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NL-11-006

January 19, 2011

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

Subject: Response to December 16, 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. 2 (TAC No. ME0798)
Indian Point Unit No. 2
Docket No. 50-247
License No. DPR-26

References:

1. NRC letter dated December 16, 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-10-100, "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. 2 (TAC No. ME0798)," dated September 29, 2010

3. 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)"

4. Entergy letter NL-10-042, "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. 2 (TAC No. ME0798)," dated May 4, 2010

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5. 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)"

6. Entergy letter NL-09-116, "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. 2," dated October 1, 2009

7. Entergy letter NL-09-031, "Request for Exemption from 10 CFR 50, Appendix R, Paragraph III.G.2 for Use of Operator Manual Actions for Indian Point Unit No. 2," dated March 6, 2009

Dear Sir or Madam:

By letter dated March 6, 2009 (Reference 7), 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 6). Responses to the Request for Additional Information contained in NRC letter dated January 20, 2010 (Reference 5) were provided by letter dated May 4, 2010 (Reference 4). Responses to the Request for Additional Information contained in NRC letter dated August 11, 2010 (Reference 3) were provided by letter dated September 29, 2010 (Reference 2).The purpose of this letter is to provide responses to the Request for Additional Information contained in NRC letter dated December 16, 2010 (Reference 1). Note that Reference 1 indicated that a response was needed within 30 days of the date of the letter – a one-day extension until January 19, 2010 was granted by the NRC Senior Project Manager.

Entergy believes that we have been responsive in References 2 and 4 to the specific requests contained in References 3 and 5, and acknowledges difficulties that may be encountered in collating the quantity of information provided in our submittals as part of the review process. As such, in addition to new information included in this response, we have responded to this RAI by referencing the submittals in which previously supplied information was provided. However, in preparing the response to this RAI, it was identified that changes are required to certain information provided in previous submittals. The responses to the questions in this RAI contain corrected information, and the specific corrections to the previous submittals will be submitted in a separate letter.

At your earliest convenience we request that a telecom or meeting be held with the Staff to review/clarify any of the information provided in response to the three RAIs.

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,

JEP/gd

Attachment:

1. Response to December 16, 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

cc: Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
Mr. William Dean, 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

TO

ENTERGY LETTER NL-11-006

Response to December 16, 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. 2
Docket No. 50-247
License No. DPR-26

**Response to December 16, 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**

The September 29, 2010, response states that an intra-cable (conductor-to-conductor) fault within cable CK1-JB5/1 would cause the volume control tank (VCT) outlet valve (LCV-11[3]C) to spuriously close. If this failure were to occur at a time when the credited charging pump (21 Charging Pump) is in operation, or if the fire damage to unspecified control cables caused the 21 pump to spuriously start, the credited charging pump would suffer prompt damage due to a loss of suction.

The results of recent cable fire tests conducted by both the NRC and industry show that given cable damage, the occurrence of the type of fault required to cause LCV-112C to close (i.e., an intra-cable fault) is highly likely. Thus, the potential for a spurious closure of LCV-112C with a concurrent spurious start of the charging pump cannot be ignored. However, the September 29, 2010, response does not provide sufficient information to determine the likelihood of fire-induced failures that would be necessary to cause this event. For example, since the response does not provide any information related to the charging pump control cables, a spurious pump start is assumed to occur. In the absence of any discussion of the mitigating circumstances available to reduce the likelihood of this event, it is assumed that LCV-112C closes and the pump is promptly damaged.

As another example, the September 29, 2010, response indicates that in addition to a loss of offsite power (which is assumed in the analysis), a fire in Fire Area J could cause a loss of 480 volt power supplied from the emergency diesel generator (EDG) via buses 5 and 6. The response identifies the cables of concern; however, it does not describe the specific number or types of cable faults that are required to cause this event. In addition, the response does not identify the shutdown equipment supplied from buses 5 and 6 or the impact a loss of power to this equipment would have on the ability to achieve and maintain hot shutdown. In addition, although certain cables of concern lack separation from potential ignition sources, the response does not provide any justification why this configuration, when considered in conjunction with other fire safety features, provides an appropriate level of defense-in-depth to minimize the need for implementing the requested OMAs. For example, a high-energy arcing fault (HEAF) emanating from switchgear located in Fire Zone 43 could cause prompt damage to cables of concern which are routed in close proximity to it. However, in lieu of describing the likelihood or impact of this scenario, the response (Table RAI-06.1-1 Page 28) credits prompt detection of fire by plant personnel. Given the nature of HEAF events and the close proximity of required cables to the switchgear, reliance on plant personnel may not provide an appropriate level of defense in depth.

Therefore, for cases such as the examples cited above, the request should provide a detailed discussion of the plant-specific features which would minimize the likelihood of occurrence. Such features may include, for example, a combination of features such as: detection, suppression, separation distance between cables of concern, separation of cables from

potential sources of ignition and HEAF, the type of raceway (conduit, cable tray), cable type and number and type of circuit faults required to cause the undesired event.

Where a requested OMA is being credited to mitigate the impact of fire-induced failures of required shutdown equipment, additional information is needed to assess the likelihood of a fire to create the need for the requested OMAs. For each of the requested OMAs, ensure that information has been provided to demonstrate how the underlying purpose of the rule (10 CFR 50 Appendix R) is met. For example, identify:

1. all cables that could cause components of concern to spuriously start, stop, change position, become damaged or otherwise fail in an undesired manner for hot shutdown.
2. the routing of these cables within each of the fire areas identified in the request,
3. the proximity of the identified cables of concern to each other (in feet and inches),
4. the type of cable faults required to cause the component(s) to fail in an undesired manner for post-fire safe shutdown,
5. the spatial relationship of each cable to potential ignition sources and/or high energy arcing faults, and
6. any other plant specific features that serve to minimize the likelihood of the undesired event.

RAI-01.1 RESPONSE

For items 2 and 5 above, the routing of the cables of concern, within the fire area, and their spatial relationship to potential ignition sources and/or high energy arcing faults, were previously provided as "RAI-02.1 Response" in Entergy's submittal dated September 29, 2010.

For items 1 and 6 above, the enclosed Table RAI-01.1-1 summarizes the requested information, which has been provided previously in Entergy letters dated May 4, 2010 and September 29, 2010. Entergy believes that the likelihood of a fire to create the need for the requested OMAs is mitigated by the layers of fire protection defense-in-depth as detailed for each OMA in the table.

With respect to Item 3 above, Entergy has provided cable routing dimensional details for the circuits of concern in the submittal dated September 29, 2010. However, it should be noted that in most cases, the dimensional data provided does not relate to the separation between redundant trains, but rather the location and separation from ignition sources for a single train that presents the potential for use of the credited OMA if that train is impacted by fire damage.

The response to Item 4 is provided on Table RAI-01.1-2. Table RAI-01.1-2 provides insights relative to the fire-induced cable failure modes and effects that would be necessary to create the potential need to implement the OMA.

As previously discussed in the Entergy submittal dated March 6, 2009, Entergy believes that the requested "OMAs are unlikely to be required to be implemented given the defense-in-depth features of the fire protection program, and the associated low likelihood of a significant fire in any of the fire areas of concern."

Additionally, in the March 6, 2009 submittal, Entergy discussed that each of the affected fire areas has one or more mitigating fire protection characteristics that provide a level of defense-in-depth protection, thus minimizing the likelihood of need to implement post-fire shutdown procedures for credible fire scenarios in these areas. When these defense-in-depth features are considered in concert with the station fire prevention measures of housekeeping controls, hot work constraints, and transient combustible controls, and the fire brigade manual suppression capabilities, the likelihood of the need to implement the identified OMAs is reduced further.

Further, in the March 6, 2009 submittal, Entergy elaborated the defense-in-depth discussion and concluded that:

- For "The Fire Prevention layer of defense in depth...the potential for exposure fires (in transient combustibles) and fires resulting from the introduction of significant ignition sources (hot work) is sharply limited."

- For "The Fire Detection and Suppression layer of defense in depth...installed fire detection and automatic suppression systems, in conjunction with fire brigade response and deployment of the available manual fire suppression features, provides assurance that a fire will be precluded from rapidly growing and involving other fire zones or areas."

  For those areas not equipped with automatic fire detection and/or suppression systems, the available defense-in-depth features are discussed further in this submittal.

- "The Protection of Safe-Shutdown Capability layer of defense in depth is represented by the fire barriers enclosing each fire area that provide assurance that a fire that is not promptly detected and/or not promptly controlled and suppressed, will ultimately be contained within the fire area of origination." Additionally, ..."the character of the localization of the hazards and combustibles by fire zone, combined with the separation between fire zones by spatial and barrier separation, provide reasonable assurance that fires that occur within a given zone will be confined to the zone of origination."

The above described OMA characteristics and mitigating features, as previously described in Entergy submittals dated May 4, 2010 and September 29, 2010 are summarized on Table RAI-01.1-1. To facilitate review and minimize the presentation of repetitive information, the OMAs are presented on Table RAI-01.1-1 only once per unique OMA, although that same OMA may be credited in the event of fire scenarios in more than one fire area. With respect to the information requested by RAI-01.1, item 4, the discussion of fire-induced cable failure modes and effects and other mitigating factors is presented on Table RAI-01.1-2.

In response to the question presented in the second paragraph of the RAI: The concerns associated with the charging pump suction path are addressed in the responses to RAI-01.2, RAI-01.3, and RAI-01.4 herein, which include consideration of the charging pump suction issue mitigating features as enumerated below in the response to RAI-01.1.

In response to the question presented in the third paragraph of the RAI: The subject OMA is addressed in detail in Table RAI-01.1-2. The relevant cables routed through Fire Zone 43A and in proximity to the 6.9kV switchgear, an acknowledged potential HEAF source, are cables AC4-BA6 and JC2-YA9. The failure of these cables – intra-cable fault, ground fault, or open circuit -- does not present the need to implement the subject OMA, as discussed in RAI-01.1-2. The IP2 Appendix R Safe-Shutdown (SSD) Analysis conservatively identified a conditional OMA to locally operate circuit breakers, but damage to the cables identified does not present a scenario that would mandate the use of the OMA.

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Operate 22AFW Pump (turbine-driven) | Area C Zone 23 | 21 AFW Pump | EDC5-M74/1<br>EDC5-M74/2<br>ELD11-EWC26 | Exemption granted for App R III.G.2 in this area – SERs dated Oct 16, 1984 and March 4, 1987<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>23 AFW Pump power cable wrapped w/ 30 minute ERFBS<br>Radiant Energy Shield installed between 21 & 23AFW Pump |
| | | 23 AFW Pump | JB1-PT1/1<br>PT1-A19<br>XD7-M75/1<br>XD7-M75/2 | |
| Open/check open 22 AFW Pump steam supply isolation valves | Area C Zone 23 | PCV-1139 | JB1-PT1/3<br>PT1-RH7<br>PT1-YL4 | Exemption granted for App R III.G.2 in this area – SERs dated Oct 16, 1984 and March 4, 1987<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>23 AFW Pump power cable wrapped w/ 30 minute ERFBS<br>Radiant Energy Shield installed between 21 & 23AFW Pump |
| | | PCV-1310B | EWZ64-ENX2<br>JB1-YP1<br>S95-EWZ64<br>S95-S92<br>S95-YP1 | |
| | | PCV-1310A | EWZ63-ENX1<br>JB1-YN9<br>S94-EWZ63<br>S94-S93<br>S94-YN9 | |

[1] References: Entergy letter NL-10-042 dated May, 4, 2010, Tables RAI-08.1-1 through RAI-08.1-7; Entergy letter NL-10-100 dated September 29, 2010, Tables RAI-08.1-1, RAI-08.1-2, and RAI-08.1-4

[2] Reference: Entergy letter NL-10-100 dated September 29, 2010, RAI-02.1 response

[3] References: Entergy letter NL-10-042 dated May, 4, 2010, Tables RAI-GEN-1 through GEN-27; Entergy letter NL-10-100 dated September 29, 2010, Tables RAI-GEN-1, RAI-GEN-10, RAI-GEN-23, RAI-GEN-25, RAI-GEN-28, RAI-GEN-29, RAI-GEN-30, and RAI-GEN-31

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Operate 22 AFW Pump flow control valves to align AFW flow to selected steam generator(s) | Area C Zone 23 | FCV-405A | JB1-LV1 | Exemption granted for App R III.G.2 in this area – SERs dated Oct 16, 1984 and March 4, 1987<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>23 AFW Pump power cable wrapped w/ 30 minute ERFBS<br>Radiant Energy Shield installed between 21 & 23AFW Pump |
| | | FCV-405B | JB1-LV2 | |
| | | FCV-405C | JB1-LV3 | |
| | | FCV-405D | JB1-LV4 | |
| | | FCV-406A | ELZ27-YN6<br>JF5-YN6<br>PU9-JG2 | |
| | | FCV-406B | ELZ28-YN8<br>JF5-YN8<br>LL8-JF5<br>PU9-JH1 | |
| | | FCV-406C | ELZ29-YN7<br>JF9-YN7<br>LL9-JF9<br>PU9-JF2 | |
| | | FCV-406D | ELZ30-YN5<br>JF9-YN5<br>PU9-JF9 | |
| | Area K Zone 60A | FCV-406A | PU9-JG2<br>LL8-JF5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | | FCV-406B | PU9-JH1 | |
| | | FCV-406C | PU9-JF2<br>LL9-JF9 | |
| | | FCV-406D | PU9-JF9 | |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| | Area K Zone 65A | FCV-406A | PU9-JG2<br>LL8-JF5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | | FCV-406B | PU9-JH1 | |
| | | FCV-406C | PU9-JF2<br>LL9-JF9 | |
| | | FCV-406D | PU9-JF9 | |
| Align charging makeup path to RCS (locally open bypass valve 227 to mitigate a spuriously closed HCV-142) | Area F Zone 27A | MOV-227<br>HVC-142 | ECD3-EXF6/2 | Area Wide Smoke Detection<br>Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |
| | Area F Zone 33A | MOV-227<br>HVC-142 | ECD3-EXF6/2 | Open to Zone 27A w/ Area Wide Smoke Detection<br>Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in adjacent zone<br>Hose Station in adjacent zone |
| | Area F Zone 59A | MOV-227<br>HVC-142 | ECD3-EXF6/2 | Thermistor and Smoke Detector for Charcoal Filters<br>Minimal Ignition Sources<br>Portable Extinguishers in the zone<br>Hose Station in adjacent zones<br>Hydrant in adjacent yard<br>Transient Combustible Controls<br>Hot Work & Ignition Source Controls |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| | Area YD<br>Zone 900 | MOV-227<br>HVC-142 | ECD3-EXF6/2 | Outside – PAB roof<br>Low fixed combustible loading<br>Hose Station in adjacent zones<br>Portable Extinguishers in adjacent zone |
| Align charging pump suction source to RWST (close LCV-112C, open 288) | Area F<br>Zone 5A | LCV-112B<br>LCV-112C | PQ3-JB9/8 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Extinguishers in adjacent zone<br>Hose station in adjacent zone |
| | Area F<br>Zone 6 | LCV-112B<br>LCV-112C | YZ1-JB5 | Exemption granted for App R III.G.2 in this area – SER March 4, 1987<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Extinguishers in adjacent zone<br>Hose station in adjacent zone |
| | Area F<br>Zone 7A | LCV-112B<br>LCV-112C | CK1-YP3<br>YZ1-JB5<br>CK1-JB5/1 | Exemption granted for App R III.G.2 in this area – SER October 16, 1984<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| | Area F<br>Zone 22A | LCV-112B<br>LCV-112C | CK1-YP3 | Low Fixed Combustible Loading<br>Minimal Ignition Sources<br>Transient Combustible Controls<br>Hot Work Controls<br>Portable Extinguishers in adjacent zone<br>Hose Stations in adjacent zone |
| | Area F<br>Zone 27A | LCV-112B<br>LCV-112C | CK1-YP3<br>CK1-JB5/1 | Area Wide Smoke Detection<br>Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |
| | Area J<br>Zone 43A | LCV-112B<br>LCV-112C | ECE19-MN3/01<br>AE2-BA7<br>ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |
| | Area J<br>Zone 46A | | ECE19-MN3/01<br>ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Transfer Instrument Buses 23 and 23A to alternate power | Area F Zone 6 | BUS3A | PL2-M42 | Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Extinguishers in adjacent zone<br>Hose station in adjacent zone |
| | Area F Zone 7A | BUS3A | AI5-PL2<br>PL2-JA2/2<br>AI4-PT2<br>PT2-JA2<br>PL2-M42 | Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls |
| Close IA-501 to fail open valves 204A and 204B | Area H<br>Zone 70A<br>Zone 71A<br>Zone 72A<br>Zone 75A<br>Zone 77A<br>Zone 84A<br>Zone 85A<br>Zone 87A | Valve 204A | YI7-H55 | Smoke Detection over RCPs<br>Low to Moderate fixed combustible loading<br>Hose Station in adjacent zones<br>Minimal Ignition Sources<br>Transient Combustible Controls<br>Hot Work & Ignition Source Controls<br>Restricted access during operation (containment)<br>Oil collection system for RCPs |
| | | Valve 204B | YI5-H50 | |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Open IIP-500X to enable ASSS pneumatic instruments | Area H<br>Zone 70A<br>Zone 75A<br>Zone 77A<br>Zone 87A | All normal safe-shutdown instrument channels for steam generator level, pressurizer level, and pressurizer pressure | EPC3-H39/4<br>EPC4-H41/4<br>EPC4-H41/3<br>EPC3-H39/3<br>PN8-H39/2<br>PR3-H41/2<br>PR4-H33/2<br>PR4-H33/3<br>ETC5-EZC9<br>EZC9-H27<br>ETD4-EZA5<br>EZA5-H52<br>ETC6-EZD1<br>EZD1-H30<br>ETD5-EZA6<br>EZA6-H20<br>ETC7-EZD2<br>EZD2-H20<br>ETD6-EZA7<br>EZA7-H21<br>ETC8-EZD3<br>EZD3-H23<br>ETD7-EZA8<br>EZA8-H22 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Hose station in adjacent zone<br>RCP Smoke Detection |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Open breakers, pull fuses at two breakers on Bus 5A and 6A | Area J<br>Zone 17<br>Zone 19<br>Zone 39A<br>Zone 43A<br>Zone 45A<br>Zone 46A<br>Zone 47A<br>Zone 50A | 480V Bus 5A | AD1-BA8<br>AG5-XA5<br>PC9-XA5/1<br>PC9-XA5/2<br>XA5-WU9 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the area<br>Hose Stations in the area |
| | | 480V Bus 6A | AC4-BA6<br>JC2-YA9 | |
| Repower instrument buses IBUS23 and IBUS23A from backup source | Area J<br>Zone 25 | PPNL23<br>BUS3A | EGA9-EDB8/4<br>EGA9-EDB8/5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls |
| | Area J<br>Zone 43A | | AA3-BA5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose station in adjacent zone |
| | Area J<br>Zone 270 | | EDB8-EPB3 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose station in adjacent zone |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Locally operate AFW flow control valves FCV-405B, 405C, or FCV-406A | Area J<br>Zone 17<br>Zone 19<br>Zone 39A<br>Zone 43A<br>Zone 45A<br>Zone 46A<br>Zone 47A<br>Zone 50A | FCV-405B<br>FCV-405C<br>FCV-406A | AD1-BA8<br>AG5-XA5 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the area<br>Hose Stations in the area |
| | Area J<br>Zone 43A | | AE2-BA7<br>ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |
| | Area J<br>Zone 46A | | ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02 | Low to Moderate Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose Station in the zone |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Transfer 21 AFW Pump to ASSS power source | Area K Zone 60A | 21AFP | JB1-PT1/2 PT1-AI6 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | Area K Zone 65A | 21AFP | JB1-PT1/2 PT1-AI6 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| Open 21 AFW Pump recirculation bypass valve | Area K Zone 60A | FCV-1121 | JB1-YN9 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | Area K Zone 65A | FCV-1121 | JB1-YN9 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |

**TABLE RAI-01.1-1**
**OMA Initiator Cables of Concern and Mitigating Features Minimizing the Potential to Require Use of Credited OMAs**

| Required OMA[1] | OMA Initiator Fire Area Fire Zone[1] | Component of Concern[1] | Cables of Concern[2] | Fire Protection Defense in Depth[3] |
|---|---|---|---|---|
| Operate 21 AFW Pump flow control valves to control AFW flow to Steam Generators 21 & 22 | Area K Zone 60A | FCV-406A | PU9-JG2<br>LL8-JF5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | | FCV-406B | PU9-JH1 | |
| | Area K Zone 65A | FCV-406A | PU9-JG2<br>LL8-JF5 | Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hydrants in adjacent yard |
| | | FCV-406B | PU9-JH1 | |
| Transfer 23 CCW Pump to ASSS power feed if normal power/control is lost | Area P Zone 1 | 21CCP<br>22CCP<br>23CCP | AG4-M43<br>AG9-M44/01<br>EZG3-M45<br>EZG2-AJ3/01<br>EZG2-EDF9 | Exemption granted for App R III.G.2 in this area – SER October 16, 1984<br>Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose station in adjacent zone |
| Start Appendix R Diesel Generator (ARDG) if normal power and offsite power are lost | Area P Zone 1 | 21CCP<br>22CCP<br>23CCP | N/A<br><br>(Reference Table RAI-01-.1-2) | Area Wide Smoke Detection<br>Low Fixed Combustible Loading<br>Transient Combustible Controls<br>Minimal Ignition Sources<br>Hot Work & Ignition Source Controls<br>Portable Extinguishers in the zone<br>Hose station in adjacent zone |

**Table RAI-01.1-2**
**IP2 Fire Area C**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Operate 22AFW pump (turbine driven) | 21AFP<br>23AFP | EDC5-M74/1<br>EDC5-M74/2<br>ELD11-EWC26<br><br>JB1-PT1/1<br>PT1-A19<br>XD7-M75/1<br>XD7-M75/2 | Open circuit, intra-cable short, ground fault | Motor-driven AFW pump is disabled | Previously granted exemption (see Table RAI-01.1-1) credited low hazards of the area, smoke detection system, and radiant energy shields between pumps and ERFBS on 23AFW pump power cable. Likelihood of damage to both motor driven pumps, and therefore the need to perform the OMA, is considered extremely low. |
| Open/check open 22AFW pump steam supply valves | PCV-1139<br>PCV-1310A<br>PCV-1310B | JB1-PT1/3<br>PT1-RH7<br>PT1-YL4<br><br>EWZ63-ENX1<br>JB1-YN9<br>S94-EWZ63<br>S94-S93<br>S94-YN9<br><br>EWZ64-ENX2<br>JB1-YP1<br>S95-EWZ64<br>S95-S92<br>S95-YP1 | Open circuit, intra-cable short, ground fault, inter-cable short | Valve(s) may spuriously close or fail closed | This OMA is required only if the use of 22AFW pump becomes necessary, due to loss of both motor-driven AFW pumps as discussed above.<br><br>Previously granted exemption (see Table RAI-01.1-1) credited low hazards of the area, smoke detection system, and radiant energy shields between pumps and ERFBS on 23AFW pump power cable. Likelihood of damage to both motor driven pumps, and therefore the need to perform the OMA, is considered extremely low. |

**Table RAI-01.1-2**
**IP2 Fire Area C**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Operate 22AFW pump flow control valves to align AFW flow to selected steam generator(s) | FCV-405A through D (for 22AFW pump) | JB1-LV1<br>JB1-LV2<br>JB1-LV3<br>JB1-LV4 | Open circuit, intra-cable short, ground fault, inter-cable short | Valve(s) may be spuriously opened or closed | This OMA is required only if cables for all flow control valves for a given AFW pump are damaged, and remote control of all valves is lost. Given the limited fire challenge expected in this area, as underscored by the referenced exemption, loss of control of all FCVs for either the motor-driven AFW pumps or the steam-driven AFW pump is considered a low-likelihood occurrence.<br><br>*The subject OMA is directed at a scenario in which both motor-driven AFW pumps have been rendered inoperable by fire damage, thereby requiring local use of the turbine-driven pump. The associated cables for the motor-driven auxilary feedwater pump flow control valves (FCV-406A through FCV-406D) are also listed, to illustrate the number of fire-induced cable failures that would be necessary to require the use of the subject OMA.* |
| | FCV-406A through D (for 21 and 23 AFW pumps) | ELZ27-YN6<br>JF5-YN6<br>PU9-JG2<br><br>ELZ28-YN8<br>JF5-YN8<br>LL8-JF5<br>PU9-JH1<br><br>ELZ29-YN7<br>JF9-YN7<br>LL9-JF9<br>PU9-JF2<br><br>ELZ30-YN5<br>JF9-YN5<br>PU9-JF9 | | | |

**Table RAI-01.1-2**
**IP2 Fire Area F**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Align charging makeup path to RCS (locally open bypass valve 227 to mitigate a spuriously closed HCV-142) | Valve 227 | ECD3-EXF6/2 | Intra-cable short, ground fault, or open circuit | Loss of power to valve 227, causing it to fail in the normal position (closed) and rendering it inoperable for remote opening from the CCR. | This OMA is unlikely to be needed for a Fire Area F event, since HCV-142 (the normal charging makeup flowpath flow control valve) does not have cables routed through Fire Area F. Only the unlikely concurrent scenario of loss of the instrument air supply to HCV-142 (as the result of fire damage to instrument air header piping in Fire Area F) could cause HCV-142 to fail closed, thereby creating the need for performing the OMA to manually open bypass valve 227. Refer to Entergy response to RAI-09.1 in the September 29, 2010 submittal. |
| Align charging pump suction source to RWST (close LCV-112C, open 288) | LCV-112C<br>LCV-112B | CK1-JB5/1<br>CK1-YP3<br>PQ3-JB9/8<br>YZ1-JB5 | Open circuit, intra-cable short, ground fault, inter-cable short | LCV-112C fails open or fails closed; LCV-112B may fail to automatically open | The minimal hazards of the area and active fire protection features, as summarized on Table RAI-01.1-1 minimize the potential for a significant fire capable of causing the cable damage necessary to initiate this OMA. As described in Entergy's September 29, 2010 submittal, alignment of a reliable suction source (valve 288) and return of a charging pump to service is required within nominally 75 minutes. |

**Table RAI-01.1-2**
**IP2 Fire Area F**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | With respect to the potential charging prompt damage concern caused by loss of all suction sources, the proceduralized control room operator action to secure the credited charging pump on receipt of a smoke alarm from the affected plant area can be expected to effectively protect the pump from any damage potential. As described in the response to RAI-01.3 herein, upon placing the pump control into "pullout," any subsequent spurious start signals are effectively locked out, and present no threat to restart the pump. |
| Transfer Instrument Buses 23 and 23A to alternate power | BUS3A | AI4-PT2<br>AI5-PL2<br>PL2-JA2/2<br>PL2-M42<br>PT2-JA2 | Intra-cable short, ground fault, or open circuit | Loss of normal power source to Instrument Buses 23/23A | The success logic for IBUS23 and IBUS23A requires a power source from EGA8 (Static Inverter 23), which is normally fed from PPNL23, which is fed from BATTCHG23, which in turn is fed from 480V MCC26C, which is fed from BUS3A. The alternate power source for IBUS23 and IBUS23A is MCC29A, which is fed from BUS5A.<br><br>The above described buses, power panel, and MCCs are located in Fire |

**Table RAI-01.1-2**
**IP2 Fire Area F**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | Area A.<br><br>As stipulated by Appendix R, a loss of offsite power is typically presumed to occur concurrent with a fire. However, circuit and routing analyses performed for Fire Area F have confirmed that offsite power distribution is not impacted by a fire in this area. Therefore, it can be expected that the 480V distribution system, including BUS3A, will remain energized during this scenario.<br><br>If offsite power is nonmechanistically assumed to be unavailable during a fire in Fire Area F, the emergency diesel generators can be expected to automatically supply power to the safety-related 480V distribution system. Bus 3A is fed by 22EDG.<br><br>In the unlikely event that BUS3A and therefore Instrument Buses 23 and 23A are not automatically repowered by the EDG, it can be expected that Static Inverter 23 will remain operable |

| Table RAI-01.1-2<br>IP2 Fire Area F<br>Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs | | | | | |
|---|---|---|---|---|---|
| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
| | | | | | for a significant time, backed by 125VDC Battery 23, until the manual action to transfer to the alternate power source can be accomplished.<br><br>Given the low likelihood of loss of BUS3A due to fire damage to cables in this fire area as described above, the need to implement this OMA is also considered to be low likelihood. |

**Table RAI-01.1-2**
**IP2 Fire Area H**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Close IA-501 to fail open valves 204A and 204B | Valve 204A<br>Valve 204B | YI7-H55<br>YI5-H50 | Intra-cable short, inter-cable short | Valves 204A and 204B are spuriously closed due to internal cable fault | The fire challenge within Fire Area H (reactor containment) is minimal during plant power operation. The principal hazard, the RCP lube oil inventories, are secured by virtue of oil collection systems that capture and conduct any oil leakage to collection tanks located in the containment annulus area, away from any hot surfaces and ignition sources. The potential for a fire within this area, during plant power operation, sufficient to cause damage to both 204A and 204B cables, is considered to be low. Either valve 204A OR 204B remaining open is sufficient to support normal RCS makeup from the CVCS charging pump selected for use. |
| Open IIP-500X to enable ASSS pneumatic instruments | All normal safe-shutdown instrument channels for steam generator level, pressurizer level, and | All cables associated with the following normal instrumentation channels for the parameters listed at left: | Intra-cable short, open circuit, ground fault, or inter-cable hot short | Loss of all normal (electronic) instrument channels for any of the primary or secondary | The fire challenge within Fire Area H (reactor containment) is minimal during plant power operation. The principal hazard, the RCP lube oil inventories, are secured by virtue of oil collection systems that capture and conduct any oil leakage to collection tanks located in the containment |

**Table RAI-01.1-2**
**IP2 Fire Area H**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | pressurizer pressure | EPC3-H39/4<br>EPC4-H41/4<br>EPC4-H41/3<br>EPC3-H39/3<br>PN8-H39/2<br>PR3-H41/2<br>PR4-H33/2<br>PR4-H33/3<br>ETC5-EZC9<br>EZC9-H27<br>ETD4-EZA5<br>EZA5-H52<br>ETC6-EZD1<br>EZD1-H30<br>ETD5-EZA6<br>EZA6-H20<br>ETC7-EZD2<br>EZD2-H20<br>ETD6-EZA7<br>EZA7-H21<br>ETC8-EZD3<br>EZD3-H23<br>ETD7-EZA8<br>EZA8-H22 | | system parameters listed at left. | annulus area, away from any hot surfaces and ignition sources. The principal area of common routing of normal instrument channel cables is in the electrical penetration area of containment. The cables in this area are of asbestos/glass braid jacket construction (or other IEEE 383 Flame Test qualified construction), the area is devoid of ignition sources, and the area is equipped with a smoke detection system. The potential for a fire within this area, during plant power operation, sufficient to cause damage to multiple trains of normal instrument channel cables, is considered to be low. |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Open breakers, pull fuses at two breakers on Bus 5A and 6A | 480V Bus 5A<br>480V Bus 6A | BUS5A:<br>AD1-BA8<br>AG5-XA5<br>PC9-XA5/1<br>PC9-XA5/2<br>XA5-WU9<br><br>BUS6A:<br>AC4-BA6<br>JC2-YA9 | Intra-cable short, open circuit, ground fault, or inter-cable hot short | Affected circuit breakers may not trip on command | A loss of offsite power may occur as the result of a fire in this area, given that the switchgear and cables associated with offsite power distribution are located in this area. The EDGs, which are not located in this fire area, and which have no cables routed through this area, can be expected to automatically repower 480V BUS5A and BUS6A.<br><br>The cables listed for BUS5A include the incoming normal 6.9kV feeder cable (AD1-BA8), which is connected to the Bus 5A Station Service Transformer (SST) Supply Breaker, and control cables associated with the Service Air Compressor. The cables listed for BUS6A include the incoming normal 6.9kV feeder cable (AC4-BA6), which is connected to the Bus 6A SST Supply Breaker, and control cables associated with the main turbine auxiliary oil pump.<br><br>With respect to the OMA to manually |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | trip breakers for the Station Air Compressor and Turbine Auxiliary Oil Pump, the OMA need only be implemented at Operations discretion, to secure the described loads, if desired. The nominal load imposed by these components would not be expected to challenge EDG load capacity, given the minimal equipment set associated with the post-fire safe-shutdown model.<br><br>With respect to the potential OMA to manually trip the Station Service Transformer Supply Breakers, the IP2 SSD analysis identified a potential concern that if the SST Supply Breaker remains closed and a fault occurs on the incoming feeder cable, the 480V bus could back-feed into the fault through the associated SST. However, the SST supply breakers, which are located in Fire Area A, can be expected to automatically trip on undervoltage (which would be caused by faulting of the incoming power supply cable). The circuits and control power |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | associated with the SST Supply Breaker undervoltage trip function are located in Fire Area A, and would not be expected to be impacted by a fire in Fire Area J. Therefore the need to manually trip the SST Supply Breaker in such a scenario is of extremely low likelihood.<br><br>This OMA is NOT necessary to enable the restoration of power to the safety-related 480V buses, or to ensure the operability of the EDGs. Therefore, the likelihood of need to perform this OMA is considered to be low. |
| Repower instrument buses IBUS23 and IBUS23A from backup source | PPNL23<br>BUS3A | EDB8-EPB3<br>AA3-BA5<br>EGA9-EDB8/4<br>EGA9-EDB8/5 | Intra-cable short, ground fault, or open circuit | Loss of normal power source to Instrument Buses 23/23A | The success logic for IBUS23 and IBUS23A requires a power source from EGA8 (Static Inverter 23), which is normally fed from PPNL23, which is fed from BATTCHG23, which in turn is fed from 480V MCC26C, which is fed from BUS3A. The alternate power source for IBUS23 and IBUS23A is MCC29A, which is fed from BUS5A.<br><br>Cable AA3-BA5 is the normal 6.9 kV |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | power feeder to BUS3A. Failure of this cable will result in deenergization of BUS3A, and the emergency diesel generators can be expected to resupply power to BUS3A. However, it can be expected that Static Inverter 23 will remain operable for a significant time, backed by 125VDC Battery 23, until the manual action to transfer to the alternate power source can be accomplished.<br><br>Cable EDB8-EPB3 is the power supply cable to 125VDC PPNL23 from Battery 23. PPNL23 is located in Fire Area A, and Battery 23 is located in a masonry enclosure, identified as Fire Zone 25, in Fire Area J. The cable route traverses from Fire Zone 25 on the 33' elevation of the Superheater Building through adjoining Fire Zone 270, to PPNL23, which is located in the Cable Spreading Room, Fire Area A, also on the 33' elevation. The area of Fire Zone 270 traversed by the cable is characterized by minimal fixed combustibles and ignition sources. |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | | | | Cables EGA9-EDB8/4 and EGA9-EDB8/5 are located entirely within Fire Zone 25, and are not subject to fire damage other than a potential fire at Battery 23. This room is a restricted access area, not subject to routine personnel access, and devoid of combustibles or ignition sources other than the battery cells. A fire within the Battery 23 room (Fire Zone 25) can be expected to be confined within the room, and present no impact to other plant equipment.<br><br>Given the low likelihood of loss of BUS3A or PPNL23 due to fire damage to cables in this fire area, the need to implement this OMA is considered to be low likelihood. |
| Locally operate AFW flow control valves FCV-405B, 405C, or FCV-406A | FCV-405B<br>FCV-405C<br>FCV-406A | Cables associated with upstream power supplies to IBUS22 and IBUS23: | Intra-cable fault, ground fault, open circuit; inter-cable fault | Loss of power supply renders the air-operated valve unable to be remotely controlled | The listed cables are conservatively assumed by the IP2 SSD analysis to impact the availability of the upstream power supplies to IBUS22 and IBUS23, which are MCC24A and MCC29A, which are in turn supplied by 480V Buses 2A and 5A, respectively. MCC24A is |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | MCC24A (located in Fire Area J):<br>ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02<br><br>480V Buses 2A (BUS2A) and 5A (BUS5A):<br><br>AE2-BA7<br>AD1-BA8<br>AG5-XA5 | | | located in this fire area.<br><br>However, cables AE2-BA7 and AD1-BA8 are the normal 6.9kV feeder cables supplying the station service transformers on 480V buses 2A and 5A, respectively. Failure of the 6.9kV power supply cable to either bus would be mitigated by resupplying power to the buses via the EDGs. Cable AG5-XA5 is associated with the Station Air Compressor on Bus 5A, and failures of this cable do not present the potential to disable the associated 480V bus. In light of the above, the likelihood of need to perform the OMA to locally operate all of the listed AFW flow control valves is considered to be a low. |
| Open valve 288 and close valve LCV-112C | LCV-112B<br>LCV-112C | Cables associated with upstream supply to LCV-112B power source, 125V DC Distribution Panel 22 | Intra-cable fault, ground fault, open circuit, inter-cable fault | Loss of power to LCV-112B, rendering it inoperable for automatic or remote manual opening | The IP2 SSD analysis conservatively provides for the listed OMA, to provide a means to mitigate a potentially failed LCV-112B. LCV-112B provides a backup suction source for the charging pumps, from the RWST. However, normal charging pump suction valve (VCT outlet valve) is not impacted by a |

**Table RAI-01.1-2**
**IP2 Fire Area J**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| | | (DPNL22):<br><br>MCC24A (located in Fire Area J)<br>ECE18-CC5/01<br>EWF61-AG9/01<br>EWF61-AG9/02<br>EWF61-ECE19/01<br>EWF61-ECE19/02<br>ECE19-MN3/01<br><br>480V Bus 2A (BUS2A)<br>AE2-BA7 | | | fire in Fire Area J, and hence there would be no expectation of need for the automatic or remote manual use of LCV-112B. As a result, the implementation of this OMA is considered to be of low likelihood. |

**Table RAI-01.1-2**
**IP2 Fire Area K**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Transfer 21AFW Pump to ASSS power source | 21AFP | JB1-PT1/2 PT1-AI6 | Intra-cable fault, ground fault, open circuit | 21AFP circuit breaker is rendered inoperable by remote control | The cables are routed in rigid steel conduit, along the south wall of the area. They are routed vertically from the AFW Pump Room below the area and exit through the south wall of the area. The exposure within the area is minimal, and fixed combustibles and ignition sources in the area of the conduits are minimal. Given the minimal potential fire challenge to the cables, the likelihood of need for implementation of this OMA is considered to be low. |
| Open 21 AFW Pump recirculation bypass valve | FCV-1121 | JB1-YN9 | Intra-cable fault, ground fault, open circuit, inter-cable fault | FCV-1121 may spuriously open or close | The cable is routed in rigid steel conduit, along the south wall of the area. The conduit is routed vertically from the AFW Pump Room below the area and exit through the south wall of the area. The exposure within the area is minimal, and fixed combustibles and ignition sources in the area of the conduit are minimal. Given the minimal potential fire challenge to the cable, the likelihood of need for implementation of this OMA is considered to be low. |

**Table RAI-01.1-2**
**IP2 Fire Area K**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Operate 21 AFW Pump flow control valves for 21 and 22 steam generators | FCV-406A<br>FCV-406B | LL8-JF5<br>PU9-JG2<br>PU9-JH1 | Intra-cable fault, ground fault, open circuit, inter-cable fault | FCV-406A, FCV-406B may spuriously open or close | The cables are routed in rigid steel conduit, along the south wall of the area. They are routed vertically from the AFW Pump Room below the area and exit through the south wall of the area. The exposure within the area is minimal, and fixed combustibles and ignition sources in the area of the conduits are minimal. Given the minimal potential fire challenge to the cables, the likelihood of need for implementation of this OMA is considered to be low. |

**Table RAI-01.1-2**
**IP2 Fire Area P**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Transfer 23 CCW Pump to ASSS power feed if normal power/control is lost | 21CCP<br>22CCP<br>23CCP | AG4-M43<br>AG9-M44/01<br>EZG3-M45<br>EZG2-AJ3/01<br>EZG2-EDF9 | Intra-cable fault, ground fault, open circuit | CCW pumps are rendered inoperable | Separation features within the area, an ERFBS installed on the 23CCP power supply conduit, insignificant fixed combustibles and ignition sources, as acknowledged by a previously granted exemption for this area, make loss of all three CCW pumps, and therefore the need to implement this OMA, a low-likelihood event. |
| Start Appendix R Diesel Generator (ARDG) if normal power and offsite power are lost | 21CCP<br>22CCP<br>23CCP | N/A | N/A | N/A | Further review has confirmed that Fire Area P presents no impact to cables or components associated with the onsite power supplied by the safety-related EDGs (21EDG, 22EDG, 23EDG). For the fire scenarios that may be postulated for Fire Area P, there is no credible event that would require implementation of this OMA. |

**Table RAI-01.1-2**
**IP2 Fire Area YD**
**Credited OMAs And Cable/Component Failures That May Require the Use of the Credited OMAs**

| OMA | Affected Component(s) | Associated Cables | Type of cable failure(s) that may cause need for OMA | Effect of cable failure that leads to need for OMA | Comments / Conclusion |
|---|---|---|---|---|---|
| Align charging makeup path to RCS | Valve 227 | ECD3-EXF6/2 | Intra-cable fault, ground fault, open circuit | Valve 227 may be rendered inoperable by remote control, or may spuriously open/close | The described OMA (manually open MOV 227) is only required if it becomes necessary to bypass a failed-closed normal charging path flow control valve, HCV-142. While normally-closed valve 227 may be rendered inoperable, or may spuriously open or close in response to cable failure, normal charging flowpath valve HCV-142 has no cables routed through Fire Area YD. Hence, HCV-142 can be expected to continue to operate normally, and there is no need to implement the OMA to manually operate valve 227. |

**RAI-01.2**

The September 29, 2010, response indicates that LCV-112C could fail open as a result of fire damage. With continued operation of the charging pump in this scenario, draindown of the VCT could occur resulting in the introduction of hydrogen into the pump suction, damaging the pump. However, it is not clear if potential impact of this failure mode has been fully assessed in the request. Provide information which clearly demonstrates that LCV-112C failing in the open position has been fully evaluated for its impact on the ability to achieve and maintain hot shutdown. For fire areas where LCV-112C is found to be vulnerable to this failure mode, the response should also include information requested in the RAI above.

RAI-01.2 RESPONSE

Failure of LCV-112C in the open position (its normal position during plant power operation) could result in unintended drain-down of the VCT (Volume Control Tank) and consequent damage to a running charging pump, if the VCT inventory is exhausted, and cover gas is drawn into the positive-displacement charging pump suction. For this scenario to exist, LCV-112C must fail open, normally-closed alternate suction valve LCV-112B must also fail to automatically open in response to a VCT level signal, AND automatic replenishment of VCT level must be terminated, through deliberate or fire-induced isolation of all letdown flow, and fire-induced loss of the VCT automatic makeup function.

The VCT automatic makeup function is an element of the Chemical and Volume Control System (CVCS) that is not credited in the Appendix R post-fire safe-shutdown analysis, and hence the supporting equipment (e.g., primary water pumps, boric acid transfer pumps, boric acid blender, etc.) is conservatively assumed to be rendered inoperable as the result of nonspecific fire damage to cables and/or components. The VCT is also replenished through recycling of the CVCS letdown flow, and additional fire-induced cable failures would be necessary to also spuriously close the letdown isolation and/or letdown orifice valves, thereby terminating this source of continual VCT replenishment. Under these conditions of concurrent or sequential multiple spurious operations, combined with fire-induced failure of LCV-112C in the open position, the running charging pump could conceivably be exposed to a condition wherein the VCT inventory is drawn down and hydrogen cover gas is introduced into the pump suction, resulting in gas binding and potential pump damage. However, the number of multiple concurrent fire-induced failures necessary to create this condition is substantial, and the occurrence of all of the necessary failures simultaneously, or in succession, for the credible fire scenarios in the fire area of concern, is a low-likelihood event.

As described in the September 29, 2010 response, plant operating procedures have been revised to include direction to promptly secure the credited charging pump upon detection of a fire in plant areas containing cables associated with charging pump controls and charging suction valves LCV-112C and LCV-112B. By promptly securing the designated charging pump for the specific fire area of concern, the failure of LCV-112C in the open position – concurrent with loss of all VCT auto makeup function – would not challenge the credited charging pump.

As also noted in the September 29, 2010 response, notwithstanding securing the credited charging pump by placing the central control room (CCR) switch in "pullout," the charging pump control cable, downstream of the CCR switch, presents a limited potential for fire damage to that cable to cause a spurious start of the charging pump, thereby presenting a potential damage concern, if LCV-112C has failed closed and LCV-112B has failed to automatically open as designed. However, following further review, it has been determined that the previously provided information relative to a spurious restart of the charging pump was unduly conservative, in light of the protective features integral to the charging pump circuit breaker. Therefore, clarification is provided relative to the potential fire-induced initiation of a spurious charging pump start signal, in the response to RAI-01.3.

In light of the charging pump circuit breaker protective features described in the response to RAI-01.3, the control room operator action to place the 21 Charging Pump in pullout will provide an effective means of protection for the charging pump, by ensuring that it will remain deenergized and "locked out" until it is restored to service in accordance with the post-fire safe-shutdown procedural guidance. Thus, any spurious isolation, or failing open, of the charging pump suction path will have no impact on the 21 Charging Pump, following securing the pump in response to detection of a fire in the associated plant area.

In response to the six elements identified in RAI-01.1 and their applicability to the potential fire-induced failure mode of LCV-112C wherein the valve could be failed in the open position:

1. *all cables that could cause components of concern to spuriously start, stop, change position, become damaged or otherwise fail in an undesired manner for hot shutdown.*

   The cables associated with LCV-112C and routed through the fire area of concern that could result in a failed-open valve condition, if these cables are subject to fire damage are listed on Table RAI-01.1-1 and are summarized below:

   - CK1-JB5/1: For the range of potential fire-induced failure modes, the potential effect on LCV-112C is to fail the valve open or closed, and unable to be repositioned by remote electrical controls.
   - CK1-YP3: For the range of potential fire-induced failure modes, the potential effect on LCV-112C is to fail the valve open and unable to be closed electrically.
   - YZ1-JB5: For the range of potential fire-induced failure modes, the potential effect on LCV-112C is to fail the valve closed (intra-cable hot short) or open (open-circuit failure), and unable to be operated electrically.

   The potential effects of fire-induced failures of the above listed cables are discussed in detail in the response to RAI-01.1 of Entergy's September 29, 2010 submittal.

2. *the routing of these cables within each of the fire areas identified in the request,*

   The physical routing of the above listed cables in the fire area of concern (Fire Area F) is provided in the response to RAI-02.1 in Entergy's September 29, 2010 submittal.

3. *the proximity of the identified cables of concern to each other (in feet and inches),*

   LCV-112C is the sole VCT outlet valve, but a redundant charging pump suction capability is provided by RWST suction path valve LCV-112B. Cables associated with both LCV-112C and LCV-112B are routed in fire zones 6, 7A, 22A, and 27A in the fire area of concern (Fire Area F). The following cables, routed through Fire Area F, are associated with the actuation logic of both LCV-112C and LCV-112B, and as such, no separation distances are applicable: CK1-JB5/1, CK1-YP3, and YZ1-JB5. However, as described in the response to Question (6) below, not all potential fire-induced failures of these cables can be expected to result in the disabling of both LCV-112C and LCV-112B.

4. *the type of cable faults required to cause the component(s) to fail in an undesired manner for post-fire safe shutdown,*

   The potential effects of fire-induced failures of the above listed cables are discussed in detail in the response to RAI-01.1 of Entergy's September 29, 2010 submittal. Failure modes considered include open circuit, intra-cable short circuit, ground faults, and inter-cable hot shorts. As discussed in the referenced September 29, 2010 response, each of the postulated failure modes for the above listed cables presents the potential for causing LCV-112C to fail in a potentially undesired condition.

5. *the spatial relationship of each cable to potential ignition sources and/or high energy arcing faults, and*

   As described in the response to RAI-02.1 in Entergy's September 29, 2010 submittal, in the fire area of concern, the above listed cables are routed through fire zones containing ignition sources consisting principally of electrical cabinets, which in turn consist primarily of control cabinets. Separation distances to these electrical cabinets are described in the response to RAI-02.1 in Entergy's September 29, 2010 submittal. There are no ignition sources in the fire zones through which these cables are routed that present the potential for high-energy arcing faults (HEAF), consistent with the HEAF binning criteria of NUREG-6850, Vol. II, Appendix M, and FAQ 06-0017.

6. *any other plant specific features that serve to minimize the likelihood of the undesired event.*

   As discussed above, the minimal fire hazards and smoke detection system in the fire zones of concern, with the exception of Fire Zone 22A, provide reasonable assurance that a fire of sufficient severity to cause damage to the multiple cables that could isolate both charging suction paths, disable all VCT replenishment functions, prior to detection and manual suppression of the fire, is an unlikely event. A fire event that simply causes LCV-112C to fail open and LCV-112B to fail closed – but does not disable all VCT inventory replenishment means – does not present an assured prompt damage concern for the credited charging pump. As discussed in the response to RAI-01.3, the proactive control room operator action to secure the credited charging pump upon receipt of an alarm from the smoke detection system, provides reasonable assurance that the

credited charging pump will remain free of fire-induced damage until a reliable suction source can be aligned (via the requested OMA) and the charging pump returned to service, in accordance with established post-fire safe-shutdown procedures.

As summarized on Table RAI-01.1-1, with the exception of Fire Zone 22A, the fire zones within Fire Area F through which the above listed LCV-112C and LCV-112B cables are routed are all equipped with smoke detection systems, providing assurance of prompt notification to the control room operators of a fire condition, and enabling the timely securing of the credited charging pump. Fire Zone 22A, the valve corridor area containing LCV-112C, is not equipped with smoke detectors, but is devoid of fixed combustibles and has no ignition sources. This is an extremely small zone (115 ft2) that is also a high-radiation area. As such, personnel traffic is minimal, and accumulation of any significant quantity of transient combustibles in this zone – other than during plant shutdown conditions, with ongoing maintenance work – would be deterred by a combination of the transient combustible control program as well as radiological area and boundary controls.

Therefore, a fire in this zone capable of causing damage to LCV-112C cable CK1-YP3, is considered a low-likelihood event. Moreover, in the event of a fire of any significance occurring in this small zone, it can reasonably be expected that smoke generated by the fire would ultimately be detected by the smoke detection system in adjoining Fire Zone 27A, given that Fire Zone 22A is open to Fire Zone 27A. In addition, while fire damage to cable CK1-YP3 may cause maloperation of normal charging suction valve LCV-112C, and may also render inoperable the automatic control function of LCV-112B (by spuriously actuating or disabling interlock relay LCV112C-33BO/X), it can be expected that LCV-112B would remain electrically operable from its control room switch, which is not associated with cable CK1-YP3.

Based on the above, in light of the fire detection systems in or immediately adjacent to the above described fire zones, the procedural guidance to promptly secure the credited charging pump (21), and the physical separation between the 21 Charging Pump control cables and LCV-112C cables, there is reasonable assurance that failure of LCV-112C in the open (normal) position, loss of all VCT inventory replenishment functions, and concurrent or sequential cable damage causing a spurious restart of 21 Charging Pump is a low-likelihood event.

**RAI-01.3**

Several inconsistencies were noted in the September 29, 2010, response regarding the capability of operator actions to prevent pump damage by proactively shutting down the required/credited charging pump. Specific examples include:

1. Response to RAI 01.1 Item 1 (page 2) which states: If, the required/credited charging pump has been shut down proactively, no damage to the pump will occur.
2. Response to RAI 01.1 Item 5 (page 8) which states, in part: The pump is secured by placing the control room control switch in OFF and pullout. This action will stop 21 Charging Pump, to protect against any damage that could be caused by a spontaneous loss of all suction paths. Despite placing 21 Charging Pump in

OFF/pullout, ... an internal conductor-to-conductor fault on the 21 Charging Pump control cable(s) could result in a spurious start of 21 Charging Pump.

3. Response to RAI 07.1, which states, in part: 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.

In summary, although the responses provided for RAI 01.1 (Item 1) and RAI 07.1 indicate that the control room action will preclude damage to the charging pump, the response to RAI 01.1 (Item 5) indicates that pump damage may still occur. Provide further clarification of the capability of this action to preclude pump damage. Where this action is credited, provide a detailed discussion of any plant-specific features which serve to minimize the likelihood of fire damage to all cables of concern.

RAI-01.3 RESPONSE

The described operator action to secure the credited charging pump and place the pump control switch in "pullout" is a control room operator action, and not subject to consideration as an OMA in the context of Appendix R Paragraph III.G.2.

As described in the September 29, 2010 response, plant operating procedures have been revised to include guidance to promptly secure the credited charging pump upon detection of a fire in plant areas containing cables associated with charging pump controls and charging suction valves LCV-112C and LCV-112B. By promptly securing the designated charging pump for the specific fire area of concern, the fire-induced spurious isolation of all charging pump suction paths will not challenge the credited charging pump. The purpose of the proactive proceduralized response to secure the credited charging pump (in this case 21 Charging Pump) is to promptly remove the pump from operation, to minimize the potential for prompt pump damage that could be experienced if all suction is spontaneously isolated while the positive-displacement pump is running. A comparable concern may exist in the event that LCV-112C fails open due to fire damage to control cables, concurrent with failure of LCV-112B to automatically open, with the concurrent fire-induced loss of all VCT automatic makeup functions. Under these conditions, pump damage could occur as the result of gas binding as VCT cover gas is drawn into the pump, following drain-down of the VCT.

As also described in the September 29, 2010 response, notwithstanding securing the credited charging pump by placing the central control room (CCR) switch in "OFF/pullout," the charging pump control cable, downstream of the CCR control switch, presents the potential for fire damage to that cable to initiate a spurious start signal to the charging pump, thereby creating a potential pump damage concern, under the postulated conditions of loss of a viable pump suction source.

However, following further review, Entergy has determined that the information provided in the September 29, 2010 response relative to the potential for a spurious restart of the charging pump is unduly conservative, in light of the protective features integral to the circuit breaker.

While the potential exists for generation of a spurious pump start signal, the potential for actual starting of the pump is virtually nil. The following clarification is provided relative to the potential fire-induced initiation of a spurious pump start signal:

The 480V circuit breaker supplying the 21 Charging Pump is a Westinghouse DB-50 circuit breaker, which is provided with an "anti-pump" feature as discussed below, and this feature can be expected to ensure that spurious restart of the charging pump will not occur. A review of elementary wiring diagram 225132, Revision 12 and elementary wiring diagram switch development 225115, Revision 12 confirms that when the 21 Charging Pump CCR control switch is placed in "pullout," several conductors of the control cable remain energized with 125VDC control power, to maintain operation of the breaker position/status indicating light and to maintain the breaker trip logic energized. With the breaker in the tripped (open) position, a normally-open auxiliary contact in series with the trip coil maintains the trip coil deenergized.

In the event of a fire-induced intra-cable (conductor-to-conductor) fault, one or more of the normally energized conductors may contact the conductor(s) associated with the breaker closing circuit, potentially energizing the closing coil. However, in this event, the closing of the breaker will simultaneously cause the closure of the above described auxiliary contact, thereby energizing the breaker trip coil. The breaker close signal will immediately be countermanded by the trip signal, and within one or two cycles, the electromechanical "anti-pump" feature will mechanically lock the breaker in the open/tripped position. Any further spurious or intentional pump start signals will have no effect on the breaker position. It will remain tripped/open until manually reset. The electromechanical components associated with the protective anti-pump feature are located at the circuit breaker cubicle, in the 480V Switchgear Room (Fire Area A), a III.G.3 fire area, and are not subject to damage or maloperation as a result of a fire in any other fire area.

The potential fire-induced cable failure(s) considered, and the resultant potential effects, include the following:

- Intra-cable conductor-to-conductor fault: energized conductor(s) within the cable may contact the normally deenergized conductor serving the breaker closing coil, as described above. The described anti-pump feature ensures that the breaker is mechanically locked out and precluded from closing, despite any subsequent spurious close signals.

- Ground fault: No effect on breaker closing circuit would be expected, as the breaker control logic is powered by an ungrounded 125VDC supply. Multiple concurrent ground faults could potentially result in blowing of the control circuit control power fuses, leaving the breaker in the open/tripped position, and rendering the breaker not vulnerable to further spurious close signals.

- Inter-cable hot short: The closing circuit may be spuriously energized, but the trip circuitry and anti-pump feature can be expected to continue to function as described above. This failure mode is considered unlikely, given that it would be necessary to

experience a proper-polarity 125VDC external hot short to energize the breaker closing coil, requiring faults on two separate conductors to complete the circuit.

- Open circuit failure: This low-credibility failure mode could result in the circuit to the closing coil being rendered inoperable (and therefore spurious closing of the breaker would not be possible), and/or the circuit to the trip coil could be rendered inoperable, thereby impacting the described protective anti-pump feature. While open-circuit failures must be postulated and evaluated as required by Appendix R Paragraph III.G, as noted in NEI 00-01, Rev. 2, the cable fire testing performed to date has not identified open-circuit failures as a credible primary cable failure mode. Therefore, a selective fire-induced failure mode in which the circuit breaker close circuit conductors would remain intact, while the trip circuit conductors would fail open, is considered to be an exceedingly unlikely scenario.

In light of the above, the previously described control room operator action to place the 21 Charging Pump in pullout will provide an effective means of protection for the charging pump, by ensuring that it will remain deenergized and "locked out" until it is restored to service in accordance with the post-fire safe-shutdown procedural guidance. Thus, a fire-induced spurious isolation of the charging pump suction path will have no impact on the 21 Charging Pump, following securing the pump in response to detection of a fire in the associated plant area.

It should be noted that during plant power operation, only one of the three charging pumps is in operation at any given time. IPEC operational practice is to rotate the usage of all three pumps, such that over a plant operating cycle, each pump experiences a comparable period of operation. In the event of a fire scenario as discussed herein, at most one charging pump would be in operation, and potentially vulnerable to fire-induced failures of the normal and alternate charging suction paths.

In addition to credited control room action to secure the 21 Charging Pump, which is considered to provide reliable and effective protection of the pump and associated safe-shutdown capability – despite fire damage to cables -- the likelihood of concurrent or sequential fire-induced cable damage to cause spurious pump start signals and failure of the charging pump suction path is considered to be low. The fire zones containing control cables for the 21 Charging Pump and charging pump suction valves LCV-112C and LCV-112B are characterized by low combustible loading, insubstantial ignition sources, and the presence of a smoke detection system in the fire zones of concern, with the exception of Fire Zone 22A, as discussed above. The active and passive fire protection features, and other mitigating factors associated with these fire zones are presented herein in summary form by Table RAI-01.1-1. Given these features, Entergy believes there is reasonable assurance that a fire scenario of sufficient size, scope, and rapidity of development, capable of challenging not only the 21 Charging Pump, but also the remaining two charging pumps, the charging suction valves, and sufficient other plant equipment, so as to require substantial implementation of the post-fire safe-shutdown capability, is a low-likelihood event. The proceduralized control room operator action to secure the credited (21) charging pump upon detection of a fire in the area of concern is considered to be a reliable and effective means of preventing spurious restarting of the pump, during a fire scenario that presents the potential for spuriously isolating all charging pump suction sources.

**RAI-01.4**

The September 29, 2010, response indicates that Cable YZ1-JB5, provides the interlock between the refueling water storage tank (RWST) outlet valve LCV-112B and (under normal operating conditions) an inter-cable (cable to cable) Hot Short would be required to cause LCV-112C to spuriously close. However, the response does not clearly identify circuit faults that would be required to prevent normally-closed RWST outlet valve LCV-112B from opening automatically as designed in response to a close signal from LCV-112C. Identify the cables of concern, and describe their routing, type of cable faults (Open, Short to ground, inter-cable hot short or intra-cable hot short) required to prevent the normally-closed RWST outlet valve LCV-112B from automatically opening, and the proximity to other cables that, in conjunction with fire damage to this cable(s) could result in a loss of all charging suction (e.g. LCV-112C control cables).

RAI-01.4 RESPONSE

Valves LCV-112C and LCV-112B provide for redundant suction sources to the charging pumps, with motor-operated valve LCV-112C, the VCT outlet valve, normally open, and providing suction to the operating charging pump. LCV-112B, an air-operated valve that is equipped with a local air receiver (to ensure operability in the event of loss of the instrument air supply), provides an alternate charging pump suction path from the RWST. Valve LCV-112B will fail closed on loss of power or loss of air supply. Valve LCV-112B is normally maintained closed, and is automatically opened in response to a VCT low-level signal. Upon receipt of the automatic open signal, LCV-112B will travel to the full-open position, to establish suction from the RWST. Upon reaching the full-open position, a limit switch on LCV-112B provides an interlock to LCV-112C that will cause LCV-112C to close. Alternatively, LCV-112B will also automatically open in response to LCV-112C being moved off the full-open position.

Conversely, as VCT level is restored, LCV-112C will receive an open signal, and upon reaching the full-open position, a limit switch on LCV-112C provides an interlock to LCV-112B that will cause LCV-112B to close.

The cables of concern associated with LCV-112C and LCV-112B and their physical routing are discussed in detail in the response to RAI-01.1 as presented in Entergy's September 29, 2010 submittal. The cables of concern routed through Fire Area F, and their potential fire-induced failure modes and effects on redundant charging pump suction valves LCV-112C and LCV-112B, are summarized below.

| Cable | Failure Mode | Potential LCV-112C Effects | Potential LCV-112B Effects | Net Effect on Charging Operability |
|---|---|---|---|---|
| CK1-YP3 | Ground fault, blowing control power fuse | Normally open, fails as is (open) | VCT level controller auto open function may be disabled due to loss of power to LCV-112C interlock relay. | LCV-112C can be expected to remain open, providing continued suction to charging pump, prior to operators securing the pump per procedure. |
| CK1-JB5/1 | Intra-cable short, energizing open or close contactor, or blowing control power fuse | Remains open/failed open, or may spuriously close | VCT level controller auto open function may be disabled due to loss of power to LCV-112C interlock relay. | LCV-112C may spuriously close; LCV-112B can be expected to remain operable from the CCR control switch. |
| YZ1-JB5 | External (inter-cable) hot short on conductors of this cable serving LCV-112C may energize close contactor; ground fault may blow control power fuse in MCC<br><br>Intra-cable faults on other conductors of this cable serving LCV-112B may spuriously open LCV-112B. Open circuit failure on these conductors could render LCV-112B failed closed | Closes, if external hot short energizes close contactor. Remains open if control power fuse is blown. | Spuriously opens on intra-cable hot short. Open circuit failure mode considered an unlikely scenario that would render LCV-112B failed closed. | Multiple selective circuit/conductor failures, including open-circuit failures on the conductors serving LCV-112B, would be necessary to cause LCV-112C to spuriously close while simultaneously causing LCV-112B to be failed closed. It can be reasonably expected that the credible failure mode will result in LCV-112B remaining operable in auto mode, or spuriously opened, thereby maintaining an adequate charging pump suction flow path. |

As discussed in the September 29, 2010 response, post-fire safe-shutdown operating procedures include direction to secure the credited charging pump, upon receipt of a fire alarm in any of the plant areas of concern. Upon securing the credited charging pump, the potential loss of all suction sources will not challenge the credited pump, which will be restarted per the post-fire safe-shutdown procedure, following manual alignment of charging pump suction to the RWST, by locally opening manual valve 288. Given that the credited charging pump is secured promptly via operator action in the CCR, the remaining concern is that fire-induced damage to the charging pump control cable(s), downstream of the CCR control switch, should not present the potential for spurious restart of the pump, concurrent with spurious closure of both charging suction valves LCV-112C and LCV-112B.

The fire zone routing of the above listed cables is described in the September 29, 2010 response, and as described in the response to RAI-01.2 herein, all of the zones forming the routing path for these cables, with the exception of Fire Zone 22A for cable CK1-YP3, are equipped with smoke detection systems and exhibit minimal fire hazards and ignition sources, as described by Table RAI-01.1-1

In light of the above, the following conclusions apply: (1) it is unlikely that a fire of sufficient size and rapidity of development will occur, to challenge both charging pump suction capabilities, prior to detection and manual suppression of the fire, (2) with the charging pump control room control placed in pullout, spurious start signals will be effectively locked out and have no effect on the secured pump motor. In summary, concurrent or sequential loss of all suction sources and a spurious start of the credited charging pump, thereby leading to potential pump damage, is considered to be a low likelihood event.