BTP CMEB 9.5-1 FIRE EVENT SAFE SHUTDOWN EVALUATION

UNIT 2

FIRE EVENT SAFE SHUTDOWN EVALUATION

SUMMARY REPORT

REVISION 0

FOR THE

VOGTLE ELECTRIC GENERATING PLANT

June 1, 1988

TABLE OF CONTENTS

1.0 INTRODUCTION

A. Scope

The scope of this report is to summarize the results of the fire event safe shutdown evaluation which considered the impact of fire induced hot shorts, open circuits and shorts to ground in electrical circuitry on the ability to safely shut down the plant with and without offsite power.

This report specifically addresses the evaluation performed for fires located in fire areas outside the control room. A separate evaluation report addresses the evaluation performed for the control room fire.

B. Objective

The results of the analysis serve to define those special operational actions for each fire area which should be considered to ensure the capability to achieve safe shutdown. They also identify where spurious actuations could occur which could hinder or preclude the ability to achieve safe shutdown if operator actions are not taken to terminate the undesired event.

The effects of a fire are not anticipated to be immediate. Fire detection systems in the plant will provide early warning and identify the location of a fire. The information in this report can be used in preparing procedures for responding to a fire to identify the potential operator actions in each fire area. Based on the function of the affected component(s), with consideration of the fire location, the procedures can define the priority to be given to performance of operator actions.

This information can be used to assess the manpower requirements to achieve safe shutdown in the event of a fire.

2.0 SUMMARY OF RESULTS

Fire damage can result in the inability to operate equipment and/or can result in undesired spurious actuation of equipment which can impact the capability to achieve safe shutdown. This damage can occur due to the effects of the fire on the component or its electrical circuitry (power and control). Table 2-1 defines the safe shutdown train (as defined in FSAR Table 9.5.1-1) determined to be free of fire damage along with the special operational and design considerations and reference to the spurious actuation considerations (presented in Section 3) on a fire area by fire area basis.

TABLE 2-1
(Sheet 1 of 11)

UNIT 2 SUMMARY OF RESULTS FOR FIRES OUTSIDE THE CONTROL ROOM

FIRE AREA(a)	AVAILABLE SAFE SHUTDOWN TRAIN(b)	SPECIAL CONSIDERATIONS	
		OPERATIONAL/ DESIGN	SPURIOUS ACTUATIONS (See Section 3)
1-AB-LD-B	A	NONE	NONE
1-CB-LA-N	A OR B	SEE NOTE 2	NONE
-P	A OR B	SEE NOTE 2	NONE
-R	A OR B	SEE NOTE 2	NONE
-U	A OR B	NONE	1d, 8b
1-CB-L1-A	SEE THE CONTROL ROOM ALTERNATE SHUTDOWN EVALUATION		
-B	A	SEE NOTE 1	NONE
-C	A OR B	SEE NOTE 2	NONE
-F	A OR B	SEE NOTE 2	NONE
-G	A OR B	SEE NOTE 3	NONE
1-CB-L2-B	A OR B	SEE NOTE 2	NONE
-E	A	NONE	1d,2a,2b,2c,4d,5b, 6b,6c,7b,8b,10a,10b, 13b,13c,14b,15,16a, 16b,17a,18,19,20, 22b,23,25,26a,26b
1-CB-L3-C	A OR B	SEE NOTE 2	NONE
-H	B	NONE	NONE
-J	B	NONE	NONE
-K	A	NONE	NONE
2-AB-LD-A	A	SEE NOTE 4	5a,5b,6b,6c,7b, 8a,8b,10a,12
-B	A/B	SEE NOTE 5	5a,5b,6a,7a,9a, 9b,11,13a,13d,20, 23
-C	A	NONE	NONE
-D	B	NONE	6a,7a,11,13a,13d
-E	B	NONE	NONE
-F	A OR B(c)	NONE	NONE
-G (FIRE ZONE 14C)	A	SEE NOTE 6	5b,6b,12
-G (OTHER FIRE ZONES)	B	SEE NOTE 6	5a,6a,10a,11,12, 13a,13d,20,23
-H	B	NONE	NONE
-I	B	NONE	5a,6a,11,13a,13d, 23
-J	B	NONE	NONE
2-AB-LC-A	A	NONE	12
-B	B	NONE	5a,6a,7a,13a,13d, 23
-C	B	SEE NOTE 7	7a,11
-D	B	NONE	5a,11,12
-E	A	NONE	5b,6b,11,12

a. Fire areas & zones are defined in FSAR Appendix 9A.
b. Safe shutdown trains are defined in FSAR Table 9.5.1-1.
c. No safe shutdown equipment or circuits in the fire area.

TABLE 2-1
(Sheet 2 of 11)

UNIT 2 SUMMARY OF RESULTS FOR FIRES OUTSIDE THE CONTROL ROOM

FIRE AREA(a)	AVAILABLE SAFE SHUTDOWN TRAIN(b)	SPECIAL CONSIDERATIONS: OPERATIONAL/ DESIGN	SPECIAL CONSIDERATIONS: SPURIOUS ACTUATIONS (See Section 3)
2-AB-LB-A	A	NONE	6a,6b,11,12
-B	B	SEE NOTE 8	6a,10a,11,12,23
2-AB-LA-A	B	NONE	5a,6a
-B	A	SEE NOTE 9	6c
-C	B	NONE	13a
-D	B	NONE	13a, 20
-E	B	SEE NOTE 10	13a,13d,20
2-AB-L1-B	A	NONE	5b,6c,12
-C	B	NONE	5a,11
2-AB-L2-A	A	NONE	NONE
-C	A OR B(c)	NONE	NONE
-E	B	NONE	13a,13d
2-CB-LC-A	B	NONE	1a,1b,1d,3c,4a, 5a,6a,7a,13a,13d, 14a,23
-B	B	SEE NOTE 11	1a,3c,4a,15
2-CB-LB-A	B	SEE NOTE 12	1a,1b,1c,1d,1e,4c, 7a,15
-B	B	NONE	1a,1b,1c,1d,1e,4c
-C	A	NONE	2a,22b
-D	A	SEE NOTE 13	2a,2b,2c,3b,3c,4a, 4d,7b,8a,8b,10a, 10b,13b,13c,15,16a, 16b,17a,19
-E	A OR B(c)	NONE	NONE
-F	A OR B(c)	NONE	NONE
-G	A OR B(c)	NONE	NONE
-H	A	NONE	13b,13c
-I	A OR B	NONE	3b,3c,4a,8a,8b,9a, 9b,10a,10b
-J	A	NONE	NONE
-K	B	NONE	1a
-L	B	NONE	1d,15
-M	B	NONE	1a
-N	B	NONE	1a,22a
-O	A	NONE	2a
-P	A	NONE	2a,2b,2c,13b,13c, 15,22b

a. Fire areas and zones are defined in FSAR Appendix 9A.
b. Safe shutdown trains are defined in FSAR Table 9.5.1-1.
c. No safe shutdown equipment or circuits in the fire area.

TABLE 2-1
(Sheet 3 of 11)

UNIT 2 SUMMARY OF RESULTS FOR FIRES OUTSIDE THE CONTROL ROOM

FIRE AREA(a)	AVAILABLE SAFE SHUTDOWN TRAIN(b)	SPECIAL CONSIDERATIONS	
		OPERATIONAL/ DESIGN	SPURIOUS ACTUATIONS (See Section 3)
2-CB-LB-Q	A	NONE	NONE
-T	B	NONE	1a,1b,1c,1d,1e,4c, 7a,16a,16b,17a,19
-X	B	NONE	1a,6a,13a,13d,14a
2-CB-LA-A	A	SEE NOTE 14	13b,13c,20
-B	A	NONE	13b
-C	A OR B(c)	NONE	NONE
-D	A	SEE NOTE 15	13b,13c
-F	A OR B	NONE	14a
-G	B	NONE	1a,1c,3a,3b,3c,4a, 4c,5a,6a,7a,13a,13d, 14a,15,17b
-H	A	NONE	4a,14b,15,17b
-I	A	NONE	2a,2b,2c,4d,5b, 6b,6c, 7b,8a,8b,10a,10b, 13b,13c,14b,15,18, 20,23
-J	A	NONE	NONE
-K	B	SEE NOTE 16	1a,1b,1c,1d,1e,2a, 2b,3a,3b,3c,4a,4b, 4c,5a,6a,7a,9a,9b, 13a,13d,14a,15,16a, 16b,17a,19,20, 21,22a,23,24,25, 26a,26b
-L	A	NONE	1d,2a,2b,2c,4d,5b, 6b,6c,7b,8b,13b, 13c,14b,19
-M	B	NONE	1d,3b,14a,15
-N	B	NONE	1a,1c,2a,3b,3c,4a, 5a,14a,15
-O	A OR B	NONE	3a,3b,3c,4a,4b,8a, 8b
-P	B	NONE	1a,1b,1c,1d,1e,4c, 5a,6a,13a,13d,14a, 15,19,20,23

a. Fire areas and zones are defined in FSAR Appendix 9A.
b. Safe shutdown trains are defined in FSAR Table 9.5.1-1.
c. No safe shutdown equipment or circuits in the fire area.

TABLE 2-1
(Sheet 4 of 11)

UNIT 2 SUMMARY OF RESULTS FOR FIRES OUTSIDE THE CONTROL ROOM

FIRE AREA(a)	AVAILABLE SAFE SHUTDOWN TRAIN(b)	SPECIAL CONSIDERATIONS: OPERATIONAL/ DESIGN	SPECIAL CONSIDERATIONS: SPURIOUS ACTUATIONS (See Section 3)
2-CB-LA-Q	A OR B	NONE	1d,3b,8a,8b,9a,9b, 10a,10b
-R	A	NONE	2a,2b,2c,4d,5b,6b, 6c,7b,13b,13c,14b, 15,16a,16b,17a,18, 19,20,22b,23,25, 26a,26b
-S	A	NONE	13b,13c
-T	A	NONE	13c,20
-X	B	See Note 17	1a,1d,2a,4a,4c, 6a,9b,13a,13d,14a, 15,19
2-CB-L1-E	A OR B(c)	NONE	NONE
-F	B	NONE	NONE
2-CB-L2-A	A	NONE	14b,15
-B	A	NONE	1d,2a,2b,2c,4d,5b, 6b,6c,7b,8b,10a,10b, 13b,13c,14b,15, 16a,16b,17a,18,19, 20,21,22b,23,24,25, 26a,26b
2-CB-L3-B	A OR B (c)	NONE	NONE
-C	B	NONE	NONE
2-FB-LC-A	A	NONE	5b,6b,6c,7b,8a,8b, 10a,10b,18,23
2-CTB	A/B	SEE NOTE 18	1a,1b,1c,1d,1e,2a, 2b,2c,3a,3b,3c,4a, 4b,4c,4d,7a,7b,16a, 16b,17a,19
	A	NONE	13b
2-DB-L1-A	B	NONE	NONE
-B	A	NONE	NONE
-C	B	NONE	NONE
-D	A	NONE	NONE
2-DPB-A	B	NONE	NONE

a. Fire areas and zones are defined in FSAR Appendix 9A.
b. Safe shutdown trains are defined in FSAR Table 9.5.1-1.
c. No safe shutdown equipment or circuits in the fire area.

UNIT 2 SUMMARY OF RESULTS FOR FIRES OUTSIDE THE CONTROL ROOM

FIRE AREA(a)	AVAILABLE SAFE SHUTDOWN TRAIN(b)	SPECIAL CONSIDERATIONS	
		OPERATIONAL/ DESIGN	SPURIOUS ACTUATIONS (See Section 3)
2-DPB-B	A	NONE	NONE
2-AFB-A	A	SEE NOTE 19	NONE
-B	B	NONE	NONE
-C	A OR B	SEE NOTE 19	15
-D	A OR B	SEE NOTE 19	NONE
2-NSP-LA-A	B	NONE	NONE
-B	A	SEE NOTE 20	NONE

a. Fire areas and zones are defined in FSAR Appendix 9A.
b. Safe shutdown trains are defined in FSAR Table 9.5.1-1.
c. No safe shutdown equipment or circuits in the fire area.

NOTES:

1. Special Operational Considerations for Fire Area 1-CB-L1-B:

   a. Fire damage to the control room essential cooling system dampers HV-12128, HV-12129, HV-12130 and HV-12131 may require that the plant shutdown be achieved from the Train A remote shutdown panel should the control room become uninhabitable due to lack of cooling.

   b. Fire damage to the control room ceiling lighting power sources located in this fire area may require that the plant shutdown be achieved from the Train A remote shutdown panel.

2. Special Operational Consideration for Fire Areas 1-CB-LA-N, 1-CB-LA-P, 1-CB-LA-R, 1-CB-L1-C, 1-CB-L1-F, 1-CB-L2-C, 1-CB-L3-C:

   To preclude smoke infiltration into the control room due to a fire in this fire area, close the normal ventilation system isolation dampers by using both the Train A and B control switches (the electrical circuits for at least one of the redundant dampers is free of fire damage).

3. Special Operational Consideration for Fire Area 1-CB-L1-G:

It may not be possible to close either control room kitchen, toilet and converence room ventilation exhaust damper HV-12162 or HV-12163 due to a fire in this fire area. To assist in precluding smoke infiltration into the control room, stop operation of the kitchen, toilet and conference room ventilation fan A-1531-B7-008 by tripping breaker 11 in 480V MCC ANBC.

4 Special Operational and Design Considerations for Fire Area 2-AB-LD-A:

a. Fire damage to cables for both boric acid transfer pump discharge valves HV-8104 and HV-8439 may require use of the refueling water storage tank and RCS letdown to achieve RCS boration. Valve LV-0112D can be opened from the control room.

b. Conduit 2CE442RX294 is wrapped to protect the Train A safe shutdown cables for PT-0408 and PT-11741 from a fire in this fire area.

5. Special Operational and Design Considerations for Fire Area 2-AB-LD-B:

a. Use Train B to achieve safe shutdown with the following operational considerations unless the fire is in rooms D11 of fire zone 13, C21 of fire zone 24 or B92 of fire zone 40:

1. Starting of the Train B RHR pump room cooler 2-1555-A7-008 from the remote shutdown panel may be required due to a fire in this fire area.

2. Fire damage to both boric acid transfer pump discharge valves HV-8104 and HV-8439 and both BAST level transmitters LT-0102 and LT-0104 or their associated cables may require use of the refueling water storage tank and RCS letdown to achieve RCS boration. Valve LV-0112E can be opened from the control room.

3. Fire damage to the Train B RHR mini-flow valve circuits may require verification of the position of FV-0611 during RHR system operation. Trip breaker 38 in 480V MCC 2BBD and locally open valve FV-0611 as necessary.

b. Use Train A to achieve safe shutdown if the fire is in rooms D11 of fire zone 13, C21 of fire zone 24 or B92 of fire zone 40 where fire can damage PT-11742 or its associated electrical cable.

c. Pull box 2DE443KXJ01 is wrapped to protect the Train B safe shutdown cable for PT-11742 from a fire in this fire area.

6. Special Operational Considerations for Fire Area 2-AB-LD-G:

a. Use safe shutdown Train A if the fire is in fire zone 14C.

b. Use safe shutdown Train B if the fire is not in fire zone 14C. Fire damage to cables for both boric acid transfer pumps and BAST level transmitters may require use of the refueling water storage tank and RCS letdown to achieve RCS boration. Valve LV-0112E can be opened from the control room.

7. Special Design Consideration for Fire Area 2-AB-LC-C:

Pull box 2DE443KXJ02 is wrapped to protect the Train B safe shutdown cables for LT-0104 and PT-11742 from a fire in this fire area.

8. Special Operational Consideration for Fire Area 2-AB-LB-B:

Due to fire damage to the high pressure safety injection path valves HV-8801A and HV-8801B and their associated cables, it may be necessary to add makeup to the reactor coolant system using the Train B charging pump through the Train A safe shutdown charging path (HV-0190A and HV-8116) in this fire area. Circuits for the valves in this recommended flow path are not subject to fire damage in this fire area.

9. Special Operational Consideration for Fire Area 2-AB-LA-B:

Local level indicator LI-0990C is available should fire damage to the redundant refueling water storage tank level indication cables result in loss of RWST level indication in the control room due to a fire in this fire area.

10. Special Operational Considerations for Fire Area 2-AB-LA-E:

    a. Isolation of steam flow from steam generators 1 and 4 by other than closure of the main steam isolation valves and their bypass valves may be required to preclude uncontrolled cooldown and steam generator boil dry due to a fire in this fire area.

    b. Isolation of main feedwater flow to steam generators 1 and 4 by other than closure of the main feedwater isolation and bypass valves may be required to preclude uncontrolled cooldown and steam generator overfilling due to a fire in this fire area.

    c. Fire damage to the electrical cables for high pressure safety injection valve HV-8801B may necessitate opening valve HV-8801A (free of fire damage for this area) to accomplish RCS boration and makeup addition using the Train B centrifugal charging pump.

11. Special Operational and Design Considerations for Fire Area 2-CB-LC-B:

    a. Fire damage to the Train B CBSF battery room exhaust fans 2-1532-B7-002 and 2-1532-B7-004, and their associated discharge dampers, HV-12727 and HV-12749, may require use of portable ventilation (not required for at least 48 hours) to dilute hydrogen build-up in the Train B battery rooms (B32 and B37).

    b. The following raceway are wrapped to protect essential Train B safe shutdown cables from a fire in this fire area:

2BE350TLAM	2DE350TXAH
2BE350RR218	2DE350TQAG
2BE350RX286	2DE350RQ127
2BE350RS136	2DE350RQ210
2BE350RS018	2DE350RX142
2BE350RS077	2DE350RX145

12. Special Operational Consideration for Fire Area 2-CB-LB-A:

    Fire damage to the reactor trip switchgear may necessitate ensuring reactor trip by some other means. Tripping breaker 10 in 480V switchgear 2NB08 and breaker 10 in 480V switchgear 2NB09 will ensure reactor trip by deenergizing the rod drive motor generator sets.

13. Special Design Considerations for Fire Area 2-CB-LB-D:

The following raceway are wrapped to protect essential Train A safe shutdown cables from a fire in this fire area:

2CE361KXH01	2CE340KXH02
2CE361KPH01	2CE340KPH02

14. Special Operational Consideration for Fire Area 2-CB-LA-A:

The main feedwater isolation and bypass valves for steam generators 2 and 3 can be closed from the control room using switches HS-5228B, HS-5229B, HS-15197A and HS-15198A. The Train B electrical circuits associated with these switches are not subject to fire damage in this fire area.

15. Special Operational Considerations for Fire Area 2-CB-LA-D:

a. Isolation of steam flow from steam generators 2 and 3 by other than closure of the main steam isolation valves and their bypass valves may be required to preclude uncontrolled cooldown and steam generator boil dry due to a fire in this fire area.

b. Isolation of main feedwater flow to steam generators 2 and 3 by other than closure of the main feedwater isolation and bypass valves may be required to preclude uncontrolled cooldown and steam generator overfilling due to a fire in this fire area.

16. Special Operational Considerations for Fire Area 2-CB-LA-K:

a. Fire damage to instrument cables associated with the Train B RCS wide range pressure transmitter PT-0403 may necessitate use of control room RCS pressure indicator PI-0418.

b. Fire damage to instrumentation cables associated with the Train B RHR pump suction valve pressure interlock transmitter PT-0428 may necessitate opening valve HV-8702B from the Train B remote shutdown panel.

17. Special Design Consideration for Fire Area 2-CB-LA-X:

Conduit 2BE342RX135 is wrapped to protect the Train B safe shutdown cables for RE-13135B from a fire in this fire area.

18. Special Operational and Design Considerations for Fire Area 2-CTB:

a. For a fire in this area, use safe shutdown Train A or B depending on the location of the fire. In general, the east and north portions of the containment annulus area outside the secondary shield wall (fire zone 140B) and the north steam generator/reactor coolant pump area inside the secondary shield contains safe shutdown Train B equipment and cables. Similarly, the west and south portions of the containment annulus area outside the secondary shield wall (fire zone 140A) and the south steam generator/reactor coolant pump area inside the secondary shield wall contains safe shutdown Train A equipment and cables.

b. A radiant energy shield is provided for PT-0403 and LT-0459 to preclude simultaneous fire damage to these devices and instrumentation cables of their redundant counterparts.

c. The following raceway are wrapped to protect essential safe shutdown cables from a fire in this fire area:

2AE53ARX321	2BE53BKXJ01
2AE53ARX323	2BE52AKXJ98
2ARJB0056	2BRJB0050
2AE53AKXJ95	2BE532RX065

19. Special Operational Consideration for Fire Areas 2-AFB-A, 2-AFB-C AND 2-AFB-D:

Local level indicators LI-5100 and LI-5115 are available should fire damage to the condensate storage tank level transmitters and/or their associated electrical cables result in loss of CST level indication in the control room due to a fire in this fire area.

20. Special Operational Consideration for Fire Area 2-NSP-LA-B:

Local level indicator LI-0990C is available should fire damage to the refueling water storage tank level transmitter cables result in loss of RWST level indication in the control room due to a fire in this fire area.

3.0 SPURIOUS ACTUATION CONSIDERATIONS

Fire induced hot shorts, shorts to ground and opens in electrical circuitry may result in the spurious actuation or inaction of components which may impact the capability to achieve safe shutdown. While fire induced spurious actuation concerns can be eliminated by providing protective wrappings of circuits, it is impractical to wrap all spurious actuation concern circuits in the plant. Operator actions can be taken to preclude or terminate these undesired events. The following sections present spurious actuation concerns for each plant fire area in which they occur. Each section describes the spurious actuation in the following format:

- Possible Spurious Actuations

  The potential undesirable spurious control actions/inactions of the as-built systems are summarized.

- Key Monitorable Parameters (functional)

  Those available parameters which enable the operator to identify the spurious component action/inactions are listed. These parameters are electrically and physically independent of the fire under consideration.

- Time Constraints

  Critical time constraints for system or component operation are quantified.

- Operational Considerations

  The basis for operator action(s) required to prevent or mitigate the adverse effects of the spurious control action/inactions summarized in the possible spurious actuations, is detailed.

- Compensatory Measures

  The measures to accomplish each of the operational considerations is presented. These or other equivalent compensatory measures should be included in the plant operating procedures as applicable.

A. Possible Spurious Actuations

1a. Pressurizer PORV PV-0455A may open due to a fire in this fire area.

1b. Pressurizer PORV PV-0455A may open if cold overpressure protection is armed due to fire damage to PT-0405 circuits in this fire area.

1c. Pressurizer PORV PV-0455A may open and it may not be possible to close block valve HV-8000A due to a fire in this fire area.

1d. Pressurizer PORV PV-0455A and both pressurizer spray valves PV-0455B and PV-0455C may open due to fire damage to PT-0455/PT-0457 circuits in this fire area.

1e. Pressurizer PORV PV-0455A and both pressurizer spray valves PV-0455B and PV-0455C may open (PT-0455/PT-0457 circuit damage) and it may not be possible to close block valve HV-8000A due to a fire in this fire area.

2a. Pressurizer PORV PV-0456A may open due to a fire in this fire area.

2b. Pressurizer PORV PV-0455A may open if cold overpressurization is armed due to fire damage to PT-0403 circuits in this fire area.

2c. Pressurizer PORV PV-0456A may open and it may not be possible to close block valve HV-8000B due to a fire in this fire area.

3a. Pressurizer spray valve PV-0455B may open due to a fire in this fire area.

3b. Pressurizer spray valve PV-0455C may open due to a fire in this fire area.

3c. Pressurizer auxiliary spray valve HV-8145 may open due to a fire in this fire area.

4a. It may not be possible to close either letdown isolation valve LV-0459 or LV-0460 due to a fire in this fire area.

4b. Excess letdown valves HV-8153, HV-8154 and HV-0123 may all open due to a fire in this fire area.

4c. Reactor vessel head letdown path valves HV-8095A, HV-8096A and HV-0442A may all open due to a fire in this fire area.

4d. Reactor vessel head letdown path valves HV-8095B, HV-8096B and HV-0442B may open due to a fire in this fire area.

5a. CVCS volume control tank outlet valve LV-0112B may close due to fire in this fire area.

5b. CVCS volume control tank outlet valve LV-0112C may close due to fire in this fire area.

6a. CVCS charging pump common mini-flow valve HV-8110 may close due to a fire in this fire area.

6b. CVCS Train A charging pump mini-flow valve HV-8111A may close due to a fire in this fire area.

6c. The Train A charging path containment isolation valve HV-8105 may close due to a fire in this fire area.

7a. Both Train A RHR pump suction valves HV-8701A and HV-8701B may open due to a fire in this fire area.

7b. Both Train B RHR pump suction valves HV-8702A and HV-8702B may open due to a fire in this fire area.

8a. Train A RHR heat exchanger outlet valve HV-0606 may close due to a fire in this fire area.

8b. Train A RHR heat exchanger bypass valve FV-0618 may open due to a fire in this fire area.

9a. Train B RHR heat exchanger outlet valve HV-0607 may close due to a fire in this fire area.

9b. Train B RHR heat exchanger bypass valve FV-0619 may open due to a fire in this fire area.

10a. Train A RHR system vent valve HV-10465 may open due to a fire in this fire area.

10b. Train B RHR system vent valve HV-10466 may open due to a fire in this fire area.

11. RHR to CVCS charging pump valve HV-8804A may open due to a fire in this fire area.

12. RHR to safety injection pump valve HV-8804B may open due to a fire in this fire area.

13a. Main steam atmospheric dump valve PV-3000 may open due to a fire in this fire area.

13b. Main steam atmospheric dump valve PV-3010 may open due to a fire in this fire area.

13c. Main steam atmospheric dump valve PV-3020 may open due to a fire in this fire area.

13d. Main steam atmospheric dump valve PV-3030 may open due to a fire in this fire area.

14a. Train A motor driven auxiliary feedwater pump 2-1302-P4-003 may start due to a fire in this fire area.

14b. Train B motor driven auxiliary feedwater pump 2-1302-P4-002 may start due to a fire in this fire area.

15. The turbine driven auxiliary feedwater pump 2-1302-P4-001 may start due to fire damage to HV-5106 circuits in this fire area.

16a. Automatic starting of the Train A motor driven auxiliary feedwater pump 2-1302-P4-003 may occur due to fire damage to steam generator 1 and 4 level or feedwater flow transmitter circuits in this fire area.

16b. Automatic starting of the Train B motor driven auxiliary feedwater pump 2-1302-P4-002 may occur due to fire damage to steam generator 2 and 3 level or feedwater flow transmitter circuits in this fire area.

17a. Automatic starting of the turbine driven auxiliary feedwater pump 2-1302-P4-001 may occur due to fire damage to steam generator level or feedwater flow transmitter circuits in this fire area.

17b. Automatic starting of the turbine driven auxiliary feedwater pump 2-1302-P4-001 may occur due to fire damage to the undervoltage relay LOP signal circuits in this fire area.

18. Safety injection actuation may occur due to fire damage to containment pressure circuits in this fire area.

19. Safety injection actuation may occur due to fire damage to pressurizer pressure circuits in this fire area.

20. Safety injection actuation may occur due to fire damage to steam line pressure circuits in this fire area.

21. Safety injection actuation may occur due to fire damage to the manual actuation switch circuits in this fire area.

22a. Safety injection actuation may occur due to fire damage to solid state protection cabinet 2-1605-Q5-SPA 125V DC power feeder circuits in this fire area.

22b. Safety injection actuation may occur due to fire damage to solid state protection cabinet 2-1605-Q5-SPB 125 V DC power feeder circuits in this fire area.

23. Containment spray actuation may occur due to fire damage to containment pressure circuits in this fire area.

24. Containment spray actuation may occur due to fire damage to the manual actuation switch circuits in this fire area.

25. Safety injection and containment spray actuation may occur due to fire damage to process control cabinet power feeders in this fire area.

26a. Safety injection and containment spray actuation may occur due to fire damage to solid state protection cabinet 2-1605-Q5-SPA 120V AC power feeder circuits in this fire area.

26b. Safety injection and containment spray actuation may occur due to fire damage to solid state protection cabinet 2-1605-Q5-SPB 120V AC power feeder circuits in this fire area.

B. Key Monitorable Parameters (functional)

1. RCS pressure and pressurizer level
2. RCS pressure and pressurizer level
3. RCS pressure
4. Pressurizer level
5. Pressurizer level
6. Pressurizer level
7. N/A (See Compensatory Measure)
8. RCS temperature
9. RCS temperature
10. RWST level/pressurizer level (See operational considerations)
11. N/A (See Compensatory Measure.)
12. N/A (See Compensatory Measure.)
13. RCS temperature and steam generator level
14. Steam generator level and/or CST level
15. Steam generator level and/or CST level
16. Steam generator level and/or CST level
17. Steam generator level and/or CST level
18. Pressurizer level and RCS pressure
19. Pressurizer level and RCS pressure
20. Pressurizer level and RCS pressure
21. Pressurizer level and RCS pressure
22. Pressurizer level and RCS pressure
23. RWST level
24. RWST level
25. Pressurizer level, RCS pressure and/or RWST level
26. Pressurizer level, RCS pressure and/or RWST level

C. Time Constraints

1a. The reactor coolant system may depressurize to the Safety Injection Actuation (SIA) set point in less than 1 minute* if one pressurizer PORV opens.

1b. Reactor coolant depressurization and loss of RCS inventory is not an immediate concern when cold over-pressurization is armed.

* Assumes no pressurizer heaters available.

1c. The reactor coolant system may depressurize to the SIA set point in less than 1 minute* if one pressurizer PORV opens.

1d. The reactor coolant system may depressurize to the SIA set point in approximately 47 seconds* if simultaneous opening of both spray valves and 1 PORV occurs (fire damage to PT-0455/PT-0457 circuits).

1e. The reactor coolant system may depressurize to the SIA set point in approximately 47 seconds* if simultaneous opening of both spray valves and 1 PORV occurs (fire damage to PT-0455/PT-0457 circuits).

2a. The reactor coolant system may depressurize to the SIA set point in less than 1 minute* if one pressurizer PORV opens.

2b. Reactor coolant depressurization and loss of RCS inventory is not an immediate concern when cold over-pressurization is armed.

2c. The reactor coolant system may depressurize to the SIA sent point in less than 1 minute* if one pressurizer PORV opens.

3a. The reactor coolant system may depressurize to the SIA set point in less than 4 minutes in the event one pressurizer spray valve opens.

3b. The reactor coolant system may depressurize to the SIA set point in less than 4 minutes in the event one pressurizer spray valve opens.

3c. The reactor coolant system may depressurize to the SIA set point in approximately 3.5 minutes if the auxiliary spray valve opens.

4a. There is no immediate concern about not being able to isolate letdown using LV-0459 or LV-0460.

4b. There is no immediate concern associated with spurious simultaneous opening of excess letdown valves HV-8153, HV-8154 and HV-0123. (See Operational Considerations and Compensatory Measures.)

4c. Spurious letdown through the reactor vessel head letdown path is not a concern requiring immediate operator action. (See Operational Considerations and Compensatory Measures).

4d. Spurious letdown through the reactor vessel head letdown path is not a concern requiring immediate operation action. (See operational considerations and compensatory measures).

5. Loss of suction to any operating centrifugal charging pumps can result in pump damage within approximately 10 seconds.

6a. Loss of mini-flow recirc for any operating centrifugal charging pumps can result in pump damage within approximately 30 seconds (RCP seal flow considered).

6b. Loss of mini-flow recirc for any operating centrifugal charging pumps can result in pump damage within approximately 30 seconds (RCP seal flow considered).

6c. There is no immediate concern associated with HV-8105, CVCS containment isolation, closing. (See Compensatory Measures.)

7. N/A (See Compensatory Measures.)

8. There is no immediate concern associated with loss of RCS cooling due to RHR heat exchanger outlet valve closure or bypass valve opening.

9. There is no immediate concern associated with loss of RCS cooling due to RHR heat exchanger outlet valve closure or bypass valve opening.

10. There is no immediate concern associated with an RHR system vent valve opening. (See operational considerations)

11. N/A (See Compensatory Measures.)

12. N/A (See Compensatory Measures.)

13. Assuming reactor trip and closure of the MSIVs, a steam generator can boil dry in approximately 13 minutes assuming no main feedwater, no auxiliary feedwater, RCPs running and a steam generator ADV open.

14. One steam generator level can reach an over-fill condition in approximately 20 minutes, assuming no main feedwater flow and one steam generator is receiving the full flow from one motor driven pump, spurious closure of one auxiliary feedwater valve, and 1/4 of the flow from the turbine driven pump.

15. One steam generator level can reach an overfill condition in approximately 20 minutes, assuming no main feedwater flow and one steam generator is receiving the full flow from one motor driven pump, spurious closure of one auxiliary feedwater valve, and 1/4 of the flow from the turbine driven pump.

16. One steam generator level can reach an overfill condition in approximately 20 minutes, assuming no main feedwater flow and one steam generator is receiving the full flow from one motor driven pump, spurious closure of one auxiliary feedwater valve, and 1/4 of the flow from the turbine driven pump.

17. One steam generator level can reach an overfill condition in approximately 20 minutes, assuming no main feedwater flow and one steam generator is receiving the full flow from one motor driven pump, spurious closure of one auxiliary feedwater valve, and 1/4 of the flow from the turbine driven pump.

18. Safety injection actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

19. Safety injection actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

20. Safety injection actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

21. Safety injection actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

22. Safety injection actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

23. Containment spray actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

24. Containment spray actuation is not a concern requiring immediate operator action (See Operational Considerations and Compensatory Measures).

25. Safety injection and containment spray actuations are not concerns requiring immediate operator actions (See Operational Considerations and Compensatory Measures).

26. Safety injection and containment spray actuations are not concerns requiring immediate operator actions (See Operational Considerations and Compensatory Measures).

D. Operational Considerations

1. RCS pressure control is necessary to ensure adequate subcooling margin, and RCS inventory control is necessary to ensure maintaining the core covered.

2. RCS pressure control is necessary to ensure adequate subcooling margin, and RCS inventory control is necessary to ensure maintaining the core covered.

3. RCS pressure control is necessary to ensure adequate subcooling margin.

4. RCS inventory control is necessary to ensure maintaining the core covered.

5. At least one centrifugal charging pump must be operational in order to control RCS inventory and RCS boration.

6a. At least one centrifugal charging pump must be operational in order to control RCS inventory and RCS boration.

6b. At least one centrifugal charging pump must be operational in order to control RCS inventory and RCS boration.

6c. Charging flow into the RCS is necessary to maintain RCS inventory. (See compensatory measures.)

7. N/A (See Compensatory Measures.)

8. Control of RHR heat exchanger bypass and outlet valves is necessary to control RCS cooldown rate.

9. Control of RHR heat exchanger bypass and outlet valves is necessary to control RCS cooldown rate.

10. RHR system vent valve closure is necessary to prevent undesired loss of reactor coolant during shutdown cooling RHR system operation. Spurious vent valve opening prior to system starting can result in limited loss of RWST volume.

11. Fire induced spurious opening of HV-8804A during RHR system shutdown cooling operation could result in CVCS charging pump suction piping over pressurization and/or RCS inventory loss.

12. Fire induced spurious opening of HV-8804B during RHR system shutdown cooling operation could result in safety injection pump suction piping over pressurization and/or RCS inventory loss.

13. Steam generator level and pressure control is necessary to preclude uncontrolled RCS cool-down and depressurization.

14. Control of auxiliary feedwater is necessary to ensure the ability to achieve safe shutdown.

15. Control of auxiliary feedwater is necessary to ensure the ability to achieve safe shutdown.

16. Control of auxiliary feedwater is necessary to ensure the ability to achieve safe shutdown.

17. Control of auxiliary feedwater is necessary to ensure the ability to achieve safe shutdown.

18. Fire induced safety injection actuation during plant shutdown operations can result in RCS repressurization.

19. Fire induced safety injection actuation during plant shutdown operations can result in RCS repressurization.

20. Fire induced safety injection actuation during plant shutdown operations can result in RCS repressurization.

21. Fire induced safety injection actuation during plant shutdown operations can result in RCS repressurization.

22. Fire induced safety injection actuation during plant shutdown operations can result in RCS repressurization.

23. Fire induced containment spray actuation during plant shutdown operations can result in undesired loss of RWST volume.

24. Fire induced containment spray actuation during plant shutdown operations can result in undesired loss of RWST volume.

25. Fired induced safety injection and containment spray actuation during plant shutdown operations can result in RCS repressurization and undesired loss of RWST volume.

26. Fired induced safety injection and containment spray actuation during plant shutdown operations can result in RCS repressurization and undesired loss of RWST volume.

E. Compensatory Measures

1a. RCS depressurization/inventory loss can be terminated by closing the open pressurizer PORV block valve which is not subject to fire damage due to a fire in this fire area.

1b. RCS depressurization/inventory loss can be terminated by closing the open pressurizer PORV block valve or by tripping the PORV power supply breaker (breaker 04 in 125Vdc MCC 2AD1M).

1c. To ensure closure of pressurizer PORV PV-0455A when it may not be possible to close its respective block valve, trip the valve power supply breaker (breaker 04 in 125V dc MCC 2AD1M).

1d. RCS depressurization/inventory loss can be terminated by closing the open pressurizer PORV block valve or by tripping the PORV power supply breaker (breaker 04 in 125V dc MCC 2AD1M) and by tripping the loop 1 and 4 reactor coolant pumps to stop spray flow through the spray valves.

1e. To ensure closure of pressurizer PORV PV-0455A when it may not be possible to close its respective block valve, trip the valve power supply breaker (breaker 04 in 125V dc MCC 2AD1M). Undesired pressurizer spray flow can be stopped by tripping the reactor coolant pumps for loops 1 and 4.

2a. RCS depressurization/inventory loss can be terminated by closing the open pressurizer PORV block valve which is not subject to fire damage due to a fire in this fire area.

2b. RCS depressurization/inventory loss can be terminated by closing the open pressurizer PORV block valve or by tripping the PORV power supply breaker (breaker 04 in 125V dc MCC 2BD1M).

2c. To ensure closure of pressurizer PORV PV-0456A when it may not be possible to close its respective block valve, trip the valve power supply breaker (breaker 04 in 125V dc MCC 2BD1M).

3a. Tripping the loop 1 and 4 reactor coolant pumps will stop spray flow through the spray valves.

3b. Tripping the loop 1 and 4 reactor coolant pumps will stop spray flow through the spray valves.

3c. To terminate the undesired RCS pressure reduction caused by spurious opening of the pressurizer auxiliary spray valve HV-8145, stop operation of the charging pumps. To preclude opening or to ensure closure of pressurizer auxiliary spray valve HV-8145 trip breaker 21 in 125V dc panel 2ND31 and breaker 14 in 125V dc panel 2ND32.

4a. To ensure isolation of letdown, trip the valve (LV-0459 and LV-0460) power supply breaker 21 in 125V dc panel 2ND31 and breaker 14 in 125V dc panel 2ND32.

4b. To preclude loss of reactor coolant via the excess letdown path (requires multiple hot shorts for the situation to occur) trip the power supply breaker for HV-8153 and HV-8154 (breaker 14 in 125V dc panel 2ND32).

4c. To preclude loss of reactor coolant via the Train A reactor head letdown path (requires multiple hot shorts for the situation to occur) trip the power supply breaker for at least one valve. Breaker 03 in 125V dc panel 2AD12 is the power supply to HV-0442A.

4d. To preclude loss of reactor coolant via the Train B reactor head letdown path (requires multiple hot shorts for the situation to occur) trip the power supply breaker for at least one valve. Breaker 03 in 125V dc panel 2BD12 for HV-0442B.

5. To ensure a suction head to the centrifugal charging pumps where fire may cause spurious closure of a VCT outlet valve, align the pumps with the RWST by opening LV-0112D and/or LV-0112E.

6a. To preclude damage to either operating centrifugal charging pump due to fire induced closure of the common mini-flow valve HV-8110, stop pump operation or ensure flow to the RCS (in addition to RCP seal flow) until HV-8110 is ensured open. To preclude HV-8110 spurious closure trip breaker 11 in 480V MCC 2ABD.

6b. To preclude damage to the Train A charging pump 2-1208-P6-002 due to fire induced closure of HV-8111A, stop pump operation or ensure flow to the RCS (in addition to RCP seal flow) until HV-8111A is ensured open. To preclude HV-8111A spurious closure trip breaker 11 in 480V MCC 2BBD.

6c. To ensure the ability to charge to the RCS using the Train A centrifugal charging pump either align the pump discharge to charge thru the high head safety injection path by opening HV-8801A and/or HV-8801B (control flow by intermittent charging pump operation or valve operation) or local manually open HV-8105 (the normal Train A charging path for safe shutdown is via throttle valve HV-0190A and HV-8105) after tripping its power supply (breaker 12 in 480V MCC 2BBB). Tripping the valve power supply prior to closure of the valve will preclude spurious fire induced valve closure.

7. The RHR suction valves are closed and the power supply breakers for the valves are locked in the tripped open position when RCS pressure is greater than RHR system operating pressure.

HV-8701A: 480V MCC 2ABE breakers 15-1 and 15-2

HV-8701B: Inverter 2CD1I5 and motor starter 2CD1I5N breakers

HV-8702A: Inverter 2DD1I6 and motor starter 2DD1I6N breakers

HV-8702B: 480V MCC 2BBE breakers 13-1 and 13-2

8. To ensure the ability to accomplish a cooldown using the Train A RHR system, it may be necessary to open RHR heat exchanger outlet valve HV-0606 and/or close RHR heat exchanger bypass valve FV-0618 by local isolation and venting of the valve air set instrument air supply.

9. To ensure the ability to accomplish a cooldown using the Train B RHR system, it may be necessary to open RHR heat exchanger outlet valve HV-0607 and/or close RHR heat exchanger bypass valve FV-0619 by local isolation and venting of the valve air set instrument air supply.

10. To preclude opening or to ensure closure of both RHR system vent valves, HV-10465 and HV-10466, trip breaker 08 in 125V dc panel 2ND31.

11. To preclude CVCS charging pump suction piping over-pressurization and/or RCS inventory loss due to spurious opening of HV-8804A, trip the valve power supply breaker (breaker 05 in 480V MCC 2ABB) and verify the valve in the closed position whenever the RHR system is operated in the shutdown cooling mode of operation. (NOTE: Applicable procedures should address the need to re-energize HV-8804A in preparation for cold leg recirculation if a mode 4 LOCA should occur.)

12. To preclude safety injection pump suction piping over-pressurization and/or RCS inventory loss due to spurious opening of HV-8804B, trip the valve power supply breaker (breaker 05 in 480V MCC 2BBB) and verify the valve in the closed position whenever the RHR system is operated in the shutdown cooling mode of operation. (NOTE: Applicable procedures should address the need to re-energize HV-8804B in preparation for cold leg recirculation if a mode 4 LOCA should occur.)

13. To preclude opening or to ensure closure of a main steam ADV, trip its power supply:

PV-3000 (breaker 17 in 120V ac panel 2AY2A)
PV-3010 (breaker 10 in 120V ac panel 2BYC1)
PV-3020 (breaker 12 in 120V ac panel 2BYC1)
PV-3030 (breaker 18 in 120V ac panel 2AY2A)

14a. To preclude undesired auxiliary feedwater addition to steam generators 1 and 4 due to fire induced starting of the Train A auxiliary feedwater pump 2-1302-P4-003, either close the pump discharge valves HV-5137 and HV-5139 or trip the pump power supply breaker 17 in 4.16 KV switchgear 2AA02. Local closure of HV-5137 and HV-5139 after tripping their respective power supply breakers may be required for a fire in Fire Area 2-CB-LA-G. (Breakers 37 and 17 respectively in 480V MCC 2ABB)

14b. To preclude undesired auxiliary feedwater addition to steam generators 2 and 3 due to fire induced starting of the Train B auxiliary feedwater pump 2-1302-P4-002, either close the pump discharge valves HV-5132 and HV-5134 or trip the pump power supply breaker 21 in 4.16 KV switchgear 2BA03.

15. To preclude undesired auxiliary feedwater addition to steam generators 1, 2, 3 and 4 due to fire induced starting of the turbine driven auxiliary feedwater pump 2-1302-P4-001, either close the pump discharge valves HV-5120, HV-5122, HV-5125 and HV-5127 or trip the turbine trip and throttle valve, PV-15129, locally. For a fire in Fire Area 2-AFB-C close the turbine steam supply isolation valves HV-3009 and HV-3019 after tripping their power supply breakers (01 in 125V dc MCC 2BD1M and 01 in 125V dc MCC 2AD1M).

16a. To preclude undesired auxiliary feedwater addition to steam generators 1 and 4 due to fire induced starting of the Train A auxiliary feedwater pump 2-1302-P4-003, either close the pump discharge valves HV-5137 and HV-5139 or trip the pump power supply breaker 17 in 4.16 KV switchgear 2AA02.

16b. To preclude undesired auxiliary feedwater addition to steam generators 2 and 3 due to fire induced starting of the Train B auxiliary feedwater pump 23-1302-P4-002, either close the pump discharge valves HV-5132 and HV-5134 or trip the pump power supply breaker 21 in 4.16 KV switchgear 2BA03.

17. To preclude undesired auxiliary feedwater addition to steam generators 1, 2, 3 and 4 due to fire induced starting of the turbine driven auxiliary feedwater pump 2-1302-P4-001, either close the pump discharge valves HV-5120, HV-5122, HV-5125 and HV-5127 or trip the turbine trip and throttle valve, PV-15129, locally.

18. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components.

19. To preclude RCS pressure transients due to spurious safety injection actuation, overrid safety injection and manually control the components.

20. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components.

21. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components.

22. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components.

23. To preclude loss of RWST volume due to spurious containment spray actuation override and stop the containment spray pump (pull to lock pump control handswitch).

24. To preclude loss of RWST volume due to spurious containment spray actuation override and stop the containment spray pump (pull to lock pump control handswitch).

25. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components. To preclude loss of RWST volume due to spurious containment spray actuation override and stop the containment spray pump (pull to lock pump control handswitch).

26. To preclude RCS pressure transients due to spurious safety injection actuation, override safety injection and manually control the components. To preclude loss of RWST volume due to spurious containment spray actuation override and stop the containment spray pump (pull to lock pump control handswitch).