| | | |
|---|---|---|
| **WISCONSIN PUBLIC SERVICE CORPORATION** | **NO.** E-0-06 | **REV** K |
| **KEWAUNEE NUCLEAR POWER PLANT** | **TITLE** FIRE IN ALTERNATE FIRE ZONE | |
| **OPERATING PROCEDURE** | **DATE** AUG 04 1998 | **PAGE** 1 **of** 50 |
| REVIEWED BY D Braun | APPROVED BY [signature] | |

| | | |
|---|---|---|
| NUCLEAR SAFETY RELATED ☒ YES ☐ NO | PORC REVIEW REQUIRED ☒ YES ☐ NO | SRO APPROVAL OF TEMPORARY CHANGES REQUIRED ☒ YES ☐ NO |

1.0 INTRODUCTION

1.1 The purpose of this procedure is to PLACE the plant in Hot Shutdown and cooldown to Cold Shutdown using the Dedicated Shutdown System, in the event a fire removes the ability to monitor or control plant operation from the Control Room. Only train "A" equipment can be controlled from the Dedicated Shutdown Panel. Train "B" equipment will be inoperable or unreliable so will NOT be addressed. Offsite power will be lost or unreliable and all controls/instrumentation routed through the relay room will be inaccurate and/or unreliable.

2.0 SYMPTOMS OR ENTRY CONDITIONS

2.1 A fire that causes the inability to monitor or control major plant parameters from the Control Room necessary for safe shutdown. (i.e., RCS pressure, temperature, power level, pressurizer level, etc.)

2.2 This procedure will be entered from E-FP-08.

3.0 AUTOMATIC ACTIONS

3.1 NO automatic actions are assumed to occur.

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P PDR

# ATTACHMENT 1

**Letter from M. L. Marchi (WPSC)**

**To**

**Document Control Desk (NRC)**

**Dated**

**September 28, 1998**

**Answers to Supplemental Reqnest for Additional Information**

**FIRE QUESTION**

1. In the October 13, 1995, response to the Kewaunee Fire PRA question F.1, it is stated that:

 > "All circuits within the control room are fused. It is therefore assumed that a fire would cause the fuse to blow and the equipment to fail in its normal mode."

 This does not take into consideration the fact that hot shorts in control cables can simulate the closing of control switches, leading, for example, to the repositioning of valves, spurious operation of motors and pumps, or the shutdown of operating equipment. Such hot shorts would not cause a fuse to blow. These types of faults might, for example, lead to a LOCA, diversion of flow within various plants systems, deadheading and failure of important pumps, premature or undesirable switching of pump suction sources, undesirable equipment operations, and unrecoverable damage in motor-operated valves.

 The analysis of a fire in Mechanical Control Console C (see p.5 of the October 13, 1995, submittal) assumes that a fire can cause spurious opening of PORV, but that the PORV will close when the fuse blows. But, since the fire may simulate the closing of a switch, there is no reason to assume the fuse will blow.

 It appears that the actual emergency operating procedures for the plant may take into consideration the possibility that hot shorts in a control room fire may have adverse effects, and that as a result emergency operating procedure E-0-06 or E-0-07 are invoked for control room fires. However, it is not clear that these procedures were properly incorporated into the accident sequence delineation and quantification for control room fires, in the October 13, 1995 submittal. In particular, because these operating procedures E-0-06 and E-0-07 require the isolation of offsite power, and perhaps the isolation of one train of equipment (either the dedicated train or the alternate train), then almost any control room fire requires, by the procedures, to consider a reactor trip with loss of offsite power. In addition, one train of AC electric power (either train A or train B) may be isolated. Examples where offsite power and one train of electric power may be isolated are fires in Mechanical Console C, which could potentially affect the pressurizer PORVs, and a fire in Mechanical Control Console B, which could affect the charging pumps and their associated valves. It is not clear from the submittal whether, because of the concern about hot shorts in the control room, control of plant will be transferred to points outside the control room, for a control room fire, even when the control room can still be occupied. Accordingly, please provide the following information:

1. *According to plant operating procedures, for what control room fires are either procedures E-0-06 or E-0-07 invoked? For what control room fires will offsite power be isolated? For what control room fires will offsite power and one train of electric power be isolated? For what control room fires will control be transferred from the control room to the dedicated shutdown panel, or to other locations outside the control room?*

2. *For those control room fires in which control is transferred to outside the control room, and the dedicated train of shutdown equipment is not available (as a consequence of the control room fire), describe the actions required to bring the plant to safe shutdown.*

3. *For those control room fires in which E-0-06 or E-0-07 are invoked, or offsite power is isolated, delineate the accident sequences and provide the details of their quantification.*

4. *If there are any control room fires where offsite power and a train of electric power is not isolated, but a hot short is possible which simulates the closing of a switch (and therefore does not blow a fuse), delineate and quantify the accident sequences. For example, a fire in Mechanical Control Console C may open a PORV because of a hot short, and a fuse may not blow.*

5. *Provide a copy of procedures E-0-06 and E-0-07.*

**WPSC REPLY**

1. When operators determine that a fire exists in the plant, they enter procedure E-FP-08 "Emergency Operating Procedure - Fire." Step 4.11 of E-FP-08 reads:

   IF fire causes the inability to monitor and control major plant parameters from the Control Room necessary for safe shutdown (i.e., RCS pressure, temperature, power level, pressurizer level, etc.), REFER to E-0-06.

   Step 4.12 of E-FP-08 reads:

   IF fire causes inability to monitor or control Dedicated System components (Train A - Safeguards, DSP equipment, A D/G, etc.), REFER to E-0-07.

   Step 4.11 gives the operators flexibility so they do not need to evacuate the control room for minor fires. Only fires that cause the inability to monitor and control major plant parameters would result in evacuation. None of the control room fires evaluated are of this severity. In each scenario, only one train is affected and operators are able to shut the plant down with the opposite train. Offsite power and one train of power are only isolated if E-0-06 is invoked. Similarly, the dedicated shutdown panel is only used if E-0-06 is invoked.

The October 13, 1995 submittal erroneously states that for a fire in the bus 5 switches, procedure E-0-07 would be invoked. Procedure E-0-07 only applies to a fire in a dedicated zone. Since the control room is an alternate fire zone, E-0-07 is never invoked for a control room fire. The revised quantification, correcting this error, is in Attachment 2.

2. The control room is considered part of the alternate train. As required by 10CFR50 Appendix R, the alternate train is separated from dedicated train equipment. Procedure E-0-06 requires switches to be manipulated and fuses to be pulled, thus electrically isolating dedicated and alternate train equipment. Thus no shutdown procedures taking into account failures of both trains are necessary. In the event that the operator action to isolate dedicated train equipment from the control room fails, core damage is assumed.

3. As stated above, none of the evaluated control room fires result in transfer to E-0-06. E-0-07 is not applicable to control room fires.

4. The only areas for which fuses were credited are the steam generator PORV controllers on mechanical control console A and the pressurizer PORV switches on mechanical control console C. These sequences were quantified and the results of all four control room fires analyzed are in Attachment 2. The net result of adding the two additional sequences is a less than 0.1% increase in fire core damage frequency.

5. Attachment 3 contains procedures E-0-06 and E-0-07.

## HIGH WINDS, FLOODS, AND OTHER EXTERNAL EVENTS (HFO) QUESTION

1. This question concerns the resolution of GI-103, Design for Probable Maximum Precipitation (PMP). The IPEEE submittal (see p. 5-25ff) calculates, using NOAA Hydrometerological Report (HMR) No. 52, a runoff of 1.9 inches (see p. 5-50 of the IPEEE submittal). The submittal then states (see p. 5-29) that "due to the immense size of Lake Michigan and its normal water level (approximately 23 feet below the plant elevation) no flooding of Lake Michigan from a combination of rain collection and runoff will ever endanger Kewaunee." But this is not the issue. The issue is whether ponding on the site can affect safety-related equipment, and whether roof ponding can fail roofs, with attendant failure of safety-related equipment. The roof ponding issue is adequately addressed, in a response dated August 29, 1995, to a request for additional information. However, the site ponding issue is not addressed adequately. Moreover, the runoff was calculated with a runoff coefficient of 0.15. Considering the fact that the soil has high clay content (see p. F-6 of the Point Beach A-45 study, NUREG/CR-4458, and see also Section 3.1.3.6 of the Kewaunee IPEEE submittal), and that the ground may be frozen in the spring (when it is most likely the PMP event would occur), the runoff coefficient should likely be considerably higher. We note that the U.S. Army Corps of Engineers Engineer Manual, EM 1110-2-1417, Flood-Runoff Analysis, p. 13-7, states that for Probable Maximum Storms (PMSs), ground conditions that affect losses should be the most severe that can reasonably exist in conjunction with a PMS, and that, where it is possible for the ground to be frozen, zero or near

zero loss rates should be used. Accordingly, a runoff coefficient C=0.9 may be more appropriate. Moreover the PMP estimates in the submittal were based on a 10 sq. mi area; a 1 sq. mi area would give a greater depth. From Fig. 24 of HMR 52, a 1 hr, 1 sq. mi PMP corresponds to a rainfall intensity I=16.5 in/hr, as opposed to the 13 in/hr used in the IPEEE submittals (for a 10mi$^2$ area). The drainage area A is stated to be not greater than 640 acres (=1 sq. mi) in Rev. 12 of the Kewaunee Updated Final Safety Analysis Report (UFSAR) on p. 2.6-8. Using the rational formula, the peak flow Q is given by

Q=CIA, with C=0.9, I=16.5 in/hr, and A = 1 mi$^2$,

from which one obtains Q=9583 cubit feet per sec. But the peak flow that the drainage ditch can handle is 467 cubic feet per sec, from the UFSAR, p. 2.6-9. Thus the drainage ditch does not appear to be able to handle the runoff, and there may be some site flooding and ponding, from a PMP event.

Furthermore, it should be noted that one cannot determine the level of flooding at the site from computing a rate of increase of water level from Q/A=CIA/A, as is done on p. 5-29 of the IPEEE submittal. Here, A is the drainage area; the water from this area collects on the site, but the amount of water that collects in a particular area on the site depends on the topography of the site. Portions of the area A may not be on the site, but the water from these portions can run off onto the site. Some areas of the site may experience sheet runoff and there may be ponding of water in other areas.

*Please address the issue of site flooding and ponding from the PMP. Please provide an analysis of the PMP which demonstrates the extent to which site flooding and ponding from the PMP results in water ingress into buildings housing safety-related equipment. Have any storms that have occurred resulted in water ingress into buildings housing safety-related equipment?*

**WPSC REPLY**

Based on a review of section 5.2, External Floods, of the IPEEE submittal, WPSC agrees that the application of the "Rational Formula" and the related calculation are in error. In order to evaluate the impact of local precipitation at the site, the following description is offered.

The property on which the plant is located is graded from a high point (635' elevation) at Wisconsin State Highway 42 to the west down to the shore of Lake Michigan to the east. Any runoff would therefore flow eastward towards Lake Michigan (585' elevation).

The section of the site property on which the plant is located occupies approximately 60 acres which is bounded to the north and south by natural drainage channels that drain storm water away from the plant to Lake Michigan.

The plant electric substation (612' elevation) is located between the plant and Highway 42. An intervening ditch exists on the west side of the substation. This ditch is designed to collect runoff from the small section of land between the substation and Highway 42 including runoff directed via culverts from a large section on the west side of the highway. The ditch directs runoff water through culverts located under the main access road to the south channel. The peak flow to the ditch is approximately 336 CFS based on the one hundred year hourly rain intensity of 2.5 inches. The peak flow to the ditch based on the new PMP (16.5 inches/hour) is approximately 9580 CFS which exceeds the capacity of the ditch. The peak flow that this drainage ditch can handle without overflowing is approximately 467 CFS. Runoff that exceeds the capacity of the ditch results in ditch overflow that runs down and across the main access road and into the lake via the south drainage channel. The capacity of this channel at its mid-point (approximate entry point for ditch overflow) is approximately 11,000 CFS, which is more than adequate to handle trench overflow.

The land surrounding the main power block (605' elevation) is graded such that runoff from building roofs is diverted to low areas surrounding the plant. These areas are equipped with storm drains that direct runoff directly to the lake or to the south drainage channel. If runoff exceeds the capacity of the storm drains, some small ponding would occur, and would be relieved by sheet runoff to the lake due to the natural grade at those points. Therefore, the water level in these low areas is not expected to rise to the point where plant buildings would be affected.

In the 24 years that the plant has been in operation no ponding due to excessive rainfall has occurred. No storms have occurred at the site that resulted in significant water ingress into plant buildings other than minor roof leakage.

The PMP is an estimate of the theoretically greatest depth of precipitation for a given duration that is physically possible over a particular drainage area. It is intended to be an estimate of the maximum precipitation that can be generated. There is, however, no frequency of occurrence associated with rainfall events of this intensity. The PMP estimates do not consider local area historical rainfall data. The revised PMP greatly exceeds the maximum expected rainfall for the plant that formed the basis for the design of the site.

As detailed above, the site has adequate design capability to address the 100 year hourly rain intensity which historical experience has not challenged, and provisions to address the revised PMP, therefore no additional actions are required.

# ATTACHMENT 2

## Letter from M. L. Marchi (WPSC)

## To

## Document Control Desk (NRC)

## Dated

## September 28, 1998

## REVISED CONTROL ROOM FIRE ANALYSIS

### A. FIRE GROWTH AND PROPAGATION: CONTROL ROOM (AX35 )

Due to its unique features, the control room was not evaluated with COMPBRN, but a qualitative screening was performed. There are eight major control cabinets in the control room. Each cabinet was examined to determine what components are controlled from that cabinet and what effect loss of those components would have on core damage frequency. The following assumptions were made:

1. The initiating frequency for a fire in the control room cabinets is $9.5\text{x}10^{-3}$. These cabinets have been divided into 47 regions of approximately equal area for the purpose of this study. The initiating frequency for each region is then $9.5\text{x}10^{-3}/47$ or $2.02\text{x}10^{-4}$. The initiating frequency for each fire is then $2.02\text{x}10^{-4}$ times the fraction of switches that could initiate the fire, plus an additional $2.02\text{x}10^{-4}$ for each adjacent region that could propagate a fire into the region being considered.

2. Switches for redundant trains of safety related equipment that are within 6 inches of each other are separated by metal barriers. It is assumed that a fire in one train can not cross these barriers and propagate to the other train. The existence of these barriers was verified in cases in which this assumption was made. Propagation from one component to another in the same train was considered.

3. It is assumed that a fire would begin at a contact associated with a switch or indicator. There are very sensitive ionization detectors in each cabinet that would detect any smoke very early. Operators would then receive an alarm, examine the inside of the affected cabinet and apply $CO_2$ from easily accessible fire extinguishers. An insulation fire would be a slow smoldering fire and, with no operator action, would propagate to the cable bundle entering the cabinet. Operators would have ample time to prevent this from occurring. Such obvious operator actions are generally given very low error probabilities; in this case $1.0\text{x}10^{-4}$ is used. The frequency of a control room fire that spreads to the cable bundle is then $9.5\text{x}10^{-7}$, which is below the screening criterion. It is therefore assumed that a fire is detected and extinguished and would not spread to other components beyond the immediate vicinity of the source.

4. Consistent with the screening methodology used for other zones, equipment failures that would not result in a reactor trip are not considered.

5. Fires disabling gauges, alarms, and indicating lights are not considered because their failures would not cause a reactor trip.

6. If a fire would have no other effect than to cause a reactor trip, with or without main feedwater, it is not considered further because the fire frequency is more than two orders of magnitude below the frequencies for these events due to other causes. If a reactor trip were due to a fire in the control room, it would be considered part of the transient initiating event frequency. These fires are therefore not considered further because they are bounded by the internal events analysis.

7. It is assumed that, since Foxboro controllers are completely enclosed, a fire in one does not spread to adjacent equipment.

Following is an evaluation of each control room cabinet.

Electrical Control Console A: This panel contains switches for all 4160V and 480V electrical buses as well as both emergency diesel generators. The switches for each source breaker for 4160V safeguards bus 5 are adjacent. It is therefore possible that a fire in one switch could propagate to the others. It is assumed that a single fire could make bus 5 and all its potential sources (diesel generator A, reserve auxiliary transformer, tertiary auxiliary transformer) unavailable. Likewise for bus 6, a single fire could affect diesel generator B, the reserve auxiliary transformer and the tertiary auxiliary transformer. These fires are therefore retained for further analysis.

Electrical Vertical Panel A: This panel contains switches for the substation and offsite power sources. A fire in this panel could cause a loss of offsite power, but no additional failures. Since the initiating frequency for a fire in this panel, (six regions x $2.02 \times 10^{-4}$ or $1.21 \times 10^{-3}$) is a factor of 36 smaller than the loss of offsite power frequency from the internal events PRA, the core damage frequency due to a fire in this panel is bounded by that from the internal events PRA. This panel is therefore not considered further.

Mechanical Control Console A: This panel contains a reactor trip pushbutton and switches for the turbine, main feedwater, auxiliary feedwater, steam dump, and other miscellaneous secondary side equipment, such as heater drain pumps.

A fire in the non-safeguards portion of this panel (turbine, feedwater, other secondary side equipment) or the reactor trip pushbutton, could cause at worst a transient without main feedwater. Therefore, according to assumption 6, these fires are not considered further.

A fire in the auxiliary feedwater area of this panel can not propagate from one train to the other due to the barriers discussed in assumption 2. Furthermore, since the auxiliary feedwater switches are separated from the non-safeguards portion by barriers, a fire in this area of the panel would not cause a reactor trip.

The steam dump system must be armed in order for the steam dump to occur. This requires a turbine trip or load rejection. A spurious operation of the steam dump controllers would therefore not result in opening of steam dump valves. Steam generator power operated relief valve (PORV) manual control stations are also on this panel. Spurious opening of the PORVs would cause a reactor trip. This fire is therefore retained for further analysis.

Mechanical Vertical Panel A: This panel contains switches for service water, air compressors, and other miscellaneous equipment not modeled in the IPE.

A fire in the service water area of this panel could affect two service water pumps. Since there is a barrier between the switches for the A train pumps (A1 and A2) and the B train pumps (B1 and B2), a single fire is not capable of disabling both trains. If the fire disables the train that supplies cooling to the turbine building, operator action is necessary to restore cooling to the main feedwater pumps and therefore prevent a reactor trip. This is a simple operator action, there is ample time, and there is an alarm alerting the operator to the condition. The service water pump switches are separated from any switches that could cause a reactor trip by distance or barriers. It is therefore assumed that a fire in the service water area of this panel would not cause a reactor trip.

Of the five station and instrument air compressors at Kewaunee, only two have control room control. A fire disabling these two compressors would not cause a reactor trip because the other air compressors would be available.

There are other switches on this panel that are not modeled in the Level 1 IPE. Some of these, such as circulating water pumps, are capable of causing a reactor trip if they fail. Since, as explained above, a fire in the switches for these components could not propagate to the service water pump, the effect would be the same as that of the transient with main feedwater available modeled in the IPE and, in accordance with assumption 6, this area is not considered further.

Since there are no areas of this panel that could both cause a reactor trip and seriously affect the recovery from the trip, this panel is not considered further.

Mechanical Control Console B: This panel contains switches for control rod control and the chemical and volume control system (CVCS).

A fire in the control rod control area, including the manual reactor trip pushbutton, could cause a reactor trip. There is separation, however, between this area of the panel and the switches for the portion of the CVCS modeled in the IPE. Therefore, in accordance with assumption 6, this area is not considered further.

The only components in the CVCS that are modeled in the IPE for a transient are the charging pumps and associated valves. The charging pump switches are separated by barriers, so a fire in one switch would not propagate to the others. Even if a fire did cause the unavailability of the CVCS, it would not cause a reactor trip. A fire in this area is therefore not considered.

Since there are no areas of this panel that could both cause a reactor trip and seriously affect the recovery from the trip, this panel is not considered further.

Mechanical Vertical Panel B: This panel contains the nuclear instrumentation (NI) drawers and some switches for miscellaneous equipment that is not modeled in the IPE and could not cause a reactor trip. Each channel of the NI system is in a separate drawer, so that a fire in one drawer could not propagate to another. Since one channel by itself can not cause a reactor trip at power, a single fire in this panel would not trip the reactor. This panel is therefore not considered further.

Mechanical Control Console C: This panel contains switches for the pressurizer sprays, pressurizer PORVs, reactor coolant pumps, and pressurizer heaters. It also contains switches for the component cooling, residual heat removal, containment spray, and safety injection systems.

The pressurizer heaters and reactor coolant pumps are not modeled in the IPE. The sprays are not modeled for transients, but only for loss of coolant accidents and steam generator tube ruptures. The failure of these components could cause a reactor trip, but would not significantly affect the mitigation of the transient. Therefore, in accordance with assumption 6, this area is not considered further.

The pressurizer PORV switches are separated by a barrier, so a single fire could only affect one valve. A spurious opening of a pressurizer PORV would probably result in a reactor trip.

The switch for PORV PR-2A is separated from its block valve PR-1A by a barrier. Therefore, if it does open, it can be easily closed and a transient with main feedwater available results. The initiating event frequency for this event is more than four orders of magnitude below the internal events frequency for the transient with main feedwater available. Therefore, the event is bounded by the internal events analysis.

A fire in the PR-2A switch combined with a failure to close the block valve would result in a small break loss of coolant accident. Of the 16 switches in this region; only 3 could result in a fire in the PR-2A switch. The initiating event frequency for this fire is $9.5 \times 10^{-3} \times 1/47 \times 3/16 = 3.79 \times 10^{-5}$. This coupled with the human error probability for failure to close the block valve, $1.2 \times 10^{-2}$ using the increased human error values discussed in Section 9.8.7.D, results in an initiating event frequency of $4.55 \times 10^{-7}$, which is below the screening criterion. Therefore, this area is not considered further.

A fire in the PR-2B switch is, however, retained for further analysis.

The two trains of component cooling are separated by barriers so a single fire could not disable both trains. Each pump is capable of supplying all component cooling loads during normal operations. This area is separated from switches that could cause a reactor trip by barriers and/or distance. Therefore, a fire disabling one train of component cooling would not cause a reactor trip, in accordance with assumption 6, this area is not considered further.

The safety injection manual initiation pushbuttons would cause a reactor trip if they actuated spuriously. They are separated from any switches whose failure would hinder the mitigation of a transient by barriers and/or distance.

Residual heat removal, containment spray, and the rest of safety injection, are standby systems that are not capable of causing a reactor trip. Their areas in this panel is separated from systems that could cause a reactor trip by barriers and/or distance.

Since there are no areas of this panel that could both cause a reactor trip and seriously affect the mitigation of a transient, this panel is not considered further.

Mechanical Vertical Panel C: This panel contains radiation equipment, flux mapping equipment and the inadequate core cooling monitoring system. None of these systems is capable of causing a reactor trip, and therefore this panel is not considered further.

## B. DETERMINATION OF INITIATING EVENT FREQUENCY IN EACH ZONE REQUIRING QUANTIFICATION

Figures 1 through 4 show the derivation of the initiating event frequency for each control room scenario. The loss of offsite power, small break loss of coolant accident or steam line break event sequence is used depending on the scenario.

## C. FIRE-INDUCED CORE DAMAGE FREQUENCY QUANTIFICATION

Core damage frequencies are computed for each control room scenario. Tables 1 through 3 show results from the four scenarios that require quantification of core damage frequency (CDF).

1. FI10: Fire in Control Room Bus 5 Switches

   Bus 5 is disabled in this scenario. The loss of offsite power event tree (Figure 5) is used in this scenario.

   Since the fire does not prohibit operation of train B safe shutdown equipment from the control room, it is assumed that operators do not use procedure E-0-06, Fire in Alternate Zone, which requires manual isolation of offsite power and evacuation of the control room.

2. FI11: Fire in Control Room Bus 6 Switches

   Bus 6 is disabled in this scenario. The loss of offsite power event tree (Figure 5) is used in this scenario.

   Since the fire does not prohibit operation of train A safe shutdown equipment from the control room, it is assumed that operators do not use procedure E-0-06, Fire in Alternate Zone, which requires manual isolation of offsite power and evacuation of the control room.

3. FI12: Fire in Steam Generator PORV Switches

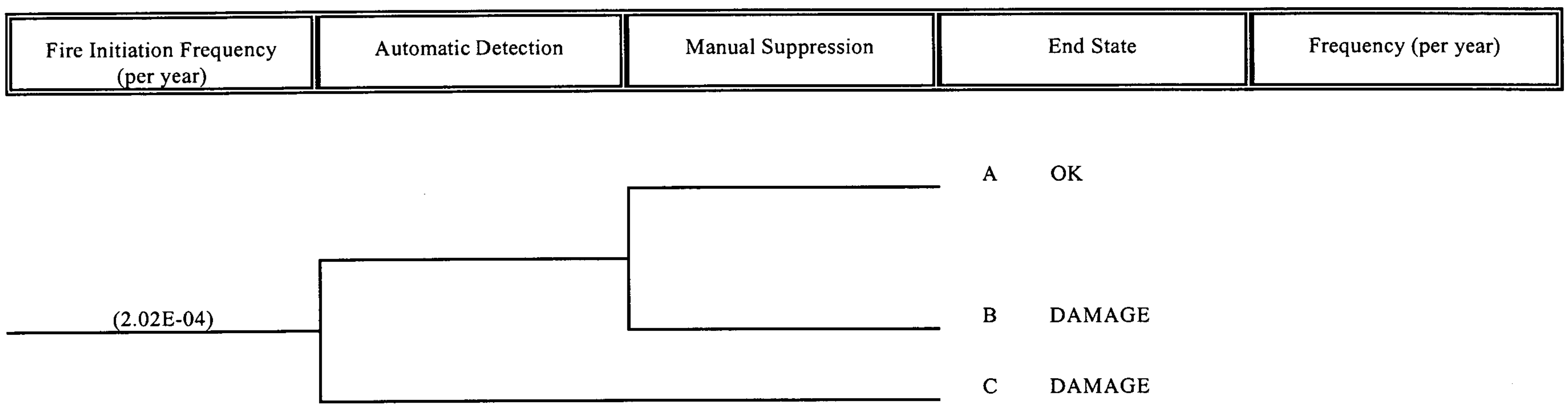
One Steam Generator power operated relief valve (PORV) (SD-3A or SD-3D) is disabled in this scenario. Scalars FAULT-A and FAULT-B represent the opening of SD-3A and SD-3B respectively. A revised steam line break event tree, which does not assume a return to criticality (Figure 6), is used in this scenario. This is because return to criticality is a issue that only applies to large pipe breaks, not to stuck open PORVs.

Since the fire does not prohibit operation of Train A safe shutdown equipment from the control room, it is assumed that operators do not use procedure E-0-06, Fire in Alternate Zone, which requires manual isolation of offsite power and evacuation of the control room.

4. FI13: Fire in Pressurizer PORV Switches

Pressurizer PORV PR-2B and block valve PR-2A are disabled in this scenario. The small break loss of coolant accident event tree (Figure 7) is used in this scenario.

## Figure I: AX-35 (FI10) INITIATING EVENT FREQUENCY CONTROL ROOM BUS 5 SWITCHES

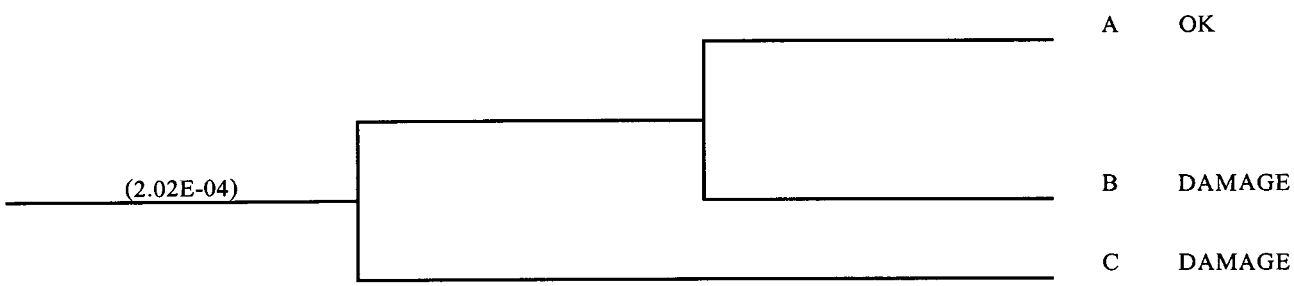



**Total Frequency = 2.02E-04/yr**

| | | |
|---|---|---|
| Active Fire Protection | = | Automatic detection (ionization detector), manual suppression (fire extinguishers) |
| | = | Credit is not granted for manual fire suppression because the fire would spread very quickly. Therefore, the total frequency is equal to the fire initiating frequency |
| Fire Initiation Frequency | = | (Compartment Fire Frequency) * (1/Number of Sections) |
| | = | (9.5E-03) * (1/47) = 2.02E-04/yr |
| Applicable Event Sequence | = | Loss of offsite power |

Figure 2: AX-35 (FI11) INITIATING EVENT FREQUENCY
CONTROL ROOM BUS 6 SWITCHES

| Fire Initiation Frequency (per year | Automatic Detection | Manual Suppression | End State | Frequency (per year) |
|---|---|---|---|---|




**Total Frequency = 2.02E-04/yr**

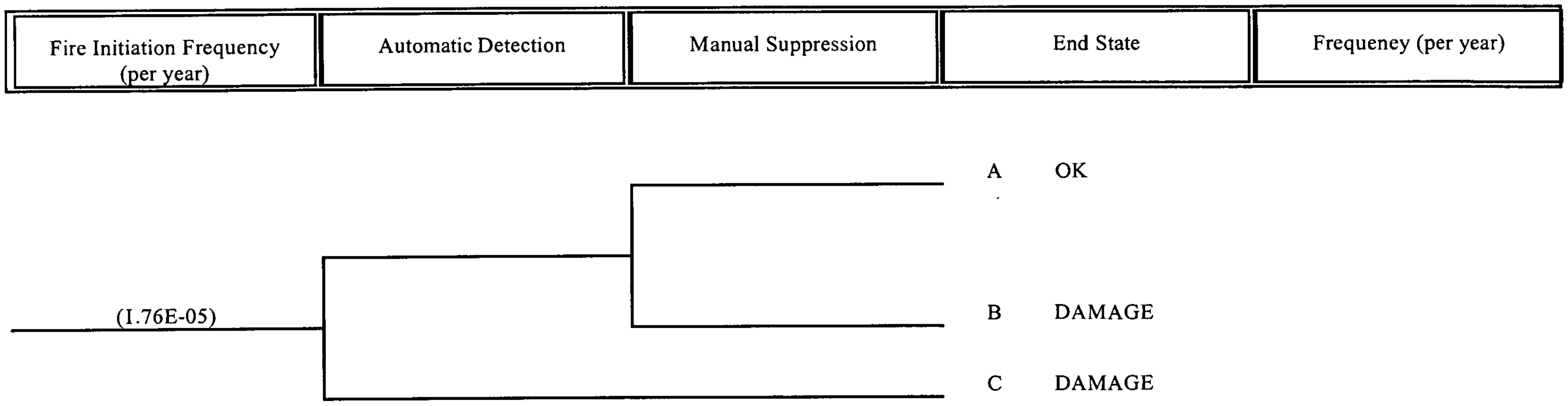
Active Fire Protection = Automatic detection (ionization detector), manual suppression (fire extinguishers)

= Credit is not granted for manual fire suppression because the fire would spread very quickly. Therefore, the total frequency is equal to the fire initiating frequency.

Fire Initiation Frequency = (Compartment Fire Frequency) * (1/Number of Sections)
= (9.5E-03) * (1/47) = 2.025E-04/yr

Applicable Event Sequence = Loss of offsite power

Figure 3: AX-35 (FI12) INITIATING EVENT FREQUENCY
CONTROL ROOM SG PORV SWITCHES




**Total Frequency** = **1.76E-05/yr**

| | | |
|---|---|---|
| Active Fire Protection | = | Automatic detection (ionization detector), manual suppression (fire extinguishers) |
| | = | Credit is not granted for manual fire suppression because the fire would spread very quickly. Therefore, the total frequency is equal to the fire initiating frequency. |
| Fire Initiation Frequency | = | (Compartment Fire Frequency) * (1/Number of Sections) * (No. of PORV switches/Total number of switches) |
| | = | (9.5E-03) * (1/47) x (2/23) = 1.76E-5/yr |
| Applicable Event Sequence | = | Steam line break |

Document Control Desk
September 28, 1998
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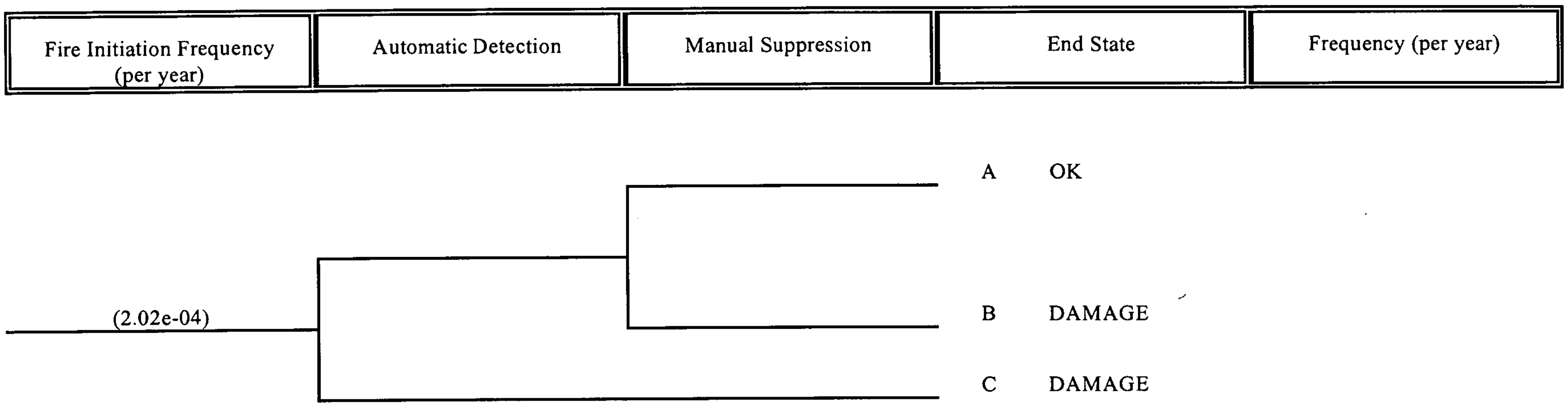
Figure 4: AX-35 (FI13) INITIATING EVENT FREQUENCY
CONTROL ROOM PRZR PORV SWITCHES




**Total Frequency = 2.02E-04/yr**

Active Fire Protection = Automatic detection (ionization detector), manual suppression (fire extinguishers)

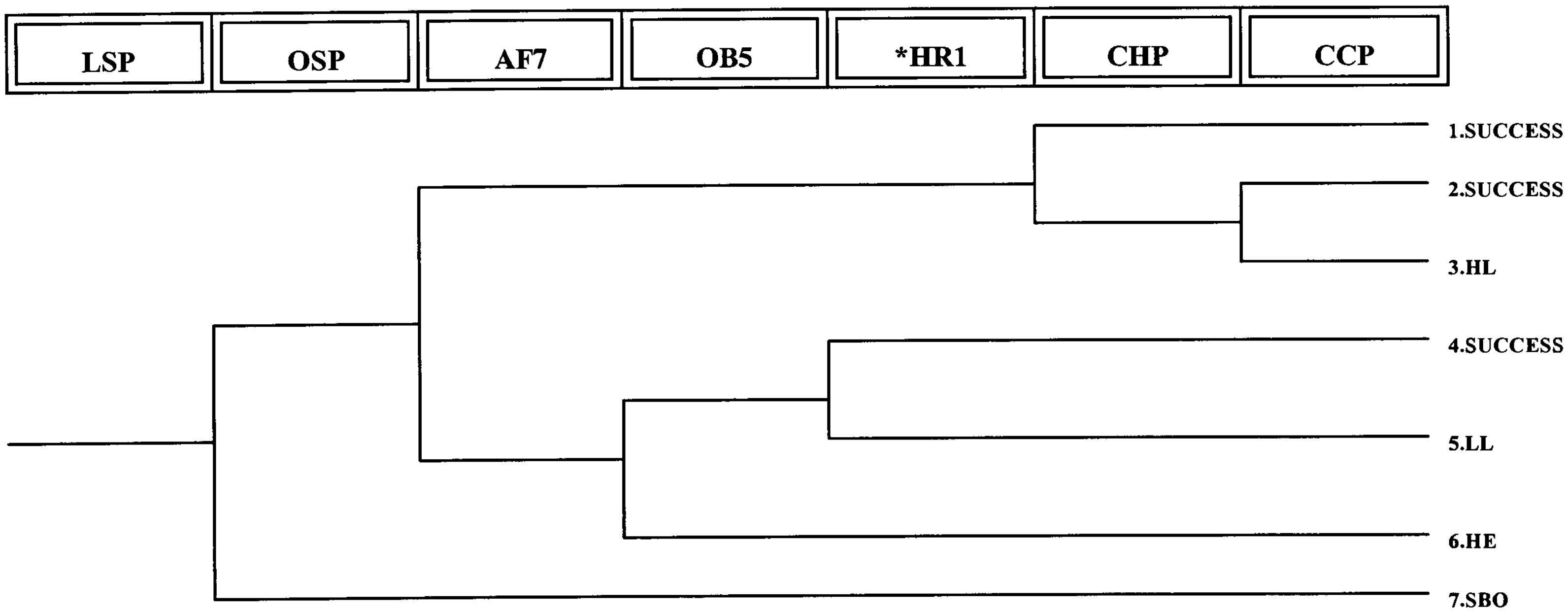
= Credit is not granted for manual fire suppression because the fire would spread very quickly. Therefore, the total frequency is equal to the fire initiating frequency.

Fire Initiation Frequency = (Compartment Fire Frequency) * (1/Number of Sections) * (No. of switches within boundary/Total number of switches)

= (9.5E-03) * (1/47) x (11/16) = $1.39\times10^{-4}$

Applicable Event Sequence = Small break LOCA

**FIGURE 5**
**LOSS OF OFFSITE POWER EVENT TREE**




***THIS NODE IS USED IN OTHER EVENT TREES. IT IS CONDITIONAL HERE DUE TO THE INITIATOR.**

**FIGURE 5**
**SUCCESS CRITERIA FOR LOSS OF OFFSITE POWER**

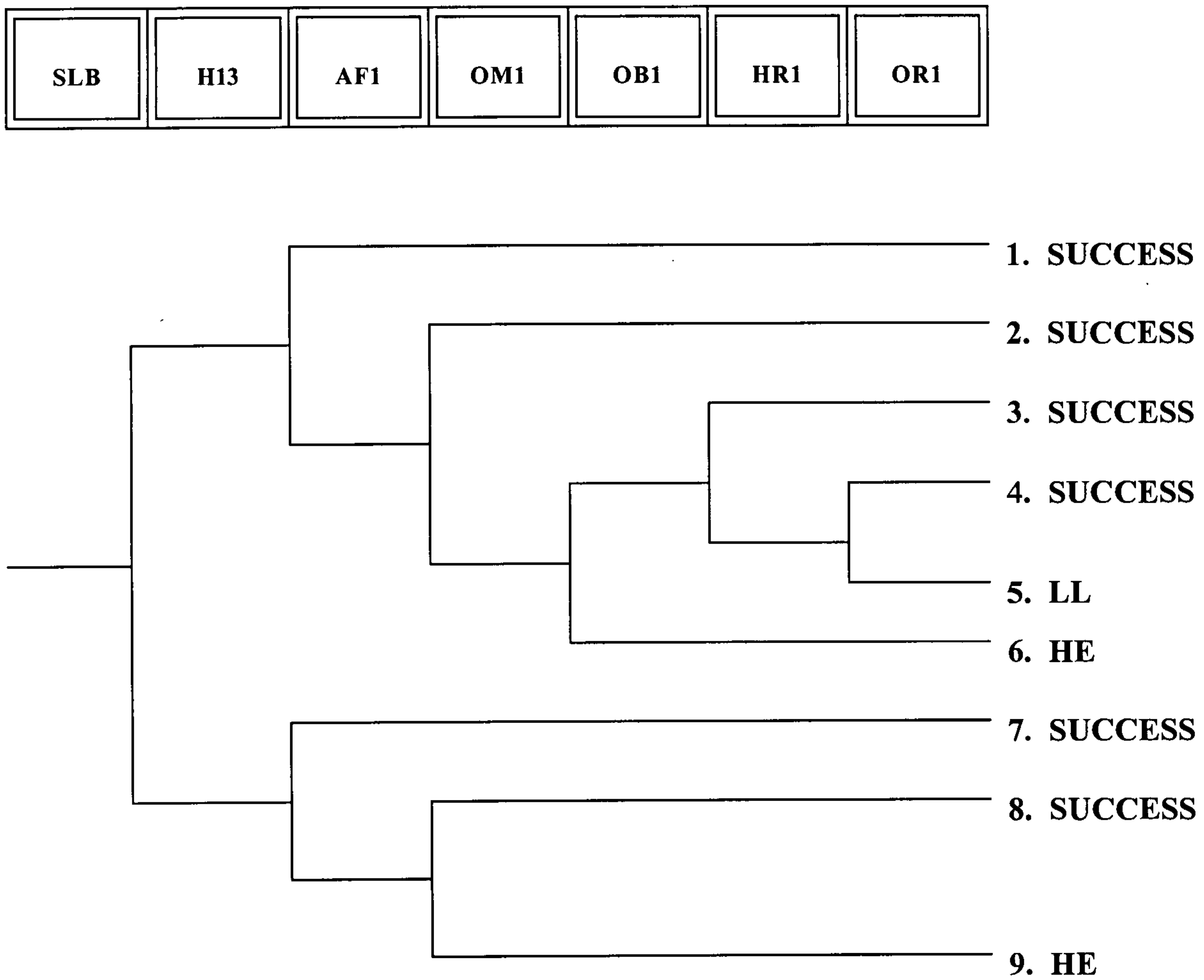
| Top Event Description | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|
| OSP- POWER AVAILABLE | Emergency AC Power available to at least 1 of 2 4.16kV safeguards buses. | Confirm operation of system. | 24 |
| AF7- AUXILIARY FEEDWATER | I of 3 AFW pumps delivering at least 200 gpm to at least 1 of 2 steam generators. | Confirm operation of system. | 24 |
| OB5- OPERATOR ACTION-BLEED AND FEED | 1 of 2 high pressure Sl trains delivering flow to 1 of 2 RCS cold legs, 1 of 2 pressurizer PORVs open (bleed and feed initiated prior to secondary dryout - assume at 30 minutes). | Manually open PORVs and block valves, start SI pumps. | 24 |
| HR1- HIGH PRESSURE RECIRCULATION | 1 of 2 SI/RHR trains delivering flow from containment sump to I of 2 RCS cold legs, sump valve on operable recirculation train open. | Manually align high pressure containment sump recirculation on low RWST level, align CCW to RHR Hx, confirm operation of system. | 20.5 |

## FIGURE 5
## SUCCESS CRITERIA FOR LOSS OF OFFSITE POWER

| Top Event Description | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|
| CHP- CHARGING PUMP OPERATION | 1 of 3 charging pumps started within 30 minutes after reactor trip for RXCP seal injection. | Manually start at least 1 charging pump, if none operating, within 30 minutes after rector trip and establish RXCP seal injection. | 24 |
| CCP- COMPONENT COOLING WATER | 1 of 2 CCW pumps delivering flow to the RXCP thermal barrier. | Confirm operation of system. | 24 |

**FIGURE 6**

**STEAM LINE BREAK EVENT TREE**



# FIGURE 6

## SUCCESS CRITERIA FOR LARGE STEAMLINE/FEEDLINE BREAK

| Top Event Description | | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|---|
| HI3- | RCS BORATION WITH BAT | 1 of 2 high pressure SI trains inject the contents of one RWST into 1 of 2 RCS cold legs. | Confirm operation of system. | 3.5 |
| AF1- | AUXILIARY FEEDWATER | 1 of 2 AFW pumps delivering at least 200 gpm to intact steam generator. | Confirm operation of system. | 24 |
| OM1- | OPERATOR ACTION-ESTABLISH MAIN FEEDWATER | 1 of 2 MFW trains delivering at least 200 gpm to intact generator. | Confirm operation of system. | 24 |
| OB1- | OPERATOR ACTION-BLEED AND FEED | 1 of 2 high pressure SI trains delivering flow to 1 of 2 RCS cold legs; 1 of 2 pressurizer PORVs open (bleed and feed initiated prior to secondary dryout - assume at 30 minutes). | Manually open PORVs and block valves, verify SI pumps running. | 24 |

## FIGURE 6

## SUCCESS CRITERIA FOR LARGE STEAMLINE/FEEDLINE BREAK

| Top Event Description | | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|---|
| HR1- | HIGH PRESSURE RECIRCULATION | 1 of 2 SI/RHR trains delivering flow from the containment sump to 1 of 2 RCS cold legs, sump valve on operable recirculation train open. | Manually align high pressure containment sump recirculation on low RWST level, align CCW to RHR Hx, confirm operation of system | 20.5 |
| OR1- | OPERATOR ACTION - LIMIT SI FLOW AND REFILL RWST | 1 of 2 reactor makeup water pumps delivering flow from the RMSTs to the RWST. 1 of 2 boric acid transfer pumps delivering flow from the BATs to the RWST. 1 of 2 SI pumps delivering flow from RWST | Open local valves to supply makeup flow to RWST, start makeup. Stop one SI pump, throttle SI flow. | 20.5 |

FIGURE 7
SMALL LOCA EVENT TREE

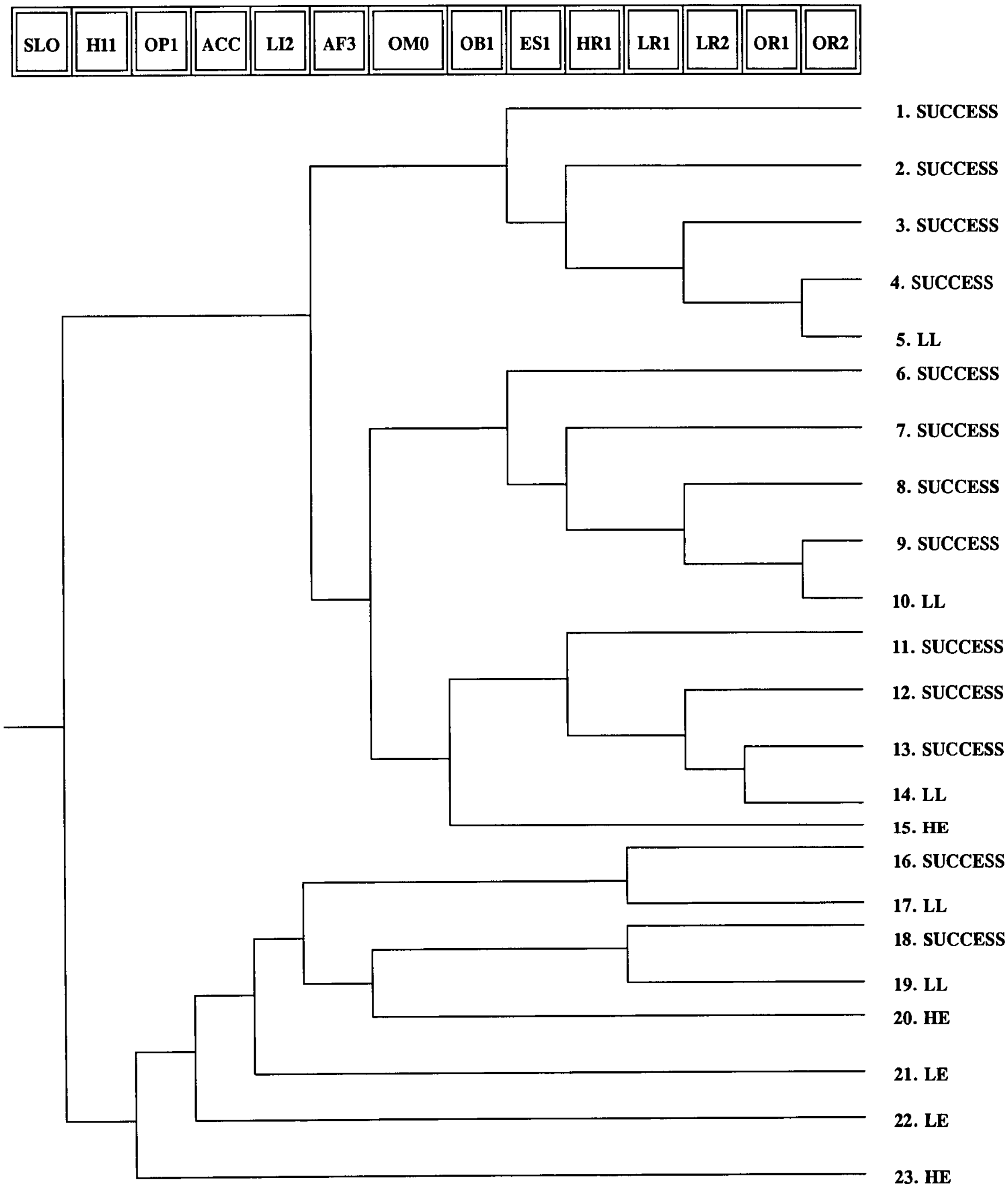


**FIGURE 7**

**SUCCESS CRITERIA FOR SMALL LOCA**

| Top Event Description | | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|---|
| HI1- | HIGH PRESSURE INJECTION | 1 of 2 high pressure SI trains injecting contents of RWST to 1 of 2 RCS cold legs | Confirm operation of system. If pumps not automatically started, manually start. | 3.5 |
| OP1- | OPERATOR ACTION-COOLDOWN AND DEPRESSURIZE RCS IN FR-C.2 | Operator initiated cooldown started within 30 minutes using at least one SG supplied with feedwater. | Cool down RCS by dumping steam at max 100° F/hr. Depressurize RCS to inject accumulators and permit initiation of low pressure SI. | Approximately 1 (until break flow and low-head SI flow are able to remove decay heat. |
| ACC- | ACCUMULATOR INJECTION | 1 of 1 accumulator injecting into intact RCS cold leg. | Confirm operation of system. | None |
| LI2- | LOW PRESSURE INJECTION | 1 of 2 low pressure SI trains injecting flow into reactor vessel. | Manually initiate low pressure SI following RCS cooldown and depressurization, confirm operation of system. | 1 |
| AF3- | AUXILIARY FEEDWATER | 1 of 3 AFW pumps delivering to at least 1 of 2 steam generators, total flow of at least 200 gpm. | Confirm operation of system. | 24 |

## FIGURE 7

## SUCCESS CRITERIA FOR SMALL LOCA

| Top Event Description | | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|---|
| OM0- | OPERATION ACTION-ESTABLISH MAIN FEEDWATER | 1 of 2 MFW trains delivering at least 200 gpm to 1 of 2 steam generators. | Manually align and initiate MFW. Confirm operation of system. | 24 |
| OB1- | OPERATOR ACTION-BLEED AND FEED | 1 of 2 high pressure SI trains delivering flow to 1 of 2 RCS cold legs; 1 of 2 pressurizer PORVs open (bleed and feed initiated prior to secondary dryout - assume at 15 minutes). | Manually open PORVs and block valves, verify SI pumps running. | 24 |
| ES1- | OPERATION ACTION COOL DOWN AND DEPRESSURIZE RCS FOR CHARGING FLOW | Cool down and depressurize RCS to near atmospheric pressure to avoid depleting RWST | Cool down RCS using SGs, depressurize RCS using spray or one pressurizer PORV, reduce SI by stopping high pressure SI pumps, operate 2 of 3 charging pumps for makeup, align RHR system for cooldown to cold shutdown. | 24 |

## FIGURE 7

## SUCCESS CRITERIA FOR SMALL LOCA

| Top Event Description | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|
| HR1- HIGH PRESSURE RECIRCULATION | 1 of 2 SI/RHR trains delivering flow from containment sump to 1 of 2 RCS cold legs, sump valve on operable recirculation train open. | Manually align high pressure containment sump recirculation on low RWST level, align CCW cooling to RHR Hx, confirm operation of system. | 20.5 |
| LR1- LOW PRESSURE RECIRCULATION | 1 of 2 low pressure SI trains in recirc from containment sump to reactor vessel via RHR heat exchangers, sump valve on operable recirculation train open | Manually align low pressure containment sump recirc on low RWST level, align CCW cooling to RHR Hx, confirm operation of system. | 24 |
| LR2- LOW PRESSURE RECIRCULATION | 1 of 2 low pressure SI trains in recirc from containment sump to reactor vessel via RHR heat exchangers, sump valve on operable recirculation train open | Manually align low pressure contaiument sump recirc on low RWST level, align CCW cooling to RHR Hx, confirm operation of system. | 24 |

## FIGURE 7

## SUCCESS CRITERIA FOR SMALL LOCA

| Top Event Description | | System Success Criteria | Necessary Operator Actions | Mission Time (hrs) |
|---|---|---|---|---|
| OR1- | OPERATOR ACTION-LIMIT SI FLOW AND REFILL RWST | 1 of 2 reactor makeup water pumps delivering flow from the RMSTs to the RWST. 1 of 2 boric acid transfer pumps delivering flow from the BATs to the RWST. 1 of 2 SI pumps delivering flow from RWST. | Open local valves to supply makeup flow to RWST, start makeup. Stop one SI pump, throttle SI flow. | 20.5 |
| OR2- | OPERATOR ACTION-LIMIT SI FLOW AND REFILL RWST | 1 of 2 reactor makeup water pumps delivering flow from the RMSTs to the RWST. 1 of 2 boric acid transfer pumps delivering flow from the BATs to the RWST. 1 of 2 SI pumps delivering flow from RWST. RCS cooldown and depressurization successful. | Open local valves to supply makeup flow to RWST, start makeup. Stop one SI pump, throttle SI flow. Cool down and depressurize the RCS. | 20.5 |

Table 1: Core Damage Frequency Results by Control Room Fire Zone

CONTRIBUTION OF INITIATING EVENTS TO PLANT COREMELT FREQUENCY

| COREMELT FREQUENCY | INITIATING EVENT CATEGORY | I-EVENT FREQUENCY | # OF CUTSETS |
|---|---|---|---|
| 1.6E-05 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.0E-04 | 454 |
| 1.3E-05 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.0E-04 | 325 |
| 8.5E-08 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C | 1.4E-04 | 106 |
| 2.0E-09 | FIRE IN SG PORV SWITCHES IN MECHANICAL CONT. CONSOLE A OCCURS | 1.8E-05 | 87 |

le: Table 2: Fire Results
e: CONTFIRE.LST ( File created by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
Reduced Sum of Sequence Probabilities: 2.9272E-05

| NUMBER | SEQUENCE PROBABILITY | SEQUENCE DESCRIPTION | SEQUENCE IDENTIFIER |
|---|---|---|---|
| 1 | 1.59E-05 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | CHARGING FAILS DURING LOSS OF OFFSITE POWER | SYS-CHP |
| | | COMPONENT COOLING FAILS DURING LOSS OF OFFSITE POWER | SYS-CCP |
| 2 | 1.30E-05 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | CHARGING FAILS DURING LOSS OF OFFSITE POWER | SYS-CHP |
| | | COMPONENT COOLING FAILS DURING LOSS OF OFFSITE POWER | SYS-CCP |
| 3 | 9.54E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | AFW FAILS DURING LOSS OF OFFSITE POWER | SYS-AF7 |
| | | HIGH PRESSURE RECIRCULATION FAILS AFTER BLEED AND FEED | SYS-HR1 |
| 4 | 8.97E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | AFW FAILS DURING LOSS OF OFFSITE POWER | SYS-AF7 |
| | | BLEED AND FEED FAILS DURING LOSS OF OFFSITE POWER | SYS-OB5 |
| 5 | 8.88E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | AFW FAILS DURING LOSS OF OFFSITE POWER | SYS-AF7 |
| | | BLEED AND FEED FAILS DURING LOSS OF OFFSITE POWER | SYS-OB5 |
| 6 | 8.10E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | FIRE-DAMAGE |
| | | AFW FAILS DURING LOSS OF OFFSITE POWER | SYS-AF7 |
| | | HIGH PRESSURE RECIRCULATION FAILS AFTER BLEED AND FEED | SYS-HR1 |
| 7 | 6.96E-08 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | COOLDOWN AND DEPRESSURIZATION FOR CHARGING FAILS | SYS-ES1 |
| | | HIGH PRESSURE RECIRCULATION FAILS AFTER BLEED AND FEED | SYS-HR1 |
| | | LOW PRESSURE RECIRCULATION FAILS AFTER HPI SUCCESSFUL | SYS-LR2 |
| | | RWST REFILL AND SI FLOW LIMITATION FAILS (BLEED & FEED) | SYS-OR2 |
| 8 | 7.66E-09 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | HIGH PRESSURE INJECTION FAILS DURING SMALL LOCA OR SGTR | SYS-HI1 |
| | | COOLDOWN AND DEPRESSURIZATION FOR LOW PRESSURE INJECTION FAILS | SYS-OP1 |
| 9 | 6.93E-09 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | HIGH PRESSURE INJECTION FAILS DURING SMALL LOCA OR SGTR | SYS-HI1 |
| | | LOW PRESSURE RECIRCULATION FAILS AFTER LPI SUCCESSFUL | SYS-LR1 |
| 10 | 1.98E-09 | FIRE IN SG PORV SWITCHES IN MECHANICAL CONT. CONSOLE A OCCURS | IEV-FI12 |
| | | AFW TO INTACT SG STEAM GENERATOR FAILS | SYS-AF1 |
| | | MAIN FEEDWATER TO INTACT STEAM GENERATOR FAILS | SYS-OM1 |

le: Table 2: Fire Results
e: CONTFIRE.LST ( File created by linking CONTFIRE.IN    WLINK ** Ver. 3.11 **)
Reduced Sum of Sequence Probabilities: 2.9272E-D5

| NUMBER | SEQUENCE PROBABILITY | SEQUENCE DESCRIPTION | SEQUENCE IDENTIFIER |
|---|---|---|---|
| | | BLEED AND FEED FAILS DURING LOCA OR STEAM LINE BREAK | SYS-OB1 |
| 11 | 1.15E-09 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | AFW FAILS DURING TRANSIENT | SYS-AF3 |
| | | MAIN FEEDWATER FAILS DURING LOCA | SYS-OM0 |
| | | BLEED AND FEED FAILS DURING LOCA OR STEAM LINE BREAK | SYS-OB1 |
| 12 | 0.00E+00 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | AFW FAILS DURING TRANSIENT | SYS-AF3 |
| | | MAIN FEEDWATER FAILS DURING LOCA | SYS-OM0 |
| | | HIGH PRESSURE RECIRCULATION FAILS AFTER BLEED AND FEED | SYS-HR1 |
| | | LOW PRESSURE RECIRCULATION FAILS AFTER HPI SUCCESSFUL | SYS-LR2 |
| | | RWST REFILL AND SI FLOW LIMITATION FAILS DURING LOCA | SYS-OR1 |
| 13 | 0.00E+00 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | HIGH PRESSURE INJECTION FAILS DURING SMALL LOCA OR SGTR | SYS-HI1 |
| | | AFW FAILS DURING TRANSIENT | SYS-AF3 |
| | | MAIN FEEDWATER FAILS DURING LOCA | SYS-OM0 |
| 14 | 0.00E+00 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | HIGH PRESSURE INJECTION FAILS DURING SMALL LOCA OR SGTR | SYS-HI1 |
| | | LOW PRESSURE INJECTION FAILS DURING MEDIUM OR SMALL LOCA | SYS-LI2 |
| 15 | 0.00E+00 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | IEV-FI13 |
| | | HIGH PRESSURE INJECTION FAILS DURING SMALL LOCA OR SGTR | SYS-HI1 |
| | | ACCUMULATOR INJECTION FAILS | SYS-ACC |
| 16 | 0.00E+00 | FIRE IN SG PORV SWITCHES IN MECHANICAL CONT. CONSOLE A OCCURS | IEV-FI12 |
| | | AFW TO INTACT SG STEAM GENERATOR FAILS | SYS-AF1 |
| | | MAIN FEEDWATER TO INTACT STEAM GENERATOR FAILS | SYS-OM1 |
| | | HIGH PRESSURE RECIRCULATION FAILS AFTER BLEED AND FEED | SYS-HR1 |
| | | RWST REFILL AND SI FLOW LIMITATION FAILS DURING LOCA | SYS-OR1 |
| 17 | 0.00E+00 | FIRE IN SG PORV SWITCHES IN MECHANICAL CONT. CONSOLE A OCCURS | IEV-FI12 |
| | | HIGH PRESSURE INJECTION FAILS DURING STEAM LINE BREAK | SYS-HI3 |
| | | AFW TO INTACT SG STEAM GENERATOR FAILS | SYS-AF1 |
| | | MAIN FEEDWATER TO INTACT STEAM GENERATOR FAILS | SYS-OM1 |

Title: Table 3: Fire Results
le: CONTFIRE.OUT ( File created by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
uced Sum of Cutsets: 2.9280E-05

| NUMBER | CUTSET PROB | BASIC EVENT NAME | EVENT PROB. | IDENTIFIER |
|---|---|---|---|---|
| 1 | 4.24E-06 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | FEEDER BREAKERS ON 4160V BUS 6 FAIL TO OPEN (NO SI SIGNAL) | 2.10E-02 | 39-CB-BUS6FB-FO |
| 2 | 4.24E-06 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | FEEDER BREAKERS ON 4160V BUS 5 FAIL TO OPEN (NO SI SIGNAL) | 2.10E-02 | 39-CB-BUS5FB-FO |
| 3 | 3.33E-06 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DIESEL GENERATOR B FAILS TO START AND RUN | 1.65E-02 | 10-GE-DG1B---PS |
| 4 | 3.33E-06 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+D0 | FIRE-DAMAGE |
| | | DIESEL GENERATOR A FAILS TO START AND RUN | 1.65E-02 | 10-GE-DG1A---PS |
| 5 | 2.06E-06 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DIESEL GENERATOR B UNAVAILABLE DUE TO TEST OR MAINTENANCE | 1.02E-02 | 10-GE-DG1B---TM |
| 6 | 1.07E-06 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | AOV SW-301B FAILS TO OPEN OR TRANSFERS CLOSED | 5.32E-03 | 02-AVSW301B--CC |
| 7 | 1.07E-06 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | AOV SW-301A FAILS TO OPEN OR TRANSFERS CLOSED | 5.32E-03 | 02-AVSW301A--CC |
| 8 | 1.01E-06 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO RESTORE DIESEL GENERATOR B AFTER TEST | 5.00E-03 | 10-GE-DG1B---AE |
| 9 | 1.01E-06 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO RESTORE DIESEL GENERATOR A AFTER TEST | 5.00E-03 | 10-GE-DG1A---AE |
| 10 | 6.10E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BREAKER 1-603 FAILS TO CLOSE OR TRANSFERS OPEN | 3.02E-03 | 39-CB-1-603--OO |
| 11 | 6.10E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BREAKER 1-509 FAILS TO CLOSE OR TRANSFERS OPEN | 3.02E-03 | 39-CB-1-509--OO |
| 12 | 6.06E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BREAKER 1-601 FAILS TO OPEN | 3.00E-03 | 39-CB-1-601--FO |

le: Table 3: Fire Results
e: CONTFIRE.OUT ( File created by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
Reduced Sum of Cutsets: 2.9280E-05

| NUMBER | CUTSET PROB | BASIC EVENT NAME | EVENT PROB. | IDENTIFIER |
|---|---|---|---|---|
| 13 | 6.06E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BREAKER 1-501 FAILS TO OPEN | 3.00E-03 | 39-CB-1-501--FO |
| 14 | 5.66E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DAMPER TAV-60B FAILS TO OPEN OR TRANSFERS CLOSED | 2.80E-03 | 16-DM-TAV60B-CC |
| 15 | 5.66E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DAMPER TAV-63A FAILS TO OPEN OR TRANSFERS CLOSED | 2.80E-03 | 16-DM-TAV63A-CC |
| 16 | 5.66E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DAMPER TAV-60A FAILS TO OPEN OR TRANSFERS CLOSED | 2.80E-03 | 16-DM-TAV60A-CC |
| 17 | 5.09E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DIESEL ROOM B SUPPLY FAN FAILS TO START AND RUN | 2.52E-03 | 16-FN-DGBF---PS |
| 18 | 5.09E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | DIESEL ROOM A SUPPLY FAN FAILS TO START AND RUN | 2.52E-03 | 16-FN-DGAF---PS |
| 19 | 4.47E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B2--PS |
| | | OPERATOR FAILS TO SWITCH TURBINE BUILDING SW HEADER (FIRE) | 1.58E-01 | 02-TURB-HDR-FHE |
| 20 | 4.47E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B1 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B1--PS |
| | | OPERATOR FAILS TO SWITCH TURBINE BUILDING SW HEADER (FIRE) | 1.58E-01 | 02-TURB-HDR-FHE |
| 21 | 1.55E-07 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VENTILATION-FIRE | 1.02E-01 | 38--DOOR-EDCFHE |
| | | MOV SW-720B FAILS TO OPEN OR TRANSFERS CLOSED | 7.50E-03 | 16-MV-SW720B-CC |
| 22 | 1.55E-07 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VENTILATION-FIRE | 1.02E-01 | 38--DOOR-EDCFHE |
| | | MOV SW-720A FAILS TO OPEN OR TRANSFERS CLOSED | 7.50E-03 | 16-MV-SW720A-CC |
| 23 | 9.52E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VENTILATION-FIRE | 1.02E-01 | 38--DOOR-EDCFHE |
| | | BATTERY ROOM FAN COIL UNIT B FAILS TO START AND RUN | 4.62E-03 | 16-FN-BRFC1B-PS |
| 24 | 9.19E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |

le: Table 3: Fire Results
e: CONTFIRE.OUT ( File created by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
Reduced Sum of Cutsets: 2.9280E-05

| NUMBER | CUTSET PROB | BASIC EVENT NAME | EVENT PROB. | IDENTIFIER |
|---|---|---|---|---|
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER TRAIN B FAILS DURING LOSP DUE TO COMMON CAUSE | 4.55E-04 | 02--SWP-----BCM |
| 25 | 9.19E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER TRAIN A FAILS DURING LOSP DUE TO COMMON CAUSE | 4.55E-04 | 02--SWP-----ACM |
| 26 | 5.81E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO OPEN BATTERY ROOM DOORS FOR VENTILATION-FIRE | 1.02E-01 | 38--DOOR-EDCFHE |
| | | BATTERY ROOM FAN COIL UNIT A FAILS TO START AND RUN | 2.82E-03 | 16-FN-BRFC1A-PS |
| 27 | 5.38E-08 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | 1.39E-04 | IEV-FI13 |
| | | LPR FAILS DUE TO COMMON CAUSE | 1.60E-03 | 34R-LPR------CM |
| | | OPERATOR FAILS TO LIMIT SI FLOW AND REFILL RWST- COOLDOWN NEEDED | 2.42E-01 | 27A-OR2------HE |
| 28 | 3.99E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B2--PS |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | AIR COMPRESSOR B FAILS TO START AND RUN | 8.44E-02 | 01-CMSIAC1B--PS |
| 29 | 3.99E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B1 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B1--PS |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | AIR COMPRESSOR B FAILS TO START AND RUN | 8.44E-02 | 01-CMSIAC1B--PS |
| 30 | 3.96E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B1 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B1--PS |
| | | SERVICE WATER PUMP B2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B2--PS |
| 31 | 3.96E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP A1 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1A1--PS |
| | | SERVICE WATER PUMP A2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1A2--PS |
| 32 | 2.26E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | AFW PUMP B FAILS TO START AND RUN | 1.63E-02 | 05BPM--AFW1B-PS |
| | | TURBINE DRIVEN AFW PUMP FAILS TO START AND RUN | 1.37E-01 | 05BPT--AFW1C-PS |
| | | OPERATOR FAILS TO ESTABLISH BLEED AND FEED (LOSP AND FIRE) | 5.00E-02 | 36--OB5-----FHE |
| 33 | 2.26E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | AFW PUMP A FAILS TO START AND RUN | 1.63E-02 | 05BPM--AFW1A-PS |
| | | TURBINE DRIVEN AFW PUMP FAILS TO START AND RUN | 1.37E-01 | 05BPT--AFW1C-PS |
| | | OPERATOR FAILS TO ESTABLISH BLEED AND FEED (LOSP AND FIRE) | 5.00E-02 | 36--OB5-----FHE |

le: Table 3: Fire Results
e: CONTFIRE.OUT ( File created by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
Reduced Sum of Cutsets: 2.9280E-05

| NUMBER | CUTSET PROB | BASIC EVENT NAME | EVENT PROB. | IDENTIFIER |
|---|---|---|---|---|
| 34 | 2.02E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | FAILURE OF DIESEL GENERATOR B SPEED SENSITIVE SWITCH | 1.00E-04 | 10-SS-28266--OP |
| 35 | 2.02E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | FAILURE OF DIESEL GENERATOR A SPEED SENSITIVE SWITCH | 1.00E-04 | 10-SS-28265--OP |
| 36 | 1.75E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO START ONE CHARGING PUMP (FIRE) | 8.40E-03 | 35--CHP-----FHE |
| | | CCW PUMP B FAILS TO START AND RUN | 1.03E-02 | 31-PM--CCW1B-PS |
| 37 | 1.75E-08 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO START ONE CHARGING PUMP (FIRE) | 8.40E-03 | 35--CHP-----FHE |
| | | CCW PUMP A FAILS TO START AND RUN | 1.03E-02 | 31-PM--CCW1A-PS |
| 38 | 1.50E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | RELAY TDR-BLS/B6 FAILS TO OPERATE | 4.44E-04 | 42-RE-TDBSB6-RF |
| 39 | 1.50E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | RELAY TDR-B1X/B6 FAILS TO OPERATE | 4.44E-04 | 42-RE-TDB1X6-RF |
| 40 | 1.42E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO SWITCH TURBINE BUILDING SW HEADER (FIRE) | 1.58E-01 | 02-TURB-HDR-FHE |
| | | RELAY TDR-BLS/B6 FAILS TO OPERATE | 4.44E-04 | 42-RE-TDBSB6-RF |
| 41 | 1.42E-08 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | OPERATOR FAILS TO SWITCH TURBINE BUILDING SW HEADER (FIRE) | 1.58E-01 | 02-TURB-HDR-FHE |
| | | RELAY TDR-B1X/B6 FAILS TO OPERATE | 4.44E-04 | 42-RE-TDB1X6-RF |
| 42 | 8.77E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B2--PS |
| | | AOV SW-4B FAILS TO CLOSE | 3.10E-03 | 02-AV-SW4B---FC |
| 43 | 8.77E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SERVICE WATER PUMP B1 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1B1--PS |
| | | AOV SW-4B FAILS TO CLOSE | 3.10E-03 | 02-AV-SW4B---FC |
| 44 | 8.20E-09 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |

le: Table 3: Fires
e: CONTFIRE.OUT ( eated by linking CONTFIRE.IN WLINK ** Ver. 3.11 **)
Reduced Sum of Cutset80E-05

| NUMBER | CUTSET PROB | BASIC EVENT NAME | EVENT PROB. | IDENTIFIER |
|---|---|---|---|---|
| | | SW PUMP A1 UNAVAILABLE DUE TO TEST OR MAINTENANCE | 2.90E-03 | 02-PM-SW1A1--TM |
| | | SERVICE WATER PUMP A2 FAILS TO START AND RUN | 1.40E-02 | 02-PM-SW1A2--PS |
| 45 | 7.35E-09 | FIRE IN PZR PORV PR-2B SWITCHES IN MECH. CONTROL CONSOLE C OCCURS | 1.39E-04 | IEV-FI13 |
| | | HPI FAILS DUE TO COMMON CAUSE | 1.70E-04 | 33I-HPI------CM |
| | | OPERATOR FAILS TO COOL DOWN AND DEPRESSURIZE RCS FOR LPI (FIRE) | 3.11E-01 | 06--OP1-----FHE |
| 46 | 7.00E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BATTERY ROOM EXHAUST FAN B FAILS TO START AND RUN | 4.62E-03 | 16-FNBREXF1B-PS |
| | | MOV SW-720B FAILS TO OPEN OR TRANSFERS CLOSED | 7.50E-03 | 16-MV-SW720B-CC |
| 47 | 7.00E-09 | FIRE IN BUS 6 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI11 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | BATTERY ROOM EXHAUST FAN A FAILS TO START AND RUN | 4.62E-03 | 16-FNBREXF1A-PS |
| | | MOV SW-720A FAILS TO OPEN OR TRANSFERS CLOSED | 7.50E-03 | 16-MV-SW720A-CC |
| 48 | 6.68E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | RELAY BLS/B6 FAILS TO OPERATE | 1.98E-04 | 42-RE--BLSB6-RF |
| 49 | 6.68E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | RELAY 52CT/1-603 FAILS TO OPERATE | 1.98E-04 | 42-RE-52C603-RF |
| 50 | 6.68E-09 | FIRE IN BUS 5 SWITCHES IN ELECTRICAL CONT. CONSOLE A OCCURS | 2.02E-04 | IEV-FI10 |
| | | EQUIPMENT FAILS DUE TO FIRE | 1.00E+00 | FIRE-DAMAGE |
| | | SW-4B AIR ACCUMULATOR LEAKS EXCESSIVELY | 1.67E-01 | 01-AC-SW4B---LK |
| | | RELAY BS/B6 FAILS TO OPERATE | 1.98E-04 | 42-RE---BSB6-RF |

# ATTACHMENT 3

**Letter from M. L. Marchi (WPSC)**

**To**

**Document Control Desk (NRC)**

**Dated**

**September 28, 1998**

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

4.0 DETAILED PROCEDURE

*******************************************************************************

CAUTION

A hydrogen fire/explosion hazard may exist at generator due to loss of seal oil system.

*******************************************************************************

NOTE: The Emergency Plan Implementing Procedures should be reviewed to evaluate if the emergency response organization should be activated.

1 MANUALLY TRIP REACTOR:

a. Reactor Trip and Bypass Breakers - OPEN

b. Neutron flux - DECREASING

2 MANUALLY TRIP TURBINE:

a. Both Turbine Stop Valves - CLOSED

3 INITIATE TRAIN A AND TRAIN B MAIN STEAM ISOLATION

a. MS-1A(B), SG A(B) Main Steam Isolation Valves - CLOSED

b. MS-2A(B), SG A(B) MSIV Bypass Valves - CLOSED

4 CLOSE BT-3A AND BT-3B, S/G BLOWDOWN ISOLATION VALVES

5 STOP BOTH RXCP's AND PLACE IN PULLOUT

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 6 | PLACE THE CONTROL SWITCHES FOR BOTH EMERGENCY DIESEL GENERATORS IN PULLOUT | |
| 7 | REQUEST CAS OPERATOR TO FAIL OPEN <u>ALL</u> SECURITY <u>AND</u> VITAL AREA DOORS <u>AND</u> INITIATE COMPENSATORY ACTIONS (Control Room Supervisor)<br><br>a. DISTRIBUTE key rings and two way radios | |
| 8 | EVACUATE CONTROL ROOM<br><br>a. ANNOUNCE Control Room Evacuation and declaration of Site Emergency over Gai-tronics | |
| 9 | PROCEED TO RESPECTIVE AREAS:<br><br>a. Shift Supervisor: TSC, for Emergency Plan implementation<br><br>b. Control Room Supervisor: <u>GO</u> <u>TO</u> Step 13<br><br>c. Control Operator A: <u>GO</u> <u>TO</u> Step 10<br><br>d. Control Operator B: <u>GO</u> <u>TO</u> Step 11 | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
| --- | --- | --- |
| 10 | PERFORM FOLLOWING LOCAL ACTIONS (Control Operator A): | |
| | a. REMOVE fuses in RR-176:<br>1) Ckt 6 (PR-2B alt control)<br>2) Ckt 12 (PR-2A)<br>3) Ckt 37 (RC-45B)<br>4) Ckt 38 (PR-33B)<br>5) Ckt 39 (RC-49) | a. OPEN BRB-104, Ckt 12 Bkr. |
| | b. REMOVE fuses in RR-174:<br>1) Ckt 9 (LD-300)<br>2) Ckt 27 (SI-101A/B) | b. OPEN BRD-103, Ckt 15 Bkr. |
| | c. REMOVE fuses in RR-171:<br>1) Ckt 13 (PR-2B norm control) | c. OPEN BRA-104, Ckt 13 Bkr. |
| | d. OPEN bkrs in Battery Room A:<br>1) BRA-104, Ckt 21 (BT-3B)<br>2) BRA-113, Ckt 12 (NI Rack) | |
| | e. OPEN bkrs on Proprietary Panel in Battery Room B:<br>1) Ckt 3 (MUX-2)<br>2) Ckt 5 (MUX-3)<br>3) Ckt 6 (MUX-4)<br>4) Ckt 8 (MUX-1) | |
| | f. <u>GO TO</u> Step 12 | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 11 | PERFORM FOLLOWING LOCAL ACTIONS (Control Operator B): | |
| | a. IF Turbine did NOT trip, TRIP Turbine at Governor End Pedestal | |
| | b. IF Reactor did NOT trip, locally TRIP both Reactor Trip Breakers | |
| | c. POSITION MS-1B Trip Lever to TRIP | |
| | d. CLOSE SD-3B/CV-31174, S/G B PORV: | d. CLOSE SD-2B, S/G B PORV Isolation Valve |
| | 1) INSERT pin to engage SD-3B manual handwheel | |
| | 2) OPEN SD-3B Diaphragm Bypass Valve | |
| | 3) CLOSE NG-225, $N_2$ Supply to SD-3B | |
| | 4) CLOSE IA-330, IA to SD-3B | |
| | 5) VERIFY SD-3B, CLOSED | |
| | e. CLOSE MU-2A and MU-2B, Condenser Normal and Emergency Make-up valves | |
| | f. ISOLATE 1B S/G Blowdown line: | |
| | 1) CLOSE BT-3B-1 | |
| | 2) CLOSE BT-15 | |
| | 3) CLOSE BT-1000B | |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 11 | CONTINUED | |
| | g. ISOLATE RXCP seal injection: | |
| | 1) CLOSE CVC-202A and CVC-202B, Seal Water Injection Filter 1A/1B Outlet (Filter room) | 1) CLOSE CVC-201A and CVC-201B, Seal Water Injection Filter 1A/1B Inlet (Filter room) |
| | 2) NOTIFY Control Operator A seal injection is isolated | |
| | h. DE-ENERGIZE buses 1 and 2: | |
| | 1) PERFORM the following for Bus 1 and 2 Source Breakers:<br>• Bkr 1-101<br>• Bkr 1-104<br>• Bkr 1-201<br>• Bkr 1-204 | |
| | a) POSITION breaker control switch to TRIP | a) IF breaker does NOT TRIP, CONTINUE with Step 1.b and VERIFY breaker TRIPS after performing Step 1.d |
| | b) OPEN Close knife switch | |
| | c) OPEN Pump Motor knife switch | |
| | d) Discharge closing spring by ROTATING lever to RACKING POSITION | |
| | e) OPEN Trip knife switch | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| | <u>NOTE</u>: SD-100 will <u>NOT</u> receive power until Diesel Generator 1A is supplying Bus 1-52. | |
| 12 | ACTIVATE DEDICATED SHUTDOWN PANEL (Control Operator A): | |
| | a. POSITION all Local/Remote switches to LOCAL | |
| | b. POSITION all On/Remote switches to ON (3 switches) | |
| | <u>NOTE</u>: The following step does <u>NOT</u> include ckts 6, 7, 13, 24, & 27-50 on SD-101. | |
| | c. VERIFY all SD-101 indicating lights ON | c. REPLACE fuses for circuits with lights OFF on SD-101 (Source from BRA-104, bkr 6). |
| | d. VERIFY Service Water Pump 1A1 and 1A2 green lights ON | d. PERFORM following at applicable supply breaker (1-506 and 1-507):<br>1) OPEN Control Power knife switches.<br>2) REPLACE Close and Trip control power fuses.<br>3) CLOSE Control Power knife switches. |
| | e. CLOSE Service Water Pump 1A1 breaker by HOLDING control switch in START for 5 seconds | |
| | f. ASSIST Control Room Supervisor until AC power is restored | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

NOTE: Positioning 4160V Local/Remote switches to Local will disable automatic breaker operation in response to the voltage restoration logic for that particular breaker.

13 ISOLATE DEDICATED SHUTDOWN ELECTRICAL SYSTEM (Control Room Supervisor):

a. POSITION following Local/Remote switches to LOCAL:

1) 1A Diesel Engine and Governor (east wall)

2) Tertiary Aux Transformer Bkr 1-501

3) Reserve Aux Transformer Bkr 1-503

4) Station Service Transf 1-51 & 1-52 Bkr 1-505

5) Diesel Gen 1-A Bkr 1-509

b. STOP Diesel Generator 1A

c. POSITION breaker control switch to TRIP for following breakers:

1) 1-509

2) 1-503

3) 1-501

c. IF breaker does NOT open, PERFORM the following:

1) OPEN Control Power knife switches

2) REPLACE Trip control power fuses

3) CLOSE Control Power knife switches

4) POSITION breaker control switch to TRIP

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 13 | | |
| CONTINUED | | |
| | d. PERFORM following for Bus 5 breakers:<br>• Main Aux Transformer /1-511<br>• Bus Tie Bkr to 1-602 /1-510<br>• Safety Injection Pump/1-508 | |
| | 1) POSITION breaker control switch to TRIP | 1) IF breaker does NOT TRIP, CONTINUE with Step 13.d.2 and VERIFY bkr TRIPS after performing Step 13.d.4 |
| | 2) OPEN Close knife switch | |
| | 3) OPEN Charge Motor knife switch | |
| | 4) DISCHARGE closing spring by positioning lever to Cell Entry position. | |
| | 5) OPEN Trip knife switch | |
| | e. POSITION Bkr 1-505, Station Service Transf 1-51 & 1-52, control switch to CLOSE | e. IF breaker does NOT close, PERFORM the following:<br>1) OPEN Control Power knife switches<br>2) REPLACE Close and Trip control power fuses<br>3) CLOSE Control Power knife switches<br>4) POSITION breaker control switch to CLOSE |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 13 | | |

CONTINUED

f. POSITION following Local/Remote switches to LOCAL

- Breaker 15201, Main Breaker Bus 1-52
- Breaker 15101, Main Breaker Bus 1-51

g. CLOSE following breakers:

- Bkr 15201, Bus 52 Supply
- Bkr 15101, Bus 51 Supply

g. IF breaker does NOT close, PERFORM the following:

1) OPEN Control Power knife switches

2) REPLACE Control Power fuses

3) CLOSE Control Power knife switches

4) CLOSE breaker using local control switch

h. PERFORM following for Bus 51 and 52 breakers:

- Bkr 15111, Bus 51 & 61 Tie
- Bkr 15108, Containment Spray Pump A
- Bkr 15211, Bus 52 & 62 Tie

1) POSITION breaker control switch to TRIP

2) POSITION charging motor Control toggle switch to OFF

NOTE: Knife switch for Bkr 15111 is located inside top left cubicle of Bus 51.

3) OPEN Circ Bkr Close knife switch

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 14 | ENERGIZE 4160V AND 480V DEDICATED SHUTDOWN ELECTRICAL SYSTEM (Control Room Supervisor): | |
| | a. POSITION 1A Diesel Generator Voltage Control Local/Remote Switch to LOCAL | |
| | b. REPLACE following fuses:<br>1) Diesel Generator Control and Excitation Cabinet:<br>a) Fuse F-4<br>b) Fuse F-5<br>2) 1A Diesel Engine Control Panel:<br>a) Fuse F-4<br>b) Fuse F-5 | |
| | c. VERIFY Engine Control Panel green Power On light, ON | c. CHECK light bulb. IF light bulb is good, RESET supply breaker (BRA-104, ckt 10). |

NOTE: Overspeed Trip is reset by moving reset lever counterclockwise until it latches.

NOTE: Detectors for Vibration and Hi Crankcase Pressure must be manually reset before alarms will clear.

d. DEPRESS Engine Control Panel Failure Reset pushbutton to clear any local alarms

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

14

CONTINUED

**************************************************************************************

CAUTION

IF cooling water is NOT established in 2-3 minutes after Diesel start. damage will occur.

**************************************************************************************

| OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|
| e. START Diesel Generator 1A by POSITIONING Engine Control switch to START | |
| f. At Diesel Generator Control and Excitation Cabinet: | |
| 1) VERIFY output Frequency - 60 Hz | 1) ADJUST using Governor control switch. |
| 2) VERIFY output Voltage - 4160V | 2) ADJUST using Voltage control switch. |
| g. CLOSE Diesel Gen 1A Bkr 1-509 using control switch on breaker cubicle | |
| h. VERIFY service water cooling to Diesel Generator 1A | |
| i. REQUEST Control Operator A load equipment as necessary | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 15 | ESTABLISH SERVICE WATER (Control Operator A): | |
| | a. START Service Water Pump 1A2 | |
| | b. VERIFY SW-3A/CV-31038, Service Water Header 1A Isol CV CLOSED | b. CLOSE SW-3A. |
| | c. VERIFY SW-4A/CV-31084, Service Water Header 1A CV CLOSED | c. CLOSE SW-4A. |
| | d. Complete activation of DSP: | |
| | 1) POSITION Annunciator Power switch to ON | |
| | 2) TEST alarms | 2) INSPECT source fuse. (SD-100, ckts 12 & 13) |
| | 3) VERIFY all indicating lights ON and ALIGNED per control switch position | 3) Continue with step 14.e and REPLACE fuses in SD-100 for circuits with lights OFF. (SD-100 source is BRA-105, bkr 10) |
| | e. POSITION MS-1A/CV-31015, Main Steam Hdr 1A Isolation Valve, key switch to TRIP | |
| | f. VERIFY SW-10A/MV-32011, Auxiliary Building SW Header 1A MV OPEN | f. OPEN SW-10A. |
| | g. OPEN SW-903A/MV-32060, Cont Fan Coil Unit 1A SW Return MV | |
| | h. OPEN SW-903B/MV-32061, Cont Fan Coil Unit 1B SW Return MV | |
| | i. START Containment Fan Coil Unit 1A | |
| | j. START Containment Fan Coil Unit 1B | |
| | k. VERIFY SW Hdr Press 1A >60 psig | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| | NOTE: WHEN AFW Pump 1A starts, AFW Pump 1A Fan Coil Unit will start automatically. | |
| 16 | ESTABLISH AUX FEEDWATER (Control Operator A): | |
| | a. START Aux FW Pump 1A | a. REPLACE control power fuses at bkr 1-504:<br>1) OPEN Control Power knife switches.<br>2) REPLACE Close and Trip control power fuses.<br>3) CLOSE Control Power knife switches.<br>4) START Aux FW Pump 1A using control switch on DSP. |
| | b. VERIFY AFW-10A/MV-32027, Aux FW Pump 1A Crossover MV CLOSED | b. CLOSE AFW-10A. |
| | c. VERIFY AFW-2A/CV-31315, 1A AFW Pump Flow CV, at 0% (full open) until Stm Gen 1A WR Level >60% | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 17 | ESTABLISH INSTRUMENT AIR (Control Room Supervisor): | |

******************************************************************

CAUTION

The following control valves are supplied with dedicated air via local air accumulators and have limited air capacity. Accumulators will NOT refill until normal instrument air is restored.

******************************************************************

| Dedicated Accumulator | Valve | Minimum Design Cycles |
|---|---|---|
| 15 gallons - | LD2 Letdown Isolation<br>LD3 Letdown Isolation | 6 cycles of LD-2 AND<br>6 cycles of LD-3 |
| 80 gallons - | CVC11 Charging Isolation<br>CVC15 Pressurizer Aux Spray<br>LD4A Ltdn Orifice Isolation<br>LD4B Ltdn Orifice Isolation<br>LD4C Ltdn Orifice Isolation | 5 cycles of CVC11<br>OR<br>5 cycles of CVC15<br>AND<br>5 cycles of LD4A, LD4B OR LD4C |
| 8 gallons | TAV62A D-G 1A Room Air Exhaust | 10 cycles |
| 18 gallons | SW4A Turb Bldg Sw Hdr Isolation | 1 close/open cycle |
| 40 gallons - | SW30A1 SW Strn 1A1 Backwash<br>SW30A2 SW Strn 1A2 Backwash | 7 cycles of SW30A1 AND<br>7 cycles of SW30A2 |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

17

CONTINUED

a. At Air Compressor 1C:

1) OPEN SA-70, 1 1/2" Dedicated IA Hdr Isol

2) OPEN SA-71, 1 1/2" Dedicated IA Hdr Fltr Outl

3) CLOSE SA-100B, Cmpr 1C Outl to IA Dyr 1B

4) CLOSE SA-2C, Cmpr 1C Rcvr Outl

5) POSITION 1C Air Compressor local control switch to CS

b. CLOSE IA-401, 1 1/2" Dedicated IA Isol (N of 1A TB Bsmt F/C Unit)

c. VERIFY 1C Air Compressor receiver pressure (PI-11344) >60 psig

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 17 CONTINUED | d. IF air accumulators for valves located inside Containment become depleted, INITIATE maintenance actions to ALIGN Dedicated Air Header to Containment:<br>1) LOOSEN jam nut on handwheel for IA-101/CV-31309, IA to Cntmt Isol (BAST Room)<br>2) Locally CLOSE IA-101<br>3) OPEN IA-101-1, Ded & Alt IA Hdr to Cntmt Isol (BAST Room)<br>4) OPEN IA-480, Dedicated IA Hdr to Cntmt Isol (Stairwell below SFP Hx Rm) | |
| 18 | ESTABLISH S/G 1A PRESSURE CONTROL (Control Operator A): | |
| | a. VERIFY BT-2A/MV-32077, Stm Gen 1A Blowdown 1A1 MV CLOSED | a. CLOSE BT-2A. |
| | b. VERIFY Reac Coolant LP A Cold Leg Temp Ind - stable at or trending to 550°F | b. OPERATE SD-3A/CV-31170, Stm Gen 1A Pwr Op Rlf, to maintain RCS Cold Leg temperature at 550°F. |
| 19 | VERIFY PRZR COLD CAL LEVEL > 10% (Control Operator A) | IF level falls below 10%, POSITION Przr Heater Backup Group 1A Normal Supply Bkr control switch to OFF. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 20 | ESTABLISH COMPONENT COOLING FLOW (Control Operator A): | |
| | a. START Component Cooling Water Pump 1A | a. REPLACE control power fuses at Bkr 15109:<br>1) OPEN Control Power knife switches.<br>2) REPLACE control power fuses.<br>3) CLOSE Control Power knife switches.<br>4) START CCW Pump 1A using control switch on DSP. |
| | b. VERIFY CC-6A/MV-32121, Component Clg Wtr Ht Exgr 1A Otlt MV OPEN | b. OPEN CC-6A. |
| | c. VERIFY CC Hx CCW Return Flow Indication indicates FLOW | |
| | d. REQUEST Control Operator B to FAIL OPEN SW-1306A, SW From CC Hx A Temp CV:<br>1) CLOSE IA-31406, IA Supply to SW-1306A<br>2) BLEED OFF air pressure at pressure regulator | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 21 | ESTABLISH CHARGING FLOW (Control Operator A): | |
| | a. VERIFY following: | |
| | 1) RXCP seal supply line valves CLOSED per Step 11.g. | |
| | 2) CVC-301/MV-32056, Refueling Water Reac Emerg Makeup LCV OPEN | 2) OPEN CVC-301. |
| | 3) CVC-1/MV-32057, Volume Control Tank Otlt Isol Mv CLOSED | 3) CLOSE CVC-1. |
| | 4) CVC-7/CV-31103, Chg Line Flow Cont Vlv OPEN | 4) OPEN CVC-7. |

NOTE: IF CVC-11 does NOT open, CVC-14 Bypass check valve around CVC-11 will provide adequate flow path.

| | | |
|---|---|---|
| | 5) CVC-11/CV-31229, Chg Line to Cold Leg LP-B RCS Isol Vlv OPEN | 5) OPEN CVC-11. |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 21 | CONTINUED | |
| | b. START Charging Pump 1C: | |
| | 1) CLOSE supply breaker by POSITIONING Charging Pump 1C control switch to START | 1) REPLACE control power fuses at Bkr 15203:<br>a) OPEN Control Power knife switches.<br>b) REPLACE control power fuses.<br>c) CLOSE Control Power knife switches.<br>d) CLOSE bkr using pump control switch on DSP. |
| | 2) DEPRESS Reset pushbutton and VERIFY annunciator, CHG PMP 1C DRIVE CONT TROUBLE (87220-24), OFF | 2) IDENTIFY cause at local fault monitor and INITIATE maintenance action. |
| | 3) START Charging Pump 1C by POSITIONING control switch to START | 3) REPLACE control power fuses (SD-100, Ckt 39 & 40). |
| | c. ADJUST Chg Pump 1C Speed Control to increase Pzr Cold Cal Level to 20-50% | |
| | d. REQUEST Control Operator B VERIFY 195 gpm CC return flow from each RXCP (FI-613/26620 and FI-609/26621 by 1B SI Pump) | d. OPEN CVC-201A/B or CVC-202A/B to establish seal injection flow to RXCPs (whichever were closed in step 11.g.)<br><br><u>IF</u> local flow indicators are energized, THROTTLE CVC-7 to establish 8 gpm seal injection flow to each RXCP. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 22 | VERIFY RCS SUBCOOLING > 50°F (Control Operator A) | GO TO Step 18. |
| | a. REFER to Table E-0-06-1 | |
| | b. Use Reac Coolant LP A Hot Leg Temp Ind | |
| 23 | ESTABLISH PRESSURIZER WATER LEVEL CONTROL (Control Operator A): | |
| | a. VERIFY Pzr Cold Cal Level > 10% | a. PERFORM following:<br>1) VERIFY Letdown, NOT IN SERVICE.<br>2) VERIFY Przr Heater Backup Group 1A Normal Supply Bkr control switch, OFF.<br>3) INCREASE Charging Flow. |
| | b. VERIFY Charging, IN SERVICE | b. GO TO Step 21. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 24 | CHECK PRESSURIZER PRESSURE - STABLE AT <u>OR</u> TRENDING TO 2235 psig (Control Operator A): | <u>IF</u> pressure is <2235 psig and DECREASING:<br>a. CLOSE RC-46/SV-33663, Rx Head/Przr Vent to PRT.<br>b. CLOSE PR-33A/SV-33660, Przr Head Vent Train A.<br>c. CLOSE CVC-15/CV-31230, Chrg Line to Przr Aux Spray.<br>d. <u>IF</u> Przr Cold Cal Level is >10%, ENERGIZE Pressurizer Heater Backup Group 1A.<br><br><u>IF</u> pressure is >2385 psig and INCREASING:<br>a. VERIFY Pressurizer Heater Backup Group 1A Normal Supply Bkr control switch, OFF.<br>b. OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT.<br>c. CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to reduce RCS pressure. |
| 25 | CHECK S/G LEVEL (Control Operator A): | |
| | a. VERIFY Stm Gen 1A WR Level >60% | a. MAINTAIN maximum AFW flow until Stm Gen 1A WR Level >60%. |
| | b. THROTTLE AFW-2A to maintain Stm Gen 1A WR Level >60% | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 26 | VERIFY CONDENSATE STORAGE TANKS LEVEL >4% (3000 gal) (Control Operator A):<br><br>a. REQUEST Control Operator B report levels from local indicators | <u>IF</u> level is <u>NOT</u> >4% (3000 gal), PERFORM following:<br><br>a. LOCALLY OPEN DW-20, RMST to CST Crossconnect Isol<br><br><u>OR</u><br><br>b. Locally OPEN SW-601A/MV-32029 supply bkr (MCC-52C, B2), <u>THEN</u> OPEN SW-601A, Service Water to Aux FW Pump 1A. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 27 | DE-ENERGIZE BUSES 3, 4, and 6 (Control Room Supervisor): | |

NOTE: Bus 1, 2, 3, 4 and 6 should remain de-energized until an evaluation is performed by Plant Management.

a. STOP Diesel Generator 1B.

b. PERFORM following for source breakers listed below:

| | Bus 3 | Bus 4 |
|---|---|---|
| MAT | 1-301 | 1-401 |
| RAT | 1-307 | 1-407 |

| OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|
| 1) POSITION breaker control switch to TRIP | 1) IF breaker does NOT TRIP, CONTINUE with Step 27.b.2 and VERIFY bkr TRIPS after performing Step 27.b.4. |
| 2) OPEN Close knife switch | |
| 3) OPEN Pump Motor knife switch | |
| 4) Discharge closing spring by ROTATING lever to Cell Entry Position. | |
| 5) OPEN Trip knife switches | |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

27

CONTINUED

c. PERFORM following for source breakers listed below:

| | Bus 6 |
|---|---|
| TAT | 1-611 |
| MAT | 1-610 |
| RAT | 1-601 |
| B D/G | 1-603 |

1) POSITION breaker control switch to TRIP

Contingency: 1) IF breaker does NOT TRIP, CONTINUE with Step 27.c.2 and VERIFY bkr TRIPS after performing Step 27.c.4.

2) OPEN Close knife switch

3) OPEN Charge Motor knife switch

4) Discharge closing spring by POSITIONING lever to Cell Entry Position.

5) OPEN Trip knife switches

d. REQUEST plant electrician OPEN G-1 Bkr and DE-ENERGIZE G-1 Control Power

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 27 | CONTINUED | |
| | e. MONITOR status of each battery: | |
| | 1) VERIFY 1A Battery, NOT grounded | 1) MAINTAIN power to SD-101 and INITIATE action to clear ground. |
| | 2) VERIFY Battery Charger BRA-108 OPERATING and 1A Battery terminal voltage >105 VDC | 2) REQUEST maintenance assistance. |
| | 3) VERIFY 1B Battery terminal voltage >105 VDC | 3) REQUEST maintenance action to prevent battery damage. |
| 28 | VERIFY RXCP COMPONENT COOLING FLOW AND ESTABLISH SEAL INJECTION FLOW (Control Operator A): | |
| | a. REQUEST Control Operator B VERIFY 195 gpm CC return flow from each RXCP (FI-613/26620 and FI-609/26621 by 1B SI Pump) | a. GO TO step 28.c. |
| | b. VERIFY CC flow to RXCP thermal barriers has been established for 30 minutes | b. CONTINUE with procedure. WHEN 30 minutes has elapsed, PERFORM Steps 28.c and 28.d. |
| | c. REQUEST Control Operator B OPEN CVC-201A/B or CVC-202A/B (whichever were closed in Step 11.g) | |
| | d. IF local flow indicators are ENERGIZED, THROTTLE CVC-7 to establish 8 gpm seal injection flow to each RXCP. | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 29 | ESTABLISH LETDOWN FLOW (Control Operator A): | |
| | a. VERIFY Przr Cold Cal Level, >20% | a. INCREASE charging flow to MAXIMUM rate and GO TO Step 31. WHEN pressurizer level is >20%, GO TO Step 29.b. |
| | b. INITIATE Letdown: | |
| | 1) ADJUST CC-302/CV-31100, Non-Rgn Hx Otlt Temp Cont, to 50% OPEN | |
| | 2) ADJUST LD-10/CV-31099, Low Pressure Letdown Line PCV, to 50% OPEN | |
| | 3) VERIFY LD-27/CV-31096, Ltdn Flow to Hldup/VC Tank 3-Way CV, in DIVERT | |
| | 4) VERIFY LD-14/CV-31098, Ltdn Flow to Demin/VC Tank 3-Way CV, in V.C. TNK | |
| | 5) Locally INSERT fuses in SD-101 FUG-7 and FUG-6 (for LD-3 and LD-6) | |
| | 6) POSITION LD-6/CV-31234, Letdown Flow to Ltdn Hx Isol CV, key switch to OPEN | |
| | 7) OPEN LD-2/CV-31108, Ltdn Line From LP-B Cold Leg RCS Isol Vlv | |
| | 8) POSITION LD-3/CV-31104, Ltdn Line From LP-B Cold Leg RCS Isol Vlv, key switch to OPEN | |
| | 9) OPEN LD-4A/CV-31231 OR LD-4B/CV-31232, Regen Hx Ltdn Otlt Orif 1A/1B Isol CV | 9) ADJUST Chg Pump 1C Speed Control to MINIMUM. WHEN Pzr Cold Cal Level reaches 70%, OPEN LD-4C. |

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 29 | <u>CONTINUED</u><br><br>10) ADJUST LD-10 to maintain Ltdn Ht Xgh Otlt Press at 250 psig and POSITION controller to AUTO<br><br>11) ADJUST CC-302 to maintain Ltdn Ht Xgh Otlt Temp at 120°-140°F and POSITION Controller to AUTO<br><br>c. REQUEST Control Operator B MONITOR CVC Holdup Tank on fill and ALIGN letdown to an empty tank when necessary.<br><br>d. ADJUST Charging Pump 1C Speed to maintain Pzr Cold Cal Level, 20-50% | |
| 30 | ESTABLISH RCS PRESSURE CONTROL (Control Operator A):<br><br>a. OPERATE Przr Heater Backup Group 1A to maintain Reactor Coolant LP A Cold Leg Temp and Przr Press - Within limits of Figure E-0-06-1 | a. <u>IF</u> pressure is >2385 psig and INCREASING:<br><br>1) VERIFY Przr Heater Backup Group 1A Normal Supply Bkr control switch, OFF.<br><br>2) OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT.<br><br>3) CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to reduce RCS pressure. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 31 | VERIFY NATURAL CIRCULATION (Control Operator A): | Increase dumping steam from Steam Generator 1A, by OPENING SD-3A, Stm Gen 1A Pwr Op Rlf. |
| | a. Reac Coolant LP A Hot Leg Temp - STABLE or DECREASING | |
| | b. RCS Subcooling based on Reac Coolant LP A Hot Leg Temp and Pzr Press - >50°F | |
| | c. Stm Gen 1A Outlet Press - STABLE or DECREASING | |
| | d. Reac Coolant LP A Cold Leg Temp - at saturation temperature for Stm Gen 1A Outlet Press | |
| 32 | ESTABLISH COLD SHUTDOWN BORON CONCENTRATION (Control Operator A): | |
| | a. VERIFY letdown, IN SERVICE | a. GO TO Step 29. |
| | b. ADJUST Chg Pump 1C Speed Control to maintain Pzr Cold Cal Level, 20-50% | |

NOTE: 12,700 gal corresponds to 5% decrease in RWST level or charging flow at maximum speed (60 gpm) for 3.5 hours.

| | | |
|---|---|---|
| | c. WHEN 12,700 gallons has been added from RWST, 1% Cold Shutdown boron concentration should be attained | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

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CAUTION

IF S/G 1B WR Level is < 10%

AND

S/G 1B Pressure is < S/G 1A Pressure, OR > 1030psig,

THEN

DO NOT initiate AFW flow to Steam Generator 1B.

*************************************************************************

NOTE: Cables for Steam Generator 1B level and pressure indication are NOT protected. Indication may NOT be available.

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 33 | ESTABLISH S/G 1B LEVEL CONTROL (Control Operator A): | IF S/G 1B is NOT available, GO TO Step 35. |
| | a. Locally OPEN supply bkr for Aux FWP 1B Disch X-over MV, AFW-10B | |
| | b. Locally CLOSE AFW-10B | |
| | c. At DSP, OPEN AFW-10A | |
| | d. Locally THROTTLE AFW-10B to establish 25 gpm on FI-18202, AFW to 1B S/G (Aux bldg bsmt) | |
| | e. ADJUST AFW-10B to maintain Stm Gen 1B WR Level >60% | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 34 | ESTABLISH 1B S/G PRESSURE CONTROL (Control Operator A): | |
| | a. ESTABLISH communications with Control Operator B | |
| | b. REQUEST Control Operator B locally OPEN SD-3B to reduce Stm Gen 1B Otlt Press to the existing value for Stm Gen 1A, THEN CLOSE SD-3B | |
| | c. WHEN Stm Gen 1B Otlt Press is 100 psig > Stm Gen 1A Otlt Press, REPEAT Steps 34.a and 34.b | |
| 35 | MAINTAIN STABLE PLANT CONDITIONS (Control Operator A): | |
| | a. Reac Coolant LP A Cold Leg Temp Ind - 550°F | |
| | b. Reac Coolant LP A Cold Leg Temp and Pzr Press - Within limits of Figure E-0-06-1 | b. GO TO Step 22. |
| | c. Pzr Cold Cal Level - 20%-50% | c. GO TO Step 23. |
| | d. Stm Gen 1A WR Level - >60% | d. GO TO Step 25. |
| | e. Stm Gen 1B WR Level (if available) - >60% | e. GO TO Step 33. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 36 | VERIFY STATUS OF SUPPORT EQUIPMENT (Control Operator A): | |
| | a. Screenhouse Exhaust Fan 1A and Diesel Generator Vent Supply Fan 1A, ON | a. Locally START fans. |
| | b. Fire Pump 1A, RUNNING | |
| | c. Aux Bldg Mezz Sfgrd Fan Coil 1A, ON | |
| | d. Turbine Bldg Fan Coil Unit 1A, ON | |
| | e. Battery Room Fan Coil Unit 1A, ON | |
| 37 | VERIFY COLD SHUTDOWN BORON CONCENTRATION (Control Operator A): | |

NOTE: WHEN 12,700 gallons has been added from the RWST (5% level change), 1% Cold Shutdown boron concentration should be attained.

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| | a. RCS Boron Sample > Cold Shutdown Boron Concentration | a. GO TO Step 32. |
| 38 | REQUEST Plant Electricians determine feasibility of returning both CRDM Cooling Fans to service. | |

NOTE: IF plant can be maintained in a stable Hot Shutdown condition, plant management should be consulted to determine the feasibility of restoring off-site power prior to commencing any further plant status changes.

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 39 | RCS COOLDOWN TO COLD SHUTDOWN DESIRED | |
| | a. GO TO Step 40 | a. GO TO to Step 35. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

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CAUTION

WHEN cooling down using Loop A, do NOT cool down too rapidly; S/G 1B may become a heat source. IF S/G 1B pressure control and AFW flow are NOT established, Loop B will stagnate and only means of heat removal will be losses to ambient.

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| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 40 | INITIATE RCS COOLDOWN: | |
| | a. MAINTAIN cooldown rate - <25° F/hr | |
| | b. ADJUST SD-3A to achieve required cooldown rate | |
| | c. MAINTAIN Stm Gen 1A WR Level - >60% | |
| | d. MAINTAIN Reac Coolant LP A Cold Leg Temp and Pzr Press - Within limits of Figure E-0-06-1 | |
| | e. IF Stm Gen 1B is available, MAINTAIN temperature difference between Loop A and Loop B <20° F by locally OPENING SD-3B to equalize Stm Gen 1A and 1B Outlet Pressures | e. MAINTAIN 50° F RCS Subcooling based on Stm Gen 1B saturation temperature. IF Stm Gen 1B Outlet Press indication is NOT available, REQUEST maintenance assistance to establish alternate indication. |
| 41 | VERIFY REAC COOLANT LOOP A TEMPERATURES - <550° F | GO TO Step 38. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 42 | DEPRESSURIZE RCS TO 1950 PSIG: | |
| | a. DE-ENERGIZE Pressurizer Heater Backup Group 1A | |
| | b. ESTABLISH Auxiliary Spray | b. <u>IF</u> Auxiliary Spray can <u>NOT</u> be established, DEPRESSURIZE using Przr Head Vent System: |
| | 1) VERIFY letdown in service | 1) OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT |
| | 2) VERIFY at least one Charging Pump RUNNING. | 2) CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to control RCS pressure |
| | 3) OPEN CVC-15/CV-31230, Chrg Line to Przr Aux Spray | |
| | c. <u>WHEN</u> Pzr Press is equal to 1950 psig, STOP RCS depressurization | |
| | d. ENERGIZE Pressurizer Heater Backup Group 1A as necessary to maintain 1950 psig | |
| 43 | MAINTAIN THE FOLLOWING RCS CONDITIONS: | |
| | a. Pzr Press - 1950 psig | |
| | b. Pzr Cold Cal Level - 20-50% | |
| | c. RCS cooldown rate - <25°F/hr | |
| | d. Reac Coolant LP A Cold Leg Temp and Pzr Press - Within limits of Figure E-0-06-1 | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 44 | MONITOR RCS COOLDOWN:<br>a. Reac Coolant LP A Hot Leg Temp - DECREASING<br>b. Stm Gen 1B Outlet Press - STABLE or DECREASING<br>c. RCS subcooling - >50°F and INCREASING<br>1) REFER to Table E-0-06-1<br>2) Use Reac Coolant LP A Hot Leg Temp Ind | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 45 | INITIATE RCS DEPRESSURIZATION: | |
| | a. VERIFY CRDM Fans BOTH RUNNING | a. Until 18 hours soak is completed, MAINTAIN RCS subcooling - > 200°F and <u>GO TO</u> Step 45.d.<br><br>1) REFER to Table E-0-06-1<br><br>2) Use Reac Coolant LP A Hot Leg Temp Ind |
| | b. MAINTAIN RCS subcooling - >50°F<br><br>1) REFER to Table E-0-06-1<br><br>2) Use Reac Coolant LP A Hot Leg Temp Ind | |
| | c. MAINTAIN Reac Coolant LP A Cold Leg Temp and Pzr Press - Within Limits of Figure E-0-06-2 | |
| | d. DE-ENERGIZE Pressurizer Heater Backup Group 1A | |
| | e. ESTABLISH Auxiliary Spray<br><br>1) VERIFY letdown in service<br><br>2) VERIFY at least one Charging Pump RUNNING.<br><br>3) OPEN CVC-15/CV-31230, Chrg Line to Przr Aux Spray | e. <u>IF</u> Auxiliary Spray can <u>NOT</u> be established, DEPRESSURIZE using Przr Head Vent System:<br><br>1) OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT<br><br>2) CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to control RCS pressure |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 46 | CONTINUE RCS COOLDOWN AND DEPRESSURIZATION: | |
| | a. MAINTAIN RCS cooldown rate - <25°F/hr | |
| | b. MAINTAIN subcooling requirements of Step 45 | b. STOP depressurization AND RE-ESTABLISH subcooling |
| | c. MAINTAIN Reac Coolant LP A Cold Leg Temp and Pzr Press - Within limits of Figure E-0-06-1 OR E-0-06-2 | |
| | d. MAINTAIN Pzr Cold Cal Level - 20-50% | |
| | e. MAINTAIN Stm Gen 1A WR Level - >60% | |
| 47 | VERIFY PZR COLD CAL LEVEL - NO UNEXPECTED LARGE VARIATIONS | PRESSURIZE RCS within limits of Figure E-0-06-1 to collapse potential voids in system and CONTINUE cooldown. |
| 48 | DETERMINE IF SOAK IS REQUIRED | |
| | a. CRDM Fans - Less than both running | a. Soak NOT required. GO TO Step 49 |
| | b. Reac Coolant LP A Cold Leg Temp Ind < 390°F | b. MAINTAIN Pzr Press > 1400 psig GO TO Step 46 |
| | c. MAINTAIN following conditions for at least 18 hours: | |
| | 1) Pzr Press > 1400 psig | |
| | 2) Reac Coolant LP A Cold Leg Temp - Between 390°F and minimum temperature allowed per E-0-06-1 | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

NOTE: IF Stm Gen 1B is NOT depressurized periodically, Stm Gen 1B U-Tubes will void during depressurization. This will result in a rapidly increasing Pzr Level.

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 49 | DEPRESSURIZE RCS TO 950 PSIG: | |
| | a. DE-ENERGIZE Pressurizer Heater Backup Group 1A | |
| | b. ESTABLISH Auxiliary Spray | b. IF Auxiliary Spray can NOT be established, DEPRESSURIZE using Przr Head Vent System: |
| | 1) VERIFY letdown in service | 1) OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT |
| | 2) VERIFY at least one Charging Pump RUNNING. | 2) CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to control RCS pressure |
| | 3) OPEN CVC-15/CV-31230, Chrg Line to Przr Aux Spray | |
| | c. WHEN Pzr Press is equal to 950 psig, STOP RCS depressurization | |
| | d. ENERGIZE Pressurizer Heater Backup Group 1A as necessary to maintain 950 psig | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

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CAUTION

Any valve manipulation requiring Containment entry will require coordination with Health Physics and approval per EP-AD-11.

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| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 50 | CHECK IF ACCUMULATORS SHOULD BE ISOLATED: | |
| | a. Pzr Press - < 1000 psig | a. DO NOT isolate accumulators. GO TO Step 49. |
| | b. ISOLATE SI Accumulators A/B and ALIGN SI for <1000 psig: | |
| | 1) REQUEST plant electrician CLOSE the following valves from respective MCCs and LOCK OPEN supply breakers: | 1) IF power is NOT available, LOCK OPEN supply breakers and locally CLOSE valves. |
| | a) SI-20B/MV-32096, SI Accumulator 1B Disch Isol (MCC-62B) | |
| | b) SI-20A/MV-32091, SI Accumulator 1A Disch Isol (MCC-52B) | |
| | c) SI-302A/MV-32100, Reactor Vessel Safety Injection (MCC-52B) | |
| | d) SI-300A/MV-32111, RHR Pump Suction Isol (MCC-52E) | |
| | e) SI-351A/MV-32113, Cntmt Sump B Isol (MCC-52E) | |
| | f) SI-351B/MV-32114, Cntmt Sump B Isol (MCC-62H) | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 51 | MAINTAIN LETDOWN FLOW: | |
| | a. VERIFY adequate volume remains in CVC Holdup Tank on fill | a. REQUEST Control Operator B ALIGN letdown to empty CVC Holdup Tank. |
| | b. OPEN additional letdown orifice isolation valves, as necessary, to maintain letdown flow | |
| | c. ADJUST LD-10 to maintain Ltdn Ht Xgh Otlt Press at 250 psig | |
| 52 | MAINTAIN REQUIRED RXCP SEAL INJECTION FLOW: | |
| | a. IF local flow indicators are ENERGIZED, THROTTLE CVC-7 to establish 8 gpm seal injection flow to each RXCP | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

NOTE: IF Stm Gen 1B is NOT depressurized periodically. Stm Gen 1B U-Tubes will void during depressurization. This will result in a rapidly increasing Pzr Level.

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 53 | DEPRESSURIZE RCS TO 420 PSIG: | |
| | a. DE-ENERGIZE Pressurizer Heater Backup Group 1A | |
| | b. ESTABLISH Auxiliary Spray | b. IF Auxiliary Spray can NOT be established, DEPRESSURIZE using Przr Head Vent System: |
| | 1) VERIFY letdown in service | |
| | 2) VERIFY at least one Charging Pump RUNNING. | 1) OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT |
| | 3) OPEN CVC-15/CV-31230, Chrg Line to Przr Aux Spray | 2) CYCLE OPEN PR-33A/SV-33660, Przr Head Vent Train A, to control RCS pressure |
| | c. WHEN Pzr Press is equal to 420 psig, STOP RCS depressurization | |
| | d. ENERGIZE Pressurizer Heater Backup Group 1A as necessary to maintain 420 psig | |
| 54 | CHECK IF RHR SYSTEM CAN BE PLACED IN SERVICE: | |
| | a. Reac Coolant LP A Hot Leg Temp < 400°F | a. GO TO Step 46. |
| | b. Pzr Press < 425 psig | b. GO TO Step 53. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|

55 PLACE RHR TRAIN A IN SERVICE:

a. CLOSE supply breakers for following valves:

1) RHR-1A/MV-32116, Loop A Hot Leg to RHR Pump (MCC-52B Ext)

2) RHR-2A/MV-32117, Loop A Hot Leg to RHR Pump (MCC-52B Ext)

3) RHR-11/MV-32118, RHR to Loop B Cold Leg Isol (MCC-52B)

b. Locally VERIFY following valves CLOSED, <u>THEN</u> OPEN supply breakers:

1) RHR-300A/MV-32134, RHR Hx Outlet to SI Pmp 1A (MCC-52E)

2) RHR-400A/MV-32125, RHR Hx Outlet to ICS Pmp 1A (MCC-52E)

c. Locally POSITION RHR-8A/CV-31114, RHR Hx 1A Outlet CV, as follows:

1) CLOSE IA-31114-2

2) CLOSE IA-31114-1

3) BLEED OFF air pressure at pressure regulators

4) LOOSEN jam nut on valve stem

5) Manually POSITION RHR-8A to 10% OPEN

d. OPEN CC-400A/MV-32119, CC Water to Rsdl Hx 1A MV

CONTINUED

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 55 | | |
| CONTINUED | | |
| | e. VERIFY CC Hx CCW Return Flow indication <3650 gpm | e. Locally CLOSE CC-400B. |
| | f. ADJUST LD-10 to increase Ltdn Ht Xgh Otlt Press to 420 psig (equal to Pzr Press) | |
| | g. OPEN RHR-1A/MV-32116 and RHR-2A/MV-32117, Loop A Hot Leg RHR Inlt Isol MVs | g. REPLACE fuses at MCC-52B Ext. |
| | h. CLOSE LD-4A, LD-4B, and LD-4C, Regen Hx Ltdn Otlt Orif Isol CVs | |
| | i. POSITION LD-10 Controller to MANUAL and OPEN LD-10 | |
| | j. START RHR Pump 1A | |
| | k. VERIFY RHR Pump Pit Fan Coil 1A, ON | k. Locally START RHR Pump Pit Fan Coil 1A. |
| | l. Locally VERIFY 1A RHR Ht Exch Outlet Temperature (TI-12075) increases to within 50°F of Reac Coolant LP A Hot Leg Temp | |
| | m. VERIFY RHR System Boron Concentration within 100 ppm of RCS | |
| | n. OPEN RHR-11/MV-32118, RHR Return to LP-B Cold Leg Isol MV | n. REPLACE fuses at MCC-52B. |
| | o. Locally LOCK OPEN supply breaker to SW-1300A/MV-32009 (MCC-52B), <u>THEN</u> OPEN SW-1300A, CC Hx 1A Outlet | |
| | p. ADJUST LD-10 to maintain Pzr Cold Cal Level 20-50% | |

<u>CONTINUED</u>

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 55 | CONTINUED<br>q. VERIFY integrity of RHR System by MONITORING Pzr Cold Cal Level and Chg Pump 1C Speed versus LD-10 position. | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 56 | CONTINUE RCS COOLDOWN TO BELOW 200°F WITH RHR SYSTEM: | |
| | a. MAINTAIN RCS cooldown rate - <25°F/hr | |
| | b. Locally THROTTLE RHR-8A to achieve cooldown rate | b. Locally THROTTLE RHR-9A, RHR Hx 1A Outlet. |
| | c. Locally ADJUST RHR-101/CV-31116, RHR Hx Bypass CV, as follows: | |
| | 1) Fail RHR-101 closed: | |
| | a) CLOSE IA-31116-2 | |
| | b) CLOSE IA-31116-1 | |
| | c) BLEED OFF air pressure at pressure regulator | |
| | 2) VERIFY RHR-110, RHR Return to RWST, CLOSED | |
| | 3) OPEN RHR-10A, Cross Connect Valve | |
| | 4) OPEN RHR-100A, Heat Exchanger Bypass Line | |
| | 5) LOOSEN jam nut on RHR-101 valve stem | |
| | 6) OPEN RHR-101 to establish 1000-2000 gpm RHR flow | |
| | d. MAINTAIN Reac Coolant LP A Cold Leg Temp and Pzr Press - Within limits of Figure E-0-06-1 | |
| | e. MAINTAIN Pzr Cold Cal Level - 20-50% | e. ADJUST Chg Pump 1C Speed and LD-10 position. |
| | f. <u>WHEN</u> Reac Coolant LP A Hot Leg Temp is <200°F, ALIGN Containment Spray System as follows: | |
| | 1) Locally LOCK CLOSED ICS-7A and ICS-7B, Cntmt Spray Pump 1A/1B to Cntmt Vessel (N and E Pen room) | |
| | 2) REQUEST plant electrician RACK OUT 1B ICS Pump breaker | |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
| --- | --- | --- |

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CAUTION

Depressurizing the RCS before entire RCS is <200°F may result in additional void formation in RCS.

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| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
| --- | --- | --- |
| 57 | CONTINUE COOLDOWN OF INACTIVE PORTION OF RCS: | |
| | a. Steam Generator U-Tubes - CONTINUE dumping steam from both Steam Generators | |
| | b. Upper head region - Both CRDM cooling fans, RUNNING | b. WAIT 30 hours after RCS temperature reaches 200°F before depressurizing RCS to <350 psig. |
| 58 | DETERMINE IF RCS DEPRESSURIZATION IS PERMITTED: | |
| | a. Entire RCS - <200°F | a. DO NOT depressurize RCS. GO TO Step 56. |

| STEP | OPERATOR ACTIONS | CONTINGENCY ACTIONS |
|---|---|---|
| 59 | DEPRESSURIZE RCS TO 100 PSIG<br><br>a. DE-ENERGIZE Pressurizer Heater Backup Group 1A<br><br>b. OPEN RC-46/SV-33663, Rx Head/Przr Vent to PRT<br><br>c. OPEN PR-33A/SV-33660, Przr Head Vent Train A, to reduce RCS pressure<br><br>d. <u>WHEN</u> Pzr Press is equal to 100 psig, STOP RCS depressurization<br><br>e. ENERGIZE Pressurizer Heater Backup Group 1A as necessary to maintain 100 psig | |
| 60 | STABILIZE PLANT AT 180°F <u>AND</u> 100 psig | |

-END-

TABLE E-0-06-1
REACTOR COOLANT SYSTEM SUBCOOLING

| PRESSURIZER PRESSURE PSIG | T-SAT DEG F | 50 DEG SUBCOOLING DEG F | 200 DEG SUBCOOLING DEG F |
|---|---|---|---|
| 2300 | 657 | 607 | 457 |
| 2250 | 654 | 604 | 454 |
| 2200 | 650 | 600 | 450 |
| 2150 | 647 | 597 | 447 |
| 2100 | 644 | 594 | 444 |
| 2050 | 640 | 590 | 440 |
| 2000 | 637 | 587 | 437 |
| 1950 | 633 | 583 | 433 |
| 1900 | 630 | 580 | 430 |
| 1850 | 626 | 576 | 426 |
| 1800 | 622 | 572 | 422 |
| 1750 | 618 | 568 | 418 |
| 1700 | 614 | 564 | 414 |
| 1650 | 610 | 560 | 410 |
| 1600 | 606 | 556 | 406 |
| 1550 | 602 | 552 | 402 |
| 1500 | 598 | 548 | 398 |
| 1450 | 593 | 543 | 393 |
| 1400 | 588 | 538 | 388 |
| 1350 | 584 | 534 | 384 |
| 1300 | 579 | 529 | 379 |
| 1250 | 574 | 524 | 374 |
| 1200 | 569 | 519 | 369 |
| 1150 | 563 | 513 | 363 |
| 1100 | 558 | 508 | 358 |
| 1050 | 552 | 502 | 352 |
| 1000 | 546 | 496 | 346 |
| 950 | 540 | 490 | 340 |
| 900 | 534 | 484 | 334 |
| 850 | 527 | 477 | 327 |
| 800 | 520 | 470 | 320 |
| 750 | 513 | 463 | 313 |
| 700 | 505 | 455 | 305 |
| 650 | 497 | 447 | 297 |
| 600 | 489 | 439 | 289 |
| 550 | 480 | 430 | 280 |
| 500 | 470 | 420 | 270 |
| LOOP TEMPERATURE | | | |

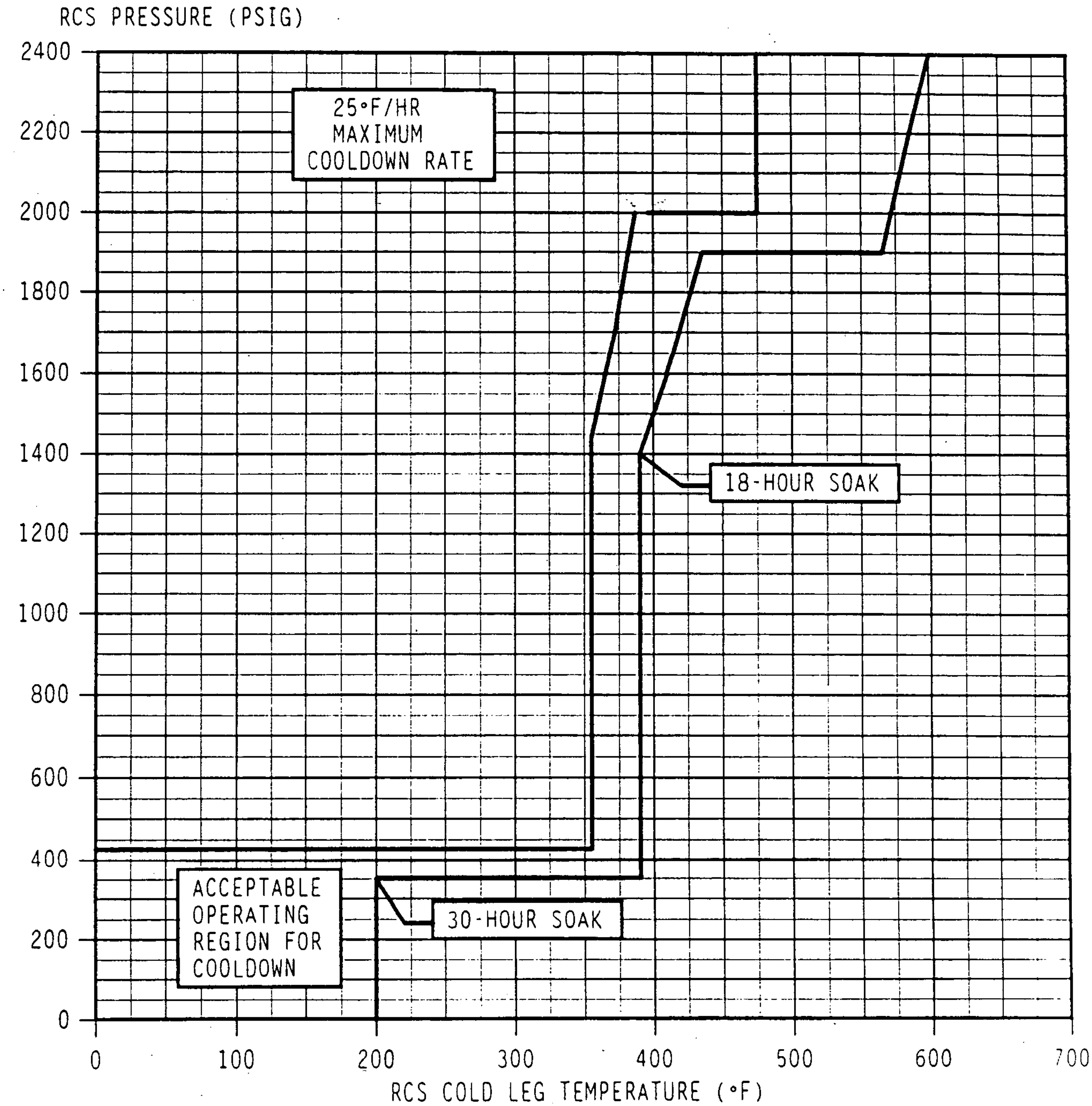


Figure E-0-06-1 Cooldown Operating Region - WITHOUT Full CRDM Cooling

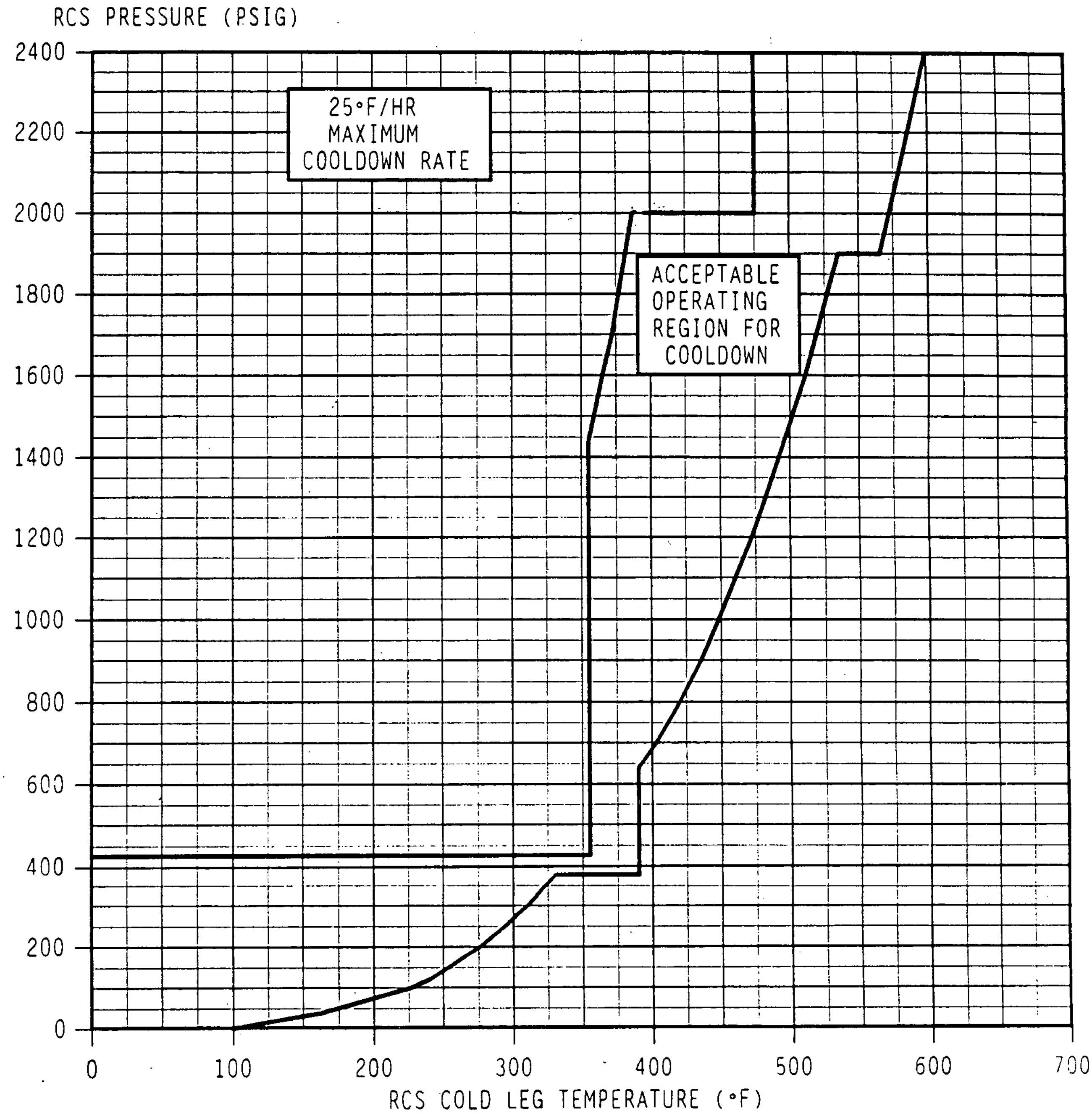


Figure E-0-06-2 Cooldown Operating Region - With Full CRDM Cooling