OMA, which is the local manual opening of HCV-142 bypass valve 227. HCV-142 cables route through several of the III.G.2 fire areas of concern, and instrument air is postulated to be lost as the result of damage to instrument air lines or instrument air loads that may spuriously operate and vent/deplete the instrument air supply, causing HCV-142 to spuriously close. Valve 227 is a manual valve that is locally opened per the OMA to restore the necessary flowpath.

3. Note also that while the Entergy lettter dated May 4, 2010 included reference to "cable runs" as ignition sources (referring to cables in trays), no dimensional data is presented for separation of the target cables from "cable run" ignition sources, as these cable runs are generally the very trays or tray stacks in which the target cables are routed.

   The dimensional data provided below focuses principally on the separation of ignition sources from the target cables and/or components associated with the respective OMAs. With respect to the separation between the target cables and/or components and significant combustibles, except as noted below, substantial quantities of combustible materials are generally not located within 20 ft of the target cables/components. A notable exception is "cable runs" as described above as in most fire zones, the dominant combustible is electrical cable insulation in cable trays. The target cables are, of course, located in cable trays surrounded by cables with flame-retardant insulation, which presents a minimal hazard of self-ignition or sustained combustion capable of challenging the target cables.

Fire Area AFW-6 / Fire Zone 23 – Auxiliary Feed Pump Room Elev 18'-6"
Cables AK3-PT2 and JB1-PT2/2 for 33 Auxiliary Feedwater (AFW) Pump are located in this zone. The cables enter the zone from the ceiling at approximately 12 ft from the floor and are routed down approximately 5.7 ft in rigid steel conduit terminating in the AFW Pump control panel. Ignition source in the zone located less than 20 ft horizontally from the cables consists of one electrical cabinet separated from the cable by approximately 12.4 ft horizontally. There are no intervening combustibles between the identified ignition source and the cable.

Cable JB1-X32/2 for 33 AFW Pump 33 is located in this zone. The cable is routed vertically from a junction box located on the north-center wall in rigid steel conduit for approximately 5.5 ft then enters a tray located approximately 10.8 ft above the floor. The cable then turns west traversing the zone for approximately 36 ft exiting the east end of the zone at the ceiling approximately 12 ft above the floor. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of one AFW Pump motor and two electrical cabinets. The AFW Pump motor is separated from the cable by approximately 8.2 ft horizontally. One electrical cabinet is located directly under the cable separated by approximately 5.7 ft vertically.

The other electrical cabinet is separated from the cable by approximately 9.8 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cable.

Cables LL7-X32, LQ7-X32, and X32-Y2J for 33 AFW Pump are located in this zone. The cables are routed from flow transmitters FC-1136S and FC-1136A-S, located approximately 4.4 ft above the floor, along the north wall for approximately 12 ft in rigid steel conduit terminating at a junction box located on the north-center wall located approximately 5 ft above the floor. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of two AFW Pump motors. The AFW Pump motors are separated from the cable by approximately 7 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

Fire Area ETN-4 / Fire Zones 7AN and 7AS – Lower Electrical Tunnel (north and south)
Cables AI5-PT2, JB1-PT2/1, JB1-X32/1 for 31 AFW Pump, JB1-X32/1 for valve FCV-1121, AH9-K1B, AH9-PL2, JA4-PL2/2 for 32 Charging Pump, JB1-SX1/1, JF5-KV4, JF5-LL8 for valve FCV-406B, JA2-KZ2 and JF9-YD5/1 for valve PCV-1134, AS9-W1D for 32 Component Cooling Water (CCW) Pump, and JB1-SX1/1, K45-YM3, K47-YM3 for valve FCV-406B are routed through these zone. Cables enter the south side of the Lower Electrical Tunnel (zone 7AS) and exit the north side (zone 7AN). There are no ignition sources in the zones located less than 20 ft horizontally from the cables.

Fire Area ETN-4 / Fire Zones 60AN and 60AS – Upper Electrical Tunnel (north and south)
Cables JB1-SZ6 for valves PCV-1310A and PCV-1310B, DE1-XV2 for 38 Service Water (SW) Strainer, JB1-TA5 for valve HCV-1118, AQ3-K1C, AQ3-PL2, JA2-PL2/1 for 31 Charging Pump, JB1-KV6 for valve FCV-405B, JB1-KV8 for valve FCV-405D, JB5-X1J for valve HCV-142, DD4-JB5 for valve LCV-112C, JB1-PT2/3 for valve PCV-1139 and JB1-S99, JB1-X02, JB1-X02/1 for valves PCV-1310A and PCV-1310B are routed through these zones. Cables enter the south side of the Upper Electrical Tunnel (zone 60AS) and exit the north side (zone 60AN). There are no ignition sources in the zones located less than 20 ft horizontally from the cables.

Fire Area ETN-4 / Fire Zone 73A – Upper Electrical Penetration Area
Cables JB1-KV8 and JB1-KV7 for valves FCV-405C and FCV-405D, cables JB1-XO2 and JB1-S99 for valves PCV-1310A and PCV-1310B, cable JBI-TA5 for valve HCV-1118, and cable JB1-PT2/3 for valve PCV-1139 are located in this zone. The cables are routed in tray located 13 to 14 ft above the floor. The cables enter the zone on the east side from the Electrical Tunnel and are routed through the north side of the zone from east to west for approximately 77 ft exiting the west end of the zone. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of eight electrical cabinets. Two electrical cabinets are located under the cable routing. One electrical cabinet is separated by approximately 5.7 ft vertically and one cabinet is separated by approximately 6.7 ft vertically. The remaining eight electrical cabinets are separated from the cable by approximately 5.3 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

Cables JB1-XO2/1 and JBI-SZ6 for valves PCV-1310A and PCV-1310-B are located in this zone. The cables are routed in tray located 13 ft above the floor. The cables enter the zone on the east side from the Electrical Tunnel and are routed through the south side of the zone from east to west for approximately 77 ft exiting the west end of the zone. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of eight electrical cabinets.

Three electrical cabinets are located under the cable routing separated by greater than approximately 4 ft vertically. Two electrical cabinets are separated from the cable by greater than approximately 2.3 ft horizontally and 2.3 ft vertically. The remaining three electrical cabinets are separated from the cables by approximately 10.2 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

Fire Area PAB-2 / Fire Zones 6, 19A – PAB 55'
Cable DD4-VN3 for valve LCV-112C is located in zone 6 entering the south end of the zone at the ceiling in conduit located approximately 14 ft above the floor. The cable terminates at LCV-112B located in the south end of the zone approximately 7.5 ft above the floor. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of the charging pump motor and a transfer switch (alternate safe-shutdown power supply for the charging pump). The motor is separated from the cable by approximately 13.8 ft horizontally. The transfer switch is separated from the cable by approximately 16 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cable.

Cables AH9-PL2 and JA4-PL2/2 for for 32 Charging Pump are located in zone 19A The cable enters the southwest corner of the zone and are routed along the south wall from west to east in tray located approximately 10 to12 ft above the floor for approximately 37 ft exiting at the east end of the zone. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of nineteen electrical cabinets and one dry transformer. Ten electrical cabinets are located under the cables separated by approximately 4.2 ft vertically or greater. The remaining nine electrical cabinets are separated from the cables by approximately 4.2 ft horizontally or greater. The dry transformer is separated from the cable by approximately 15.8 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cables.

Fire Area PAB-2 / Fire Zones 27A and 30A – PAB 73' Corridor
Cable DD4-VN5/2 for valve LCV-112C is located in these zones. The cable enters the zone in the southeast quadrant in conduit located approximately 12 ft above the floor and traverses the zone from south to north for approximately 7.41 ft before entering tray located approximately 12 ft above the floor, then turning west for approximately 55 ft. The cable then exits the tray in conduit traversing the zone from south to north for approximately 19.5 ft and entering zone 30A. In zone 30A the cable is routed in rigid steel conduit for approximately 19 ft from the south end of the zone to the north end terminating at LCV-112C. Ignition sources in the zones located less than 20 ft horizontally from the cable consist of three electrical cabinets and one dry transformer. One electrical cabinet is located under the cable separated f by approximately 6.8 ft vertically. The remaining two electrical cabinets are separated from the cable by approximately 11.9 ft horizontally or greater. The dry transformer is located under the cable separated cable by approximately 3.5 ft vertically. There are no intervening combustibles between the identified ignition sources and the cable.

Cable DD4-VN5/1 for valve LCV-112C is located in these zones. The cable enters the north-west quadrant of zone 27A from the floor in rigid steel conduit rising approximately 13.3 ft and entering zone 30A. In zone 30A the cable traverses the zone from south to north for approximately 15.1 ft, then turns east for approximately 9.7 ft, then turns down and terminates at LCV112 approximately 2.5 ft above the floor. Ignition sources in the zones located less than 20 ft horizontally from the cable consist of two electrical cabinets and one dry transformer. The

electrical cabinets are separated from the cable by approximately 1.8 ft horizontally or greater. The dry transformer is separated from the cable by approximately 0.1 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cable.

Fire Area PAB-2 / Fire Zone 58A – Elev 41' Corridor
Cable K1B-W1B for 32 Charging Pump is located in this zone. The cable enters centrally in the zone and is routed in tray located approximately 9.5 ft above the floor. The cable traverses the zone from north to south for approximately 12 ft before exiting the zone. There are no ignition sources in the zones located less than 20 ft horizontally from the cable.

Fire Area PAB-2 / Fire Zone 59A – Pipe Penetration Area
Cables JB5-X1J and VK4-X1J for valve HCV-142 are located in this zone. Cable JB5-X1J enters the zone in the southwest quadrant and enters tray located approximately 8.9 ft above the floor grating. The cable traverses the zone from west to east for approximately 40 ft entering conduit that is routed vertically to the ceiling at approximately 26 ft above the floor then turns north traversing the zone for approximately 22 ft. Then the circuit continues with cable VK4-X1J turning down for approximately 20 ft to terminate at HCV-142. Ignition sources in the zones located less than 20 ft horizontally from the cables consist of one electrical cabinet and eight MOV motors. The electrical cabinet is located under the cable separated by approximately 2.6 ft vertically. The MOV motors are separated from the cable by approximately 2.1 ft horizontally or greater and vertically by 0 ft. There are no intervening combustibles between the identified ignition sources and the cable.

Fire Area TBL-5 / Fire Zones 37A, 38A, 43A, and 44A – Turbine Building Elev 15' and 36'
Cables AQ7-WF6 and WF6-Z99 for 31 SW Strainer are routed through these zones. Cable WF6-Z99 enters zone 38A from underground in rigid steel conduit and terminates immediately in a junction box. Cable AQ7-WF6 rises vertically from the junction box in tray penetrating the ceiling approximately 21 ft above into zone 44A. In zone 44A cable AQ7-WF6 rises to approximately 7.4 ft above the floor and the turns east for approximately 86 ft traversing zone 43A before turning down and penetrating the floor into zone 37A below. In zone 37A cable AQ7-WF6 drops into tray approximately 11.3 ft above the floor and then turns east for approximately 43 ft exiting the east side of the zone. Ignition sources in the zones located less than 20 ft horizontally from the cables consist of three electrical cabinets, an MCC, and 6.9KV Switchgear. In zone 38A, two electrical cabinets are separated from the cable by greater than approximately 11.8 ft horizontally. In zone 43A, two electrical cabinets are separated from the cable by greater than approximately 1 ft horizontally. In zone 37A, the MCC and 6.9KV Switchgear are located under the cable separated by greater than approximately 3 ft vertically. Also in zone 37A, one electrical cabinet is separated from the cable by approximately 8.1 ft horizontally. There are no intervening combustibles between the identified ignition sources and the cables.

Fire Area TBL-5 / Fire Zone 52A – AFW Pump Building Elev 32'-6"
Cable JB1-X32/1 for valve FCV-1121 and cable K45-YM3 for valves FCV-406A and FCV-406B are routed through this zone. The cables enter the floor at the west end of the zone in rigid steel conduit and immediately exit the west wall. The ceiling is a nominal 8.5 ft. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of two motors and two electrical cabinets. The motors are separated from the cables by approximately 13.2 ft horizontally or greater. The two electrical cabinets are separated from the cables by

approximately 6.3 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

Cables JF5-LL8, JB1-SX1/1, JF5-KV3, JF5-KV4 for valves FCV-406A and FCV-406B are routed through this zone. The cables enter the floor at the west end of the zone in rigid steel conduit and immediately exit the west wall. The ceiling is a nominal 8.5 ft. Ignition sources in the zone located less than 20 ft horizontally from the cables consist of two motors and two electrical cabinets. The motors are separated from the cables by approximately 13.8 ft horizontally or greater. The two electrical cabinets are located above the cables separated by approximately 1 ft vertically or greater. There are no intervening combustibles between the identified ignition sources and the cables.

Fire Area YARD-7 / Fire Zones 22 and 222
Cables C2B-XD6 and C2B-XD6/1 for 38 SW Pump are routed underground to the northeast side of the Turbine Building yard where they turn above ground rising 13 ft then turn west into the Turbine Building. Ignition source located less than 20 ft horizontally from the cables consists of a temporary yard power station separated from the cables by approximately 18 ft horizontally. There are no intervening combustibles between the identified ignition source and the cable.

Cables MY1-PY1 and PY1-XV2 for 38 SW Strainer is routed underground to the east side of the Backup SW Pump area (zone 222). Cable PY1-XV2 enters a terminal box from underground and then cable MY1-PY1 turns horizontal and is routed to 38 SW Strainer. Ignition sources located less than 20 ft horizontally from the cables consist of three motors all located above the cables approximately 13.2 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

Cable AQ8-M59 for 31 SW Strainer is routed underground to the SW Pump area (zone 22). The cable enters from underground and terminates at 31 SW Pump. The conduit rises from the floor approximately 4.2 ft to the motor junction box. Ignition sources in the zone located less than 20 ft horizontally from the cable consist of five motors, one dry transformer, and three electrical cabinets. The motors are separated from the cable by approximately 3.1 ft horizontally or greater and vertically by 0 ft. The dry transformer is separated from the cable by approximately 16 ft horizontally. The three electrical cabinets are separated from the cable by approximately 16.2 ft horizontally or greater. There are no intervening combustibles between the identified ignition sources and the cable.

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-03.1 RESPONSE

Fire Zone 6 (Fire Area PAB-2), 32 Charging Pump Room, is located on elevation 55'-0" of the PAB. The room is 288 sq ft (12' x 24') with a 16' ft ceiling. The walls and ceiling are 2'-6" concrete and the floor is 1'-0" concrete. A single 3'-0" wide open doorway is located at the south end of the room for access to the adjacent corridor (Fire Zone 17A - PAB 55' Corridor). A labyrinth entry to the room is formed by a 2'-6" x 12'-6" concrete wall located in the adjoining corridor, approximately 5' south of the open doorway. A 4" curb is provided in the threshold of the open doorway entrance to Fire Zone 6 to preclude the flow of liquids into or out of the fire zone. An open at top metal partition located in the adjacent corridor encloses the access doorways for 31 and 32 Charging Pumps creating a vestibule type access through a single doorway from Fire Zone 17A. Area wide ionization type smoke detection is provided in the room. There is no automatic suppression in the room, but manual suppression is available in adjacent Fire Zone 17A.

Fixed combustible materials in the room consist of the lube oil contained in the 32 Charging Pump, cable insulation, and incidental combustibles resulting in Total Fixed Combustible Loading of 28,323 BTU/sq ft, which corresponds to a fire severity of 21 minutes. There are no fixed combustibles that penetrate through the open doorway between Fire Zone 6 and Fire Zone 17A.

Based on the types and amounts of combustibles in Fire Zone 6, the anticipated fire is a rapidly developing oil fire associated with the charging pump. Early warning detection of the fire is provided by ionization smoke detectors, resulting in CCR alarm and subsequent response by the fire brigade to extinguish the fire and maintain safe shutdown capability. Smoke and hot gases can be evacuated via the PAB and portable smoke ejectors.

Fire Zone 17A (Fire Area PAB-2) is the Main PAB Corridor at elevation 55'-0". The corridor, which is 6,386 sq ft in floor area, with a 16 ft ceiling, provides general open access to the various rooms located off elevation 55'-0".

Fixed combustible materials in the zone include resins, radiation protection supplies, plastic, rubber, cellulose, and electrical cables in trays, resulting in a total fixed combustible loading of 29,869 BTU/sq ft, which corresponds to a fire severity of 22 minutes. As previously stated for Fire Zone 6, there are no intervening combustibles between Fire Zone 6 and Fire Zone 17A that penetrate through the open doorway into Fire Zone 6.

Based on the types and amounts of combustibles in Fire Zone 17A, the anticipated fire is a slow developing cable fire which generates significant amounts of heat and smoke. Early warning detection is provided by area-wide ionization detectors, ionization detectors in the under-floor MCC area, and ultraviolet detectors in the MCC area. Activation of any detection system will result in a CCR alarm and subsequent fire brigade response to extinguish the fire and maintain safe shutdown capability. Smoke and hot gases can be evacuated via the PAB Ventilation System and portable smoke ejectors.

Fire Zone 6 and adjacent Fire Zone 17A are "Level 2" combustible control areas as classified under the Transient Combustible Control Program implemented via procedure EN-DC-161 (Control of Combustibles). Small quantities of combustibles are permitted in these areas, but

unattended combustibles exceeding any of the following quantities require formal prior review and approval by Fire Protection Engineering, with imposition of additional compensatory actions or protective measures, as determined to be required:

- 100 lbs of fire-retardant treated lumber
- 25 lbs of loose ordinary combustibles
- 5 gallons of combustible liquid in an approved container
- One pint of flammable liquid in an approved container
- One 20-oz flammable aerosol can

Additionally, with respect to the effects of the proximity of transient combustibles to "secondary combustibles," the guidance of procedure EN-DC-161 includes consideration by Fire Protection Engineering of any SSCs or other combustible materials in the affected area that could be impacted by the presence and staging of the transient combustibles. Where the performance of the Transient Combustible Evaluation is indicated, these parameters are reviewed and additional guidance is provided in the Transient Combustible Evaluation, as needed, to protect adjacent combustibles, to provide protection for combustibles located within a defined footprint, to constrain the staging location of the transient combustibles, or to specify other measures as deemed appropriate by Fire Protection Engineering.

Work activities involving secondary ignition sources and Hot Work are subject to controls and guidance provided by procedure EN-DC-127 (Control of Hot Work and Ignition Sources). All hot work requires review and approval by a qualified Hot Work Supervisor and/or Fire Protection Engineering, and a Hot Work Permit issued specifying appropriate supplemental fire protection (i.e., hot work fire watch). Permits are only valid for 24 hours. If required, the activity may be reevaluated by a Hot Work Supervisor and/or Fire Protection Engineering, and the permit may be extended on a daily basis to a maximum valid duration of 31 days.

An NRC SER dated January 7, 1987 approved an exemption from the requirements of Appendix R for Fire Zones 5, 6, 7, 17A, and 21A (Charging Pump Area and Corridor Outside). The SER concluded that "The three charging pumps are located in separate cubicles in this [55'-0"] elevation. The boundaries of each cubicle are constructed of at least 2 ft. of reinforced concrete. These walls do not fully enclose the cubicles but have indirect open doorways between charging pumps 31 and 32 and open grating above the door of the cubicle for charging pump 33, for ventilation purposes. There are some piping, unrated dampers and electrical penetrations unsealed between the cubicles. The separation between the pump center lines is 16 ft 6 in. for pumps 31 and 32 and 12 ft 6 in. for pumps 32 and 33. The fire load in this location is about 25,000 BTU/sq ft with an equivalent fire severity of about 19 minutes. Existing fire protection consists of a fire detection system as described in the September 19, 1985 letter, manual hose station and portable fire extinguishers. Therefore we [NRC] have reasonable assurance that if a fire occurs in this location, safe shutdown could still be achieved and maintained."

Based on the above, it is reasonable to conclude that a fire originating in Fire Zone 6 would likely be confined to the zone of origin, despite the lack of a door in the open doorway at the south end of the zone. The fixed fire loading in the zone is low such that a fire of any appreciable size that could potentially propagate out of Fire Zone 6 is not likely. There are no intervening fixed combustibles that penetrate through the open doorway into the adjacent Fire

Zone 17A that would permit a fire to propagate out of the zone. The curb in the threshold of the open doorway would prevent combustible liquid (i.e., oil) from migrating out of Fire Zone 6 and into the adjacent zone. Area wide smoke detection is provided in both Fire Zone 6 and 17A such that a fire would be detected in its early stages allowing for Fire Brigade response and extinguishment.

RAI-04.1

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

RAI-04.1 RESPONSE

The summary discussion of the SER dated January 7, 1987 is included in the response to RAI-03.1 in the May 4, 2010 letter under the heading "Fire Area PAB-2 / Fire Zones 5, 6, 7, and 21A" and is reproduced herein, below:

- **SER dated January 7, 1987** approved an exemption from the requirements of Paragraph III.G.2 for the PAB (Fire Zones 5, 6, 7, and 21A) based on substantial wall construction, low fire load, and area wide detection. The installed smoke detectors will provide early warning of fire conditions and rapid fire brigade response before significant damage would occur.

RAI-05.1

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

RAI-05.1 RESPONSE

The potential need for the use of SCBAs for safe-shutdown operator response is identified, on a dynamic and situational basis, by Operations personnel, rather than relying only on static procedural guidance. The Site Fire Brigade is the primary responding group for all fires at the Indian Point Energy Center (IPEC), and it is made up entirely of on-shift qualified Operations personnel. The qualified Fire Brigade Leader (FBL) is required to be a Senior Reactor Operator that holds or has held a license at IPEC in the past three years.

The need for SCBAs is an assumed condition for all fire brigade response. Therefore, all Fire Brigade members are required to respond to the fire scene in full turnout gear including SCBAs.

In accordance with their training, initial entry into a fire or post-fire area will be conducted under the direction of the FBL by the qualified Operations personnel in the Fire Brigade. The FBL at the fire scene assesses area conditions and directs personnel in the continued use of SCBAs if required.

The FBL in command at the scene of a fire is trained to be in constant contact with the CCR, allowing the FBL to communicate his assessment of the field conditions to the CCR and Shift Manager. Based on this, it can be expected that conditions that may require the use of an

SCBA (i.e., smoke-filled areas) would be known by the Shift Manager for providing direction to operators that may be dispatched to the field. It can also be expected that the Shift Manager would provide guidance consistent with that of the FBL at the fire scene, including the need to don SCBAs, if required. CCR staff not responding to the fire are prepared to don breathing apparatus if required.

All operators are required to be trained and qualified in the use of SCBAs; qualified operators are required to be familiar with all areas of the plant and, therefore, Entergy believes they are capable of assessing transient routes to avoid fire/smoke affected areas.

Operators that may be required to re-enter a fire/post fire area that has not been released for unrestricted access are trained to do so under the direction of the FBL at the fire scene, including the direction to don an SCBA if required.

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-06.1 RESPONSE

The response to RAI-05.1 in the May 4, 2010 submittal discussed the expectation of original IP3plant cables with an outer jacket construction of asbestos-glass braid construction to perform similar to thermoset cables during fire exposure. As noted in the RAI-05.1 response, these original plant cables have conductors insulated with thermoplastic (PVC) and, as such, any and all forms of intra-cable faults (conductor-to-conductor, conductor-to-ground, open conductor, etc.) may be experienced upon exposure of these cables to fire conditions. However, it is Entergy's belief that the outer jacket construction can be expected to perform in a manner comparable to a thermoset material, in that the asbestos-glass braid outer covering is not subject to melting and loss of structural integrity during fire exposure. As such, Entergy believes that this cable construction may afford some level of protection against inter-cable hot shorts and potential shorting of internal conductors to ground.

No fire test data (other than flame retardance tests) evaluating insulation performance under fire exposure conditions appears to be available relative to the plant cable types utilizing the asbestos-glass braid outer jacket. Qualitative information exists in the form of legacy specification of the use of asbestos-glass braid jacketed cables for industrial applications involving high-temperature processes or equipment. However, in EPRI-1003326 (Characterization of Fire-Induced Circuit Faults – Results of Cable Fire Testing), Cable Test 1 (Armored Cable in Hot Gas Layer, 350 kW HRR) included a post-test observation regarding the performance of a fiberglass "scrim" layer, which formed an internal jacket between the conductors and the outer armor. The post-test observation noted that insulation resistance measurements taken following the fire exposure test indicated that the fiberglass scrim layer might act to hinder or delay conductor shorts to the outer armor.

The fiberglass scrim layer of the cable configuration tested in EPRI-1003326 may be compared to the relatively robust asbestos-glass braid outer jacket of the IP3 plant cables, with the reasonable expectation that the asbestos-glass braid jacket of the cables may provide comparable resistance to either internal conductors shorting to ground (e.g., the tray or conduit enclosing the cable), or to external cables/conductors shorting to conductors within the asbestos-glass braid jacketed cables.

However, regardless of the reasonable expectation that the original IP3 plant cables with asbestos-glass braid outer jacket construction may exhibit resistance to the above described fault types, Entergy does not assume or credit in any case that the cable construction will prevent any postulated fault type. Rather, the outer jacket construction is viewed as but one layer of defense in depth, providing some level of protection against the above described fault types.

RAI-07.1

Provide a technical justification for this time period [75 minutes available to align charging pump suction from the VCT to the RWST], including any assumptions and criteria used in the evaluation.

RAI-07.1 RESPONSE

The time available to align the selected charging pump suction from the normal VCTsupply to the alternate RWST supply and to start a charging pump to restore makeup flow to the RCS is approximately 75 minutes, as determined by Calculation IP-CALC-06-00029 Revision 2 (Appendix R Cooldown to RHR Initiation Using RETRAN-3D). This analysis demonstrates the ability to maintain pressurizer level within the indicating range of the wide-range level instrumentation despite interruption of charging system makeup to the RCS for up to 75 minutes. This calculation assumes Reactor Coolant Pump (RCP) seal leakage during the evolution, at a maximum value of 21 gpm per RCP, in accordance with Westinghouse Technical Bulletin 04-22 Revision 1. The calculation also assumes that charging system letdown is isolated to further minimize RCS inventory losses during the period in which charging system makeup from the charging pump(s) has been interrupted. As determined by the referenced calculation, if one charging pump is started within approximately 75 minutes of the time of reactor trip, pressurizer level will be maintained sufficient to meet the Appendix R performance goal for RCS inventory control.

The acceptance criteria applied in the referenced calculation are:

1. The RCS should remain subcooled.
2. Pressurizer level should remain on span.
3. Available steam generator wide range level should remain on span.

The assumptions applied (i.e., employed in the RETRAN computer model) in the referenced calculation are as follows:

1. The reactor power was 102% of 3216 MWth (3280.3 MWth) and at the 3F T-avg increase (T-avg = 570F).
2. The decay heat of ANS-1979 with 2-sigma uncertainty was used.
3. A reactor trip initiated the transient (after five minutes of steady-state) and a loss of all off-site power was coincident.
4. The loss of all off-site power caused a coastdown of all RCPs. The RCP coastdown was conservatively modeled to have greater resistance to the discharge flow.
5. The loss of all off-site power resulted in a loss of the charging pumps, but letdown was maintained. Initially 89 gpm of letdown was maintained and decreased to 71.2 gpm (80% of 89 gpm) due to flashing after reactor trip.
6. Initial RCP seal leak-off was 3 gpm. After 18.2 minutes (= 54.6 gal/3 gpm) of reactor trip, the RCP seal leak-off increased to 21 gpm instantaneously (Reference Westinghouse TB 04-22, Rev. 1).
7. Pressurizer heater, pressurizer normal spray, or pressurizer power-operated relief valves (PORVs) were not available.
8. Letdown was isolated at 15 minutes after reactor trip.
9. 50 gpm blowdown per steam generator was assumed and isolated at 20 minutes after reactor trip.
10. Charging was available at 75 minutes after reactor trip.
11. Only one MD AFW [motor-driven auxiliary feedwater] pump was available at 30 minutes after reactor trip and delivered 340 gpm to two SGs [steam generators]. One MD AFW pump case was selected because one Turbine Driven (TD) AFW pump case is bounded by this analysis.
12. Isolation of normal charging was assumed at the time of pressurizer auxiliary spray.
13. Only ARVs [atmospheric relief valves] on the two SGs, which were receiving MD AFW, were available and used to cooldown the RCS.

The above assumptions were further refined by the following set of modified assumptions used in conducting several sensitivity analyses:

1. The RCP coastdown was modeled to have a best-estimate flow resistance to the discharge flow compared with the maximum resistance for the base case. The generic Westinghouse RCP model in RETRAN-3D was used.
2. One RCP seal leak-off flow rate was assumed at 5 gpm (vs. 3 gpm) initially and a participative buffer volume of 66 gallons (vs. 54.6 gallons) was used. After 13.2 minutes (= 66 gal / 5 gpm) of reactor trip, the RCP seal leak-off increased to 21 gpm instantaneously. The rest of the RCP seal leak-off flows were assumed at 3 gpm initially, increasing to 21 gpm instantaneously after 22 minutes (= 66 gal / 3 gpm) of reactor trip. (Reference Westinghouse TB 04-22, Rev. 1).
3. Charging was manually increased in order to maintain the pressurizer level at the beginning of cooldown.
4. AFW was adjusted to maintain the SG narrow range (NR) level at 45%, which corresponds to about 85% of SG wide range level.

5. The total RCS heat loss was modeled as a non-conducting heat exchanger in RETRAN-3D. During the transient, the total RCS heat loss was modeled as proportional to the temperature difference between the average RCS temperature and the containment temperature. For conservatism, the containment temperature was assumed as 130F.

It is important to note that the 75-minute figure for restoration of charging system makeup flow to the RCS applies to the manual alignment of the alternate suction supply (RWST), followed by the deliberate starting of one charging pump, to restore charging system makeup to the RCS. During the nominal 75-minute period, the selected charging pump is presumed to not be in operation and, therefore, potential damage to the charging pump resulting from spurious isolation of all suction paths to the pump is not a concern. This is contrasted with the postulated scenario -- discussed in the response to RAI-01.1 -- in which the selected charging pump may be in operation at the onset of the fire event, and fire-induced cable damage could cause the redundant charging pump suction valves (LCV-112C and LCV-112B) to fail closed, thereby isolating all suction sources and leading to potential pump damage within a relatively short time. This potential failure mode is mitigated by procedural guidance to secure the charging pump in the event of a confirmed fire condition and to start another charging pump to support continued operation until the proper response to the fire condition is assessed. In this way, the charging pump will be protected from any damage scenario that may be caused by spurious loss of pump suction sources.

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-08.1 RESPONSE

The consolidated set of OMAs, presented on a fire area basis, was presented in the May 4, 2010 Entergy letter, on Tables RAI-08.1-1 through RAI-08.1-8. The list of OMAs is presented below, consistent with the tabular format presented in the May 4, 2010 Entergy letter, with the diagnostic basis for initiation of each OMA described. Note that specific indicators are identified only where those instrument channels are credited to provide continuous and accurate readings of the associated parameters; i.e., where the credited channel(s) are free of fire damage. Where "loss of indication" is referenced as the operator alert, this reflects that all available CCR indicators for that parameter can be expected to be nonfunctional or unreliable for the specific fire area scenario. Similarly, for pump controls, loss of indicating light operation, and/or unresponsiveness of CCR control switches will serve as the operational trigger to implement the credited OMA(s).

Fire Area AFW-6 Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-1	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally start 33 AFW pump from breaker on Bus 6A	Failure of CCR control switch response / indicating lights prompts operator action to investigate breaker status at switchgear, with follow-up action to attempt breaker closure.

Fire Area ETN-4{1} Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-2	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Swap 32 CCW pump to alternate power supply OR align city water to charging pumps	Loss of CCR control and/or indication for all CCW pumps. Step flow using 3-AOP-CCW-1, 3-ONOP-FP-1, and 3-AOP-SSD-1.
Operate 480V Bus 3A breaker locally to start 31 AFW pump	Failure of CCR control switch response / indicating lights prompts operator action to investigate breaker status at switchgear, with follow-up action to attempt breaker closure.
Locally operate FCV-1121 in support of use of 31 AFW pump, OR	Operator will be present in the AFW pump room to diagnose loss of remote AFW functionality. Therefore, local operator diagnosis (noise, vibration) of FCV-1121 failing closed will trigger the action to open the manual bypass valve, if necessary.
Operate HCV-1118 manually to control 32 AFW pump	Loss of CCR control and/or indication for all AFW pumps. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Align Appendix R Diesel Generator (ARDG) to 480V Buses 2A, 3A, 5A, and 312	Loss of CCR control and/or indication for the subject buses. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Swap 31 or 32 charging pump to alternate power supply	Loss of CCR control and/or indication for all AFW pumps. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.

Fire Area ETN-4{1} Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-2	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally operate FCV-405B, FCV-405D, or FCV-406B to control AFW flow to Steam Generators	Loss of CCR control and/or indication for all AFW flow control valves. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Locally open valve 227 to establish charging makeup flowpath to RCS)	Action to locally open bypass valve 227 is only required if normal flowpath valve HCV-142 fails closed. Spurious isolation of the charging makeup path to the RCS is identified in the CCR by operators confirming that a charging pump is in operation, but pressurizer level is decreasing, or pressurizer level channels are nonfunctional or erratic in operation.
Locally close valve LCV-112C; open valve 288 to align charging pump suction to the RWST	Preemptive steps in 3-ONOP-FP-1 to secure designated charging pump early in the fire scenario will trigger action via 3-AOP-SSD-1 to locally verify charging pump suction path and perform the stated OMA, prior to starting a charging pump. 3-AOP-CVCS-1 provides guidance to be followed in the event that swap of charging pump suction to RWST cannot be confirmed (i.e., loss of CCR indication for valves LCV-112C and/or LCV-112B), which will also trigger the OMA.
Locally operate PCV-1139 to ensure steam supply to 32 AFW pump	Loss of AFW flow indication, loss of AFW pump and/or PCV-1139 indication from CCR will trigger local OMA via step flow from 3-ONOP-FP-1 to 3-AOP-SSD-1.
Locally operate PCV-1310A, 1310B to ensure steam supply to 32 AFW pump	Loss of steam supply as diagnosed during local operation of 32 AFW pump.
Locally manually perform Service Water (SW) pump strainer backwash as required	Operator rounds monitoring differential pressure across SW pump strainers will trigger action to backwash the affected strainer(s).

Fire Area ETN-4{3} Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-3	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Operate HCV-1118 manually to control 32 AFW pump	Loss of CCR control and/or indication for all AFW pumps. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Locally operate PCV-1139 to ensure steam supply to 32 AFW pump	Loss of AFW flow indication, loss of AFW pump and/or PCV-1139 indication from CCR will trigger local OMA via step flow from 3-ONOP-FP-1 to 3-AOP-SSD-1.
Locally operate PCV-1310A, PCV-1310B to ensure steam supply to 32 AFW pump	Loss of steam supply as diagnosed during local operation of 32 AFW pump.
Locally operate FCV-405C, 405D to control AFW flow to SG	Loss of CCR control and/or indication for all AFW flow control valves. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.

Fire Area PAB-2{3} Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-5	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally close valve LCV-112C and open valve 288 to align charging pump suction path to Refueling Water Storage Tank (RWST)	Preemptive steps in 3-ONOP-FP-1 to secure designated charging pump early in the fire scenario will trigger action via 3-AOP-SSD-1 to locally verify charging pump suction path and perform the stated OMA, prior to starting a charging pump. 3-AOP-CVCS-1 provides guidance to be followed in the event that swap of charging pump suction to RWST cannot be confirmed (i.e., loss of CCR indication for valves LCV-112C and/or LCV-112B), which will also trigger the OMA.

Fire Area PAB-2{5} Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-6	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally close supply breaker for 32 charging pump	Failure of CCR control switch response / indicating lights prompts operator action to investigate breaker status at switchgear, with follow-up action to attempt breaker closure.
Locally control 32 charging pump using scoop tube positioner	Loss of CCR control and/or pump status indication. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Open valve 227 to establish charging flowpath to RCS around potentially failed closed HCV-142	Action to locally open bypass valve 227 is only required if normal flowpath valve HCV-142 fails closed. Spurious isolation of the charging makeup path to the RCS is identified in the CCR by operators confirming that a charging pump is in operation, but pressurizer level is decreasing, or pressurizer level channels are nonfunctional or erratic in operation.
Locally close valve LCV-112C and open valve 288 to establish flowpath from RWST to charging pump suction	Preemptive steps in 3-ONOP-FP-1 to secure designated charging pump early in the fire scenario will trigger action via 3-AOP-SSD-1 to locally verify charging pump suction path and perform the stated OMA, prior to starting a charging pump. 3-AOP-CVCS-1 provides guidance to be followed in the event that swap of charging pump suction to RWST cannot be confirmed (i.e., loss of CCR indication for valves LCV-112C and/or LCV-112B), which will also trigger the OMA.

Fire Area TBL-5 Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-7	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally operate [bypass valve for] FCV-1121 AFW pump recirculation valve during pump startup	Loss of CCR control and/or indication for the valve. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Locally operate FCV-406A, 406B to control AFW flow to SGs	Loss of CCR control and/or indication for the valve. Utilize 3-AOP-SSD-1, based on step flow guidance from 3-ONOP-FP-1.
Locally/manually backwash SW pump strainer as required if power to strainer associated with selected SW pump is lost (use one of STR PMP-31 through STR PMP-36)	Operator rounds monitoring differential pressure across SW pump strainers will trigger action to backwash the affected strainer(s).

Fire Area YARD-7 Post-Fire OMAs and Associated Diagnostic Indicators Reference: 05/04/10 Entergy Letter – Table RAI-08.1-8	
Operator Manual Action	**Diagnostic Indicator(s) Triggering Operator Response to Perform OMA**
Locally start ARDG to supply MCC 312A in support of the use of SW Pump 38	Loss of CCR control and/or indication for all SW pumps will trigger action through 3-AOP-SW-1, and if necessary, to 3-AOP-SSD-1, to implement the use of SW pump 38.
Locally/manually backwash SW pump strainer as required if power to strainer associated with selected SW pump is lost	Operator rounds monitoring differential pressure across SW pump strainers will trigger action to backwash the affected strainer(s).

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-09.1 RESPONSE

Note that the May 4, 2010 letter incorrectly identified valve 227 as a motor-operated valve. This valve, which performs the function of bypass around valve HCV-142, is actually a manual valve. Therefore, bypass valve 227 presents no vulnerability to fire-induced circuit failures or potential spurious actuation concerns as there are no cables associated with the valve.

HCV-142 is a normally open, fail closed air-operated valve located in the charging line supplying makeup to the RCS via hot leg injection through valve 204A or cold leg injection through valve 204B. HCV-142 is normally operated in throttled mode to control flow distribution between RCS charging makeup and the RCP seal injection paths.

In the event of a fire that causes HCV-142 to spuriously close or fail closed due to fire-induced circuit faults or loss of instrument air while a charging pump is running, the normal charging makeup path to the RCS would be blocked, while the RCP seal injection path would remain open, since the seal injection line branch is upstream of HCV-142. Any excess charging flow, up to the full 98 gpm capacity of the running charging pump, would be diverted through the individual pump's relief valve back to the VCT. As such, no damage to the running charging pump would be incurred, and upon detection of low charging makeup flow or decreasing pressurizer level, the operators would take action to restore the charging flowpath by locally opening manual bypass valve 227.

As confirmed by the IP3 Appendix R Safe-Shutdown Analysis, valve HCV-142 is in fact vulnerable to fire-induced cable damage in III.G.2 Fire Areas ETN-4{1} and PAB-2{5}. However, HCV-142 is potentially vulnerable to spurious closure as the result of fire-induced loss of the instrument air supply to the valve positioner. As manual valve 227 provides a bypass path around HCV-142, these valves are considered to represent redundant trains in the context of Appendix R, Section III.G.2.

The IP3 Appendix R Safe-Shutdown Analysis does not credit the availability of the instrument air supply in any analyzed fire scenario. The instrument air supply is assumed to be unavailable in all scenarios given the complexity of instrument air piping and tubing routing, the numerous pneumatic loads, and the variety of connection types. Depending on location, it is assumed that a fire can either disable the associated compressor(s) or cause instrument air tubing and/or connections to be fused open, thereby venting the instrument air supply from all downstream pneumatic loads.

As such, while cables for valve HCV-142 are routed through III.G.2 fire areas, the loss of instrument air is also conservatively assumed to occur in all fire scenarios and, therefore, HCV-142 is assumed to be failed closed. This failure necessitates the use of manual bypass valve 227 to restore the charging makeup path to the RCS through the use of an OMA to locally open this valve.

ENCLOSURE 1

Required Changes to May 4, 2010 Entergy Letter NL-10-043

ENTERGY NUCLEAR OPERATIONS, INC.
Indian Point Nuclear Generating Unit No. 3
Docket No. 50-286
License No. DPR-64

Summary of Required Changes to May 4, 2010 Letter	
Change	**Reason for Change**
REVISE the response to RAI-11.1 to delete the reference to valve 227 as a motor-operated valve and to delete the discussion regarding Information Notice 92-18 REVISE **Table RAI-06.1-1** SSD Feature column to delete "/227" for the following Fire Areas/Zones: **ETN-4{1}/60AS** and **PAB-2{5}/59A**	The response to RAI-11.1 incorrectly identified valve 227 as a motor-operated valve where in actuality it is a manual valve
REVISE **Table RAI-06.1-1** SSD Feature column to specify only 33 AFW Pump in Fire Area/Zone **AFW-6/23**	Table RAI-06.1 discusses cables for all AFW pumps and flow control valves (implicitly) in Fire Area/Zone **AFW-6/23**, but the Required OMA per Table RAI-08.1-1 is only for the operation of 33 AFW Pump
REVISE **Table RAI-06.1-1** to delete line for Fire Area/Zone **PAB-2{5}/18A**. REVISE **Table RAI-08.1-6** OMA Initiator column to delete Zone **18A** as an Initiator Zone for the Required OMAs of "Locally close supply breaker for 32 Charging [previously "CVCS"] Pump" AND "Locally control 32 Charging [previously "CVCS"] Pump using scoop tube positioner."	Cables associated with 32 Charging Pump have been determined by field walkdown to not be routed in Fire Area / Zone **PAB-2{5}/18A**
REVISE **Table RAI-06.1-1** to delete line for Fire Area/Zone **PAB-2{5}/62A**. REVISE **Table RAI-08.1-6** OMA Initiator column to delete Zone **62A** as an Initiator Zone for the Required Action "Open valve 227 to establish Charging flowpath to RCS around potentially failed closed HCV-142." Zone 62A continues to be an OMA Performance Zone.	Cables associated with HCV-142 have been determined by field walkdown to not be routed in Fire Area / Zone **PAB-2{5}/62A**

Summary of Required Changes to May 4, 2010 Letter	
Change	**Reason for Change**
REVISE **Table RAI-06.1-1** to delete entry for Fire Area/Zone **TBL-5/54A.** While other cables for safe-shutdown components are located in this zone, none of these cables are associated with components for which III.G.2 OMAs are credited. REVISE **Table RAI-08.1-7** OMA Initiator column to delete Zone 54A as an Initiator Zone for the Required OMA of "Locally operate FCV-406A, 406B to control AFW flow to SGs.	Cables associated with valves FCV-406A/B have been determined by field walkdown to not be routed in Fire Area / Zone **TBL-5/54A**
RAI-GEN-8 (CHARACTERISTICS OF PAB-2 / SSA FIRE/ANALYSIS AREA PAB-2{5} / FIRE ZONE 18A) Change from "Compressor" to "2 – Compressor" **RAI-GEN-10** (CHARACTERISTICS OF PAB-2 / SSA FIRE/ANALYSIS AREA PAB-2{5} / FIRE ZONE 27A) Add "3 – Electrical Cabinet, 1 – Transformer" **RAI-GEN-15** (CHARACTERISTICS OF TBL-5 / FIRE ZONE 37A) Change from "12 – Electrical Cabinet" to "17 - Electrical Cabinet" Change from "33 6.9 KV Switchgear…" to "37 6.9 KV Switchgear…" Change from "7 – MCC vertical panels" to "20 MCC vertical panels" Change from "1 – Dryer" to "2 – Dryer" **RAI-GEN-16** (CHARACTERISTICS OF TBL-5 / FIRE ZONE 38A) Change from "1 – Electrical Cabinet" to "6 – Electrical Cabinet" Change from "MCC" to "14 – MCC" Add "4 – Transformer, 2 - Junction Boxes" **RAI-GEN-19** (CHARACTERISTICS OF TBL-5 / FIRE ZONE 52A) Add "2 – Electrical Cabinet"	Discrepancies in "Ignition Sources" were identified subsequent walkdowns

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to Significant Fixed Combustibles	Proximity to Ignition Sources	Comments
AFW-6 / 23	~~All three~~Control cables associated with 33 AFW ~~p~~Pumps~~, flow control valves, and associated cables~~	Small quantities of cable in overhead trays, with pumps and valves at floor elevation. The trays containing cables serving the AFW flow control valves are also located in the overhead area.	The cable runs and pump motors are the credible ignition sources. Cables serving the AFW pumps and flow control valves are located in or adjacent to overhead trays above the AFW pumps.	Nonmechanistic ignition of control or instrument cables in the overhead trays would present an immediate impact on redundant AFW trains, as the trays contain (in part) control cables serving the AFW flow control valves The remaining fixed combustibles, consisting of a minute quantity of lube oil and electrical cabinets, present no credible challenge to the AFW components in the zone The smoke detection system provides assurance of early warning of a fire condition, enabling brigade response prior to significant fire development. The automatic wet-pipe sprinkler system provides assurance of effective control of any significant fire that may occur, sharply limiting the scope of any fire damage.

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to Significant Fixed Combustibles	Proximity to Ignition Sources	Comments
ETN-4{1} / 60AS	Cables associated with: 32 AFW Pump steam supply valve PCV-1139, steam supply isolation valves PCV-1310A, 1310B, and speed control valve HCV-1118; 31 Charging Pump; AFW flow control valves FCV-405B, D, FCV-406B; Charging makeup path valve(s) HCV-142~~/227~~; Charging suction path valves LCV-112B/C	The dominant combustible material in the zone is cable in trays. The subject cables, in part, are located in these trays.	Ignition sources consist only of cable tray runs in the zone	Combustibles other than cables in trays are minimal throughout the zone. The credible fire scenario would involve transient combustibles, which are tightly controlled to "Level 2" limits, per administrative control procedure. The flame-retardant characteristics of the cables ensure that any fire would be limited in scope and severity. The smoke detection system provides assurance of early warning of a fire condition, enabling brigade response prior to significant fire development. The automatic preaction sprinkler system for all cable trays in the area provides assurance of prompt control of any credible fire, sharply minimizing the potential area of damage.

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to Significant Fixed Combustibles	Proximity to Ignition Sources	Comments
PAB-2{5} / 4A	Cables associated with 32 Charging Pump	Fixed combustibles in the zone are minimal, consisting of a small quantity of cable in trays, and incidental combustibles. Cables associated with 32 Charging Pump are routed in the overhead of the zone.	Ignition sources are three electrical cabinets, widely spaced in the zone, and one dry-type transformer, located in the southeast end of the zone. The cables of concern are routed above one or more ignition sources.	The open arrangement of the corridor and spacing between ignition sources, and small inventory of cables, provides reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred
~~PAB-2{5} / 18A~~	~~Cables associated with 32 Charging Pump~~	~~Fixed combustibles in the zone are minimal, consisting of a small quantity of cable in trays, and incidental combustibles. Cables associated with 32 Charging Pump are routed in the overhead of the zone.~~	~~Ignition sources are two waste gas compressor motors and a cable run. The cables of concern are routed above one or more of the ignition sources.~~	~~The minimal ignition sources and small inventory of cables provide reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred~~

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to *Significant* Fixed Combustibles	Proximity to Ignition Sources	*Comments*
PAB-2{5} / 30A	Cables associated with Charging pump suction path valves LCV-112B/C	Combustibles in the zone consist of a small quantity of cables in trays and incidental materials. The cables of concern are routed in or adjacent to the trays in the zone.	The sole ignition source is the cable tray run, presenting a minimal potential for fire initiation	The minimal ignition sources and small inventory of cables provide reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred
PAB-2{5} / 58A	Cables associated with 32 Charging Pump	Combustibles in the zone consist of a small quantity of cables in trays and incidental materials. The cables of concern are routed in or adjacent to the trays in the zone.	The sole ignition source is the cable tray run, presenting a minimal potential for fire initiation	The minimal ignition sources and small inventory of cables provide reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred The smoke detection system provides assurance of early warning of a fire condition, enabling brigade response prior to significant fire development
PAB-2{5} / 59A	Cables associated with Charging makeup path valve(s) HCV-142~~/227~~	Combustibles in the zone consist of a small quantity of cables in trays and incidental materials. The cables of concern are routed in or adjacent to the	The ignition sources consist of the cable tray run and a junction box, presenting a minimal potential for fire initiation	The minimal ignition sources and small inventory of cables provide reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred The smoke detection system provides assurance of early warning of a fire condition, enabling brigade response prior to significant fire development

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to Significant Fixed Combustibles	Proximity to Ignition Sources	Comments
~~PAB-2(5) / 62A~~	~~Cables associated with Charging makeup path valve(s) HCV-142/227~~	~~Combustibles in the zone consist of a small quantity of cables in trays and incidental materials. The cables of concern are routed in or adjacent to the trays in the zone.~~	~~The sole ignition source is the cable tray run, presenting a minimal potential for fire initiation.~~	~~The minimal ignition sources and small inventory of cables provide reasonable assurance that any fire occurring in the zone will be minimal in scope of damage incurred~~
TBL-5 / 37A	Cables associated with all (31 through 36) Service Water pump strainers	Combustibles in the zone include cables in trays, lube oil, and electrical cabinets distributed throughout the zone. A flammable liquids storage cabinet is located at the south end of the zone. The cables of concern are routed in the overhead, above one or more of the combustible elements in the zone.	Ignition sources include cable runs, switchgear, MCCs, transformers, and electrical cabinets. The cables of concern are in proximity to one or more ignition sources in the zone.	This zone contains 6.9kV switchgear, presenting the potential for a HEAF concern, if circuit breaker operational failures are postulated Fire detection provided in the 6.9kV switchgear area and above an MCC, as well as in battery and charger rooms, provides assurance of prompt notification of a developing fire at these locations. The general area coverage sprinkler system provides assurance of control of the likely fire scenario involving transient materials, minimizing the scope and severity of any fire damage.

Table RAI-06.1-1
Proximity of Redundant Safe-Shutdown Cables/Components,
Fire Hazards, and Ignition Sources Within Fire Areas and Fire Zones of Concern

Fire Area / Zone	SSD Feature	Proximity to Significant Fixed Combustibles	Proximity to Ignition Sources	Comments
~~TBL-5 / 54A~~	~~Cables associated with 31 AFW Pump flow control valves FCV-406A, B~~	~~The zone contains negligible fixed combustibles~~	~~Ignition sources consist of a cable run, electrical cabinet, and motors on valve operators. The cables of concern are proximate to the cable runs.~~	~~The minimal combustibles in the zone, and the distribution of the combustibles and ignition sources throughout the zone, provide reasonable assurance that a credible fire scenario would be limited in scope and severity of fire damage~~
YARD-7 / 22	Cables associated with (as well as the components themselves): 31-36 SW Pump, 31-36 SW Pump Strainer	The service water pumps and strainers are segregated from the significant combustibles of the zone by a security barrier enclosure. Combustibles within the enclosure are insignificant.	Ignition sources consist of several electrical boxes and the SW pump motors themselves	Fire detection provided in the zone would annunciate any developing fire condition, enabling fire brigade response for manual suppression of the fire. The limited ignition sources and combustibles within the zone do not present a significant fire challenge capable of rendering all SW pumps inoperable.

TABLE RAI-08.1-6
FIRE AREA PAB-2{5}
CREDITED III.G.2 OPERATOR MANUAL ACTIONS

Required OMA	Required Time to Complete	Actual Time to Diagnose Need for OMA	Actual Time to Complete OMA	Total Time to Complete and Resultant Margin	OMA Initiator (I) Fire Area/Zone OMA Performance (P) Fire Area/Zone	Comments
Locally close supply breaker for 32 Charging [previously "CVCS"] Pump	75 m	30 m	7 m	TTC: 37 m Margin: 38 m; 51%	I: Area PAB-2{5}, Zone 4A, ~~18A,~~ 19A, 58A P: Area CTL-3, Zone 11	Target: 32 Charging Pump control cables
Locally control 32 Charging [previously "CVCS"] Pump using scoop tube positioner	75 m	30 m	9 m	TTC: 39 m Margin: 36 m; 48%	I: Area PAB-2{5}, Zone 4A, ~~18A,~~ 19A, 58A P: Area PAB-2{3}, Zone 6	Target: 32 Charging Pump control cables
Open valve 227 to establish Charging flowpath to RCS around potentially failed closed HCV-142	75 m	30 m	9 m	TTC: 39 m Margin: 36 m; 48%	I: Area PAB-2{5}, Zone 27A, 30A, 59A~~, 62A~~ P: Area PAB-2{5}, Zone 62A	Targets: Cables associated with valve HCV-142 Travel time conservatively taken to be 10 minutes, from CCR to PAB. Travel time is non-critical, since no attempt is made to perform the OMA for the initial 60 minutes of the scenario.

TABLE RAI-08.1-7
FIRE AREA TBL-5
CREDITED III.G.2 OPERATOR MANUAL ACTIONS

Required OMA	Required Time to Complete	Actual Time to Diagnose Need for OMA	Actual Time to Complete OMA	Total Time to Complete and Resultant Margin	OMA Initiator (I) Fire Area/Zone OMA Performance (P) Fire Area/Zone	Comments
Locally operate [bypass valve for] FCV-1121 AFW Pump recirculation valve during pump startup (e)	30 m	4.5 m	8 m	TTC: 12.5 m Margin: 17.5 m; 58%	I: Area TBL-5, Zone 52A P: Area AFW-6, Zone 23	Target: FCV-1121 control cables
Locally operate FCV-406A, 406B to control AFW flow to SGs	30 m	4.5 m	17 m (d)	TTC: 21.5 m Margin: 8.5 m; 28%	I: Area TBL-5, Zone 52A~~, 54A~~ P: Area AFW-6, Zone 23	Target: FCV-406 control cables
Locally operate SGADV PCV-1134, PCV-1135, PCV-1136, or PCV-1137 to control secondary system cooldown						**WITHDRAWN** See response to RAI-02.1

(d) The Total Time to Complete is revised to 17 minutes, whereas the referenced submittals showed a value of 8 minutes for the Actual Time to Complete
(e) Clarified that the bypass valve for FCV-1121 is the component that is manually operated

RAI-11.1

Provide critical details or assumption of the analysis that demonstrates that the required safe shut down equipment or component located within the area is maintained free of fire damage and remains accessible and operable following the fire event.

RESPONSE

The equipment to be operated via OMA following fire area reentry is as follows:

Fire Area PAB-2{3}

- Valve 288: Valve 288 is a manually-operated valve located in Fire Zone 6, which also contains 22 Charging Pump. This valve is required to be opened to support alignment of Charging pump suction to the alternate source (RWST). The combustible load in this zone is low, and the credible ignition source is the 32 Charging Pump motor. Valve 288 is located at the south end of this zone adjacent to the doorway, and is not immediately adjacent to the pump motor. Given the fire detection features in the room and the location of valve 288, there is reasonable assurance that this mechanical-only valve will remain operable following post-fire reentry. It should also be recognized that for a fire in Fire Zone 6 involving 32 Charging Pump, 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.

  As the El. 55' corridor communicating with Fire Area PAB-2{3} is large and generally free of credible combustibles (with the exception of cables in overhead trays), there is reasonable assurance that access to valve 288, at 60 minutes following the start of the fire event, will remain sufficiently unencumbered, with the conditional use of SCBA by the operator(s), in the event that smoke venting throughout the area is incomplete at the time access to the area is needed.

Fire Area PAB-2{5}

- Manual ~~otor-operated~~ valve 227: This valve is required to be manually opened to support establishment of a makeup path to the RCS, by bypassing a spuriously closed normal makeup path control valve HCV-142. The combustible loading in the zone (Fire Zone 62A) containing this valve, as well as the adjacent zones, is insignificant, and Fire Zone 62A is devoid of any ignition sources other than a cable tray run, and does not present a substantive fire challenge to the integrity of the valve. ~~Moreover, motor-operated valve 227 has been evaluated for potential vulnerability to the fire-induced failure mode postulated by IN 92-18 (Potential for Loss of Remote Shutdown Capability During a Control Room Fire), and the associated "weak link" analysis confirms that despite postulation of limit and torque switch failures as considered by IN 92-18, the valve actuator is incapable of causing damage that would render valve 227 inoperable by hand following the fire event.~~ There is therefore adequate assurance that valve 227 will remain manually operable, following the credible fire scenario that may be encountered in Fire Zone 6 or any of the adjoining zones.

TABLE RAI-GEN-8 CHARACTERISTICS OF PAB-2 / SSA FIRE/ANALYSIS AREA PAB-2{5} / FIRE ZONE 18A	
Fire Area / Description	PAB-2 / Primary Auxiliary Building
Fire Zone / Description	18A / Waste Gas Compressor Room, Elevation 55'-0"
Fire Zone Dimensions	250 sqft w/16 ft ceiling
App R III.G.2 Compliance	a) 3-hr barrier: No b) 20 ft separation: No c) 1-hour enclosure: No -- Detection: No -- Suppression: No
App R III.G.2 Exemptions	None
Fixed Combustible Materials	Cable, Incidental materials
Cable Insulation Quantity in BTU	6.74E+06 BTU
Total Fixed Combustible Loading / Fire Severity	27,363 BTU/sqft / 21 minutes
Transient Combustible Materials	Grease, Cleaning Materials, Anti-Cs, Plastic, Wood
Transient Combustible Loading / Fire Severity	59,800 BTU/sqft / 45 minutes
Combustible Loading - Rating	Low (Fixed + Transient loads = <100,000 BTU/sqft)
Ignition Sources	2 - Compressor, Motor, Cable run, Junction Boxes
Detection Type / Coverage	None
Code of Record	NA

TABLE RAI-GEN-10 CHARACTERISTICS OF PAB-2 / SSA FIRE/ANALYSIS AREA PAB-2{5} / FIRE ZONE 27A	
Fire Area / Description	PAB-2 / Primary Auxiliary Building
Fire Zone / Description	27A / Elevation 73'-0" PAB Corridor
Fire Zone Dimensions	5,532 sqft w/ 15 ½ ft ceiling
App R III.G.2 Compliance	a) 3-hr barrier: No b) 20 ft separation: No c) 1-hour enclosure: No -- Detection: No -- Suppression: No
App R III.G.2 Exemptions	None
Fixed Combustible Materials	Cable, Incidental material, Cellulose, Plastic, Flammable Liquid Locker
Cable Insulation Quantity in BTU	7.4E+06 BTU
Total Fixed Combustible Loading / Fire Severity	8,095 BTU/sqft / 6 minutes
Transient Combustible Materials	Solvent, Cleaning materials, lube oil, grease, Wood, Plastic, Paper, Anti-Cs
Transient Combustible Loading / Fire Severity	12,092 BTU/sqft / 9 minutes
Combustible Loading - Rating	Low (Fixed + Transient loads = <100,000 BTU/sqft)
Ignition Sources	Cable run, Junction Boxes, 1 – Transformer, Water heater, 3 – Electrical Cabinet, 1 - Transformer
Detection Type / Coverage	None
Code of Record	NA
Fixed Suppression Type / Coverage	None

TABLE RAI-GEN-15 CHARACTERISTICS OF TBL-5 / FIRE ZONE 37A	
Fire Area / Description	TBL-5 / Turbine Building
Fire Zone / Description	37A / Ground Floor South, elevation 15'-0"
Fire Zone Dimensions	5,838 sqft w/ 119 ft ceiling
App R III.G.2 Compliance	a) 3-hr barrier: No b) 20 ft separation: No c) 1-hour enclosure: No -- Detection: Yes (Partial) -- Suppression: Yes (Full area sprinkler)
App R III.G.2 Exemptions	None
Fixed Combustible Materials	Cable, Incidental material, MCC-Switchgear, Cellulose, Plastic, Lube oil, Flammable Liquid Cab
Cable Insulation Quantity in BTU	1.99E+08 BTU
Total Fixed Combustible Loading / Fire Severity	70,064 BTU/sqft / 53 minutes
Transient Combustible Materials	None
Transient Combustible Loading / Fire Severity	NA
Combustible Loading – Rating	Low (Fixed + Transient loads = <100,000 BTU/sqft)
Ignition Sources	Cable run, Junction Box, Battery & Charger, 172 - Electrical Cabinet, 4 - Transformer, 373; 6.9 KV Switchgear vertical panels (HEAF potential source), 7 20 - MCC vertical panels, 1 2 - Dryer
Detection Type / Coverage	Ionization detectors over MCC 34 and 6.9 KV switchgear Thermal detection in battery and charger room
Code of Record	NFPA 72E-1974

TABLE RAI-GEN-16 CHARACTERISTICS OF TBL-5 / FIRE ZONE 38A	
Fire Area / Description	TBL-5 / Turbine Building
Fire Zone / Description	38A / Chemical Laboratory, elevation 15'"
Fire Zone Dimensions	4,500 sqft w/ 8 ft ceiling
App R III.G.2 Compliance	a) 3-hr barrier: No b) 20 ft separation: No c) 1-hour enclosure: No -- Detection: Yes (Partial) -- Suppression: Yes (Full area sprinkler)
App R III.G.2 Exemptions	None
Fixed Combustible Materials	Cable, Cellulose, Plastic, Flammable Liquid Cab, Hydrogen, Chemicals, Incidental materials, MCC
Cable Insulation Quantity in BTU	3.23E+07 BTU
Total Fixed Combustible Loading / Fire Severity	19,639 BTU/sqft / 15 minutes
Transient Combustible Materials	None
Transient Combustible Loading / Fire Severity	NA
Combustible Loading – Rating	Low (Fixed + Transient loads = <100,000 BTU/sqft)
Ignition Sources	~~1~~ 6 - Electrical Cabinet, 13 – MCC, 4 – Transformer, 2 – Junction Boxes
Detection Type / Coverage	Ionization detector / Over MCC 32
Code of Record	NFPA 72E-1974

TABLE RAI-GEN-19 CHARACTERISTICS OF TBL-5 / FIRE ZONE 52A	
Fire Area / Description	TBL-5 / Turbine Building
Fire Zone / Description	52A / Chemical Addition Area, elevation 32'-6" of AFW Bldg
Fire Zone Dimensions	1,254 sqft w/ 8 ½ ft ceiling
App R III.G.2 Compliance	a) 3-hr barrier: No b) 20 ft separation: No c) 1-hour enclosure: No -- Detection: No -- Suppression: No
App R III.G.2 Exemptions	None
Fixed Combustible Materials	Cable, Cellulose barrels, Rubber hose
Cable Insulation Quantity in BTU	4.47E+06 BTU
Total Fixed Combustible Loading / Fire Severity	6,161 BTU/sqft / 5 minutes
Transient Combustible Materials	Lube oil, Solvent, Grease, Cleaning Material, Wood
Transient Combustible Loading / Fire Severity	7,405 BTU/sqft / 6 minutes
Combustible Loading – Rating	Low (Fixed + Transient loads = <100,000 BTU/sqft)
Ignition Sources	2 – Motors & Compressors, Water heater, 2 – Electrical Cabinet
Detection Type / Coverage	None
Code of Record	NA
Fixed Suppression Type / Coverage	None