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RESPONSIBLE SECTION	PRA
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APPENDIX PAGES	28
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	RMQS 2.5

TITLE: An Analysis of the Risk Impact Due to Pressure Locking and Thermal Binding of CY ECCS MOVs

METHOD OF REVIEW: IN ACCORDANCE WITH NGF 5.06 REV 7

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Date: 8/16/95

CTP DATA BASE INPUTS

Calc. # PRA95NQA-01294-SY Rev # 0

Vendor Calc # ________ Plant CY

Title An Analysis of the Risk Impact Due to Pressure Locking and Thermal Binding of CY ECCS MOVs

CCN # ________ Superseded by: ________

QA (Y/N) N PA # ________

Building	System	Component	Component ID

Ref. Calc.	Ref. Drawing

Computer Codes Used

CAFTA 2.3

RMQS 2.5

Comments:

Calculation Checklist

Calculation Identifying Number PRA95NQA-01294-SY Revision 0

1. Preparation	Initials
1.1 Section 6.1.2	JKER
1.2 Section 6.1.3	JKER
1.3 Section 6.1.4	JKER
1.4 Section 6.4.6	JKER

2. Verification	
2.1 Section 6.2.2.1	[illegible]
2.2 Section 6.2.2.2	[illegible]
2.3 Section 6.2.2.3	[illegible]
2.4 Section 6.2.2.4	[illegible]
2.5 Section 6.2.2.5	[illegible]
2.6 Section 6.2.2.6	[illegible]
2.7 Section 6.2.2.7	[illegible]
2.8 Section 6.2.2.8	[illegible]
2.9 Section 6.2.2.9	[illegible]
2.10 Section 6.2.2.10	[illegible]
2.11 Section 6.2.2.11	[illegible]
2.12 Section 6.2.2.15	[illegible]

3. Approval	Initial & Date
3.1 Section 6.3.1	SDW 8/16/95
3.2 Section 6.3.2	SDW
3.3 Section 6.3.3	SDW
3.4 Section 6.3.4	SDW
3.5 Section 6.3.5	SDW
3.6 Section 6.3.6	SDW

4. Non-QA Applications	Initial & Date
4.1 Section 5.4 waived	
4.2 Section 6.1.4.7 waived	
4.3 Section 6.2 waived	

Basis for Waiver:

1.0 Safety Issue

The NRC issued Generic Letter 89-10 (GL89-10) which identifies a phenomenon known as pressure locking and thermal binding of gate valves. NUREG-1275 (Ref. 1) discusses this phenomenon and provides instances of occurrences. CY performed an analysis (Ref. 5) which identified the following seventeen motor operated flexible wedge gate valves which under certain transient conditions are potentially susceptible to pressure locking (PL) or thermal binding (TB):

Valve	PL	TB
SI-MOV-861A, B, C, & D	X	
SI-MOV-871A & B	X	
SI-MOV-901 & 902	X	
CH-MOV-292B & C	X	X
RHR-MOV-780, 781, 803 & 804	X	X
SI-MOV-854A & B	X	
SI-MOV-873	X	

The identified valves are located within the high pressure and low pressure injection systems, the residual heat removal system, and the charging system. Failure of these valves for certain plant transients (LOCAs, SGTR, loss of control air, etc.) could have a potentially significant impact on the CY core damage frequencies (CDF) associated with these transient initiators.

2.0 Objective of the PRA Analysis

The PRA section was requested to examine the impact on public heatlth and safety due to having operated CY with the 17 valves listed above at a failure probability that is greater than

originally estimated. This summary report documents the methods and results of that analysis.

3.0 Method of Analysis

All of the 17 valves that are under consideration are components of systems used to mitigate accident intiators leading to core-damage. Therefore, it was concluded that an appreciation of the risk impact can be derived by measuring the impact on CDF. Pressure locking (PL) is not a very well understood issue in that many valves that are susceptible, (i.e., meet all conditions and known requirements for failure) do not fail and yet while others do.

SI-MOV-861A, B, C, & D, SI-MOV-871A & B, and SI-MOV-901 & 2

The SI-MOV-861A, B, C & D valves are 3 inch diameter Crane flexible wedge motor operate gate HPSI injection valves. The SI-MOV-871A & B valves are 4 inch diameter Westinghouse flexible wedge motor operate gate LPSI core deluge valves. The SI-MOV-901 & 902 valves are 7 inch diameter Westinghouse flexible wedge motor operate gate cross connect valves. For these valves, pressure locking (PL) was determined to be a potential concern for large, medium and small LOCAs.

The change in CDF for small LOCAs was determined not to be as significant a concern as for large and medium LOCAs based on the following and therefore not evaluated in this analysis. The SI valves are only required in the event of charging injection failure. Additionally, the small LOCA does not result in sudden rapid RCS depressurization. RCS depressurization would be much slower for the small LOCA case than for large and medium LOCAs. The SI signal for

these SI valves is taken from the pressurizer. Since RCS depressurization is slower for a small RCS LOCA, the pressurizer pressure more closely follows RCS pressure. This in turn would result in lower pressure differentials within the SI valves. Thus, the SI valves would need less pullout thrust than in the large and medium LOCA cases (Appendix A). Therefore, the likelihood for pressure locking being a concern for small LOCAs is significantly less than for the large and medium LOCA cases. Additionally, on March 27, 1980 CY experienced a transient wherein a spurious SI occurred (Ref. 14) which required these valves to operate. Based upon the resultant LER 'all systems operated as designed;' in other words, the SI valves that were required to open 'opened'.

The large and medium LOCAs with and without a coincidental LNP are therefore considered to be the transients of concern for PL of these SI valves. These transients result in rapid RCS depressurization which could result in the pressure locking phenomenon for these valves. In these cases, the time delay from the start of the transient until these SI valves begin to unseat can potentially result in large differential pressures between the upstream, downstream, and bonnet faces of these valves. The objective of the following analysis is to determine the change in CDF by accounting for this potential valve failure mechanism.

This analysis will evaluate the change in CDF due to PL for these SI valves for the following four transient cases:

- large LOCA transient
- medium LOCA transient
- large LOCA transient with consequential LNP

- medium LOCA transient with consequential LNP

Large and Medium LOCAs, no LNP

PRA has reviewed several references and has had numerous discussions with plant personnel to make a determination as to the probability of these valves failing due to the pressure locking phenomenon for large and medium LOCA events. To make this determination, a combination of deterministic and qualitative evaluation was performed to determine the SI valves' failure rate. The following is a discussion of insights gained, the approximation of the failure rate for these valves, and the impact on the CDF.

For pressure locking of these SI valves to be of concern, the bonnet must become pressurized. This can occur from primarily two sources (Ref. 5) for these valves; RCS pressure leakage into the bonnet during normal operation and cycling of valves during plant heat up.

At CY, the largest of the valves of potential concern are flexible wedge gate valves with an approximate diameter of 7 inches. The reported pressure locking incidents of Appendix A to NUREG-1275 (Ref. 1) were reviewed for their applicability to CY. Based upon the amount of available information, the pressure locking phenomenon appears to predominately affect large flexible wedge gate valves (assumed ≥10 inches in diameter) and double disk gate valves (assumed all sizes). For the flexible wedge style valves, it appears that the larger the flexible wedge gate valve (extrapolated from Ref. 2); the greater the likelihood of RCS side disk flex which could thus result in bonnet pressurization. The double disk

gate valves potential for bonnet pressurization appears to be relatively consistent irrespective of the size of the valve. Thus based upon the previous discussion, these SI valves, due to their size, are considered much less likely to be susceptible to bonnet pressurization due to wedge flexing than larger flexible wedge gate valves.

Pressure locking resulting from valve cycling during plant heat up yields the greatest potential for PL. These valves are cycled with RCS temperature and pressure at 400°F and 1400 psi. Based upon the criteria of Ref. 11 the calculated results of Ref. 12 are considered extremely conservative for these valves from the PRA prespective. Specificaly since PL is not a very well understood issue in that many valves that are susceptible, (i.e., meet all conditions and known requirements for failure) do not fail and have not failed. Additionally, at these calculated pressures, the bonnet has a high potential for failure due to leakage (observed) or due to rupture (never been observed).

These SI valves are commanded open within the first seconds of a LOCA. Ref. 3 shows the RCS pressure is decreasing rapidly; however, as can be seen from Ref. 3, the RCS is still at approximately 900 psi when the valves would get the SI signal/power to open. No undervoltage condition for the valve motors was assumed since no other coincidental transient is assumed to occur. The HPSI pumps have started and are pressurizing the other side of the valves. Reference 2 provides a calculation method for determining if a valve should be considered pressure locked. The method and calculations (Appendix A) show that the valve motors developed sufficient thrust to overcome the effects of pressure locking for a large or medium LOCA transient without a coincidental

LNP with bonnet pressures equal to RCS pressure. Appendix A also provides a calculated estimate of the maximum bonnet pressure (approx. 4370 psi) that would result in motor stall for SI valves 861A through D. These calculations took into consideration valve test data, expected plant operating conditions at the time of a transient, and expected plant conditions post transient.

Based upon Ref. 11 bonnet pressures in these valves were calculated to be in excess of 14000 psi. The live load packing torque for these valves corresponds to the RCS design pressure (2485 psi at 650°F - conversation with A. Krinzman of CY). The purpose of live load torquing of the valve bonnet packing is to provide reasonable assurance that valves do not leak for internal pressures below the corresponding design pressures for the live load packing torque. Thus for pressures in excess of 2485 psi a very high likelihood of excess pressure leak off is considered to exist due to leakage through the packing. These valves are inspected for packing leakage with the plant at rated RCS pressure and temperature (2020 psi at 540°F). If a valve is observed to be leaking it is assumed that the RCS valve face seat is leaking by and that bonnet pressure is equal to RCS pressure. This assumption is considered reasonable due to the relatively small valve size (3 inches) resulting in bonnet inventory being insufficient to sustain continuous leak off rate with both valve faces properly seated.

The generic base failure rate for a motor operated valve failing to open in the CY PRA is 4.0E-3/demand. This value is based upon industry data which has a high probability of already including failures associated with the pressure locking phenomenon. For these SI valves the CY PRA failure

rate is 2.4E-2/demand (the generic base failure rate was increased by a factor of 6, since these valves are only tested during refueling outages). The common cause failure of these SI valves is determined by applying an additional appropriate beta factor to these SI valves failure rate.

PRA at this point wishes to re-iterate its acknowledgement/recognition of the significance of the PLTB failure mechanism, the importance of these valves to safe shutdown given a LOCA, and the resultant potential dire consequences should they fail. However, based upon the previous discussions to assume that these valves are failed with a certainty of one is overly conservative and is not considered representative in this case. Therefore, the CY IPE failure rate of 2.4E-2/demand for these valves was assumed to increase by an additional 50% given the following:

- the possible double counting of failures,
- the valve population size (those potentially affected by PLTB and those that are not)
- the potential for bonnet pressurization, and
- the calculated motor thrust to overcome PL.

Thus, for purposes of this analysis the random failure rate for these SI valves is 3.6E-2/demand (Table 1).

It is recognized that PLTB is primmarly a common cause failure mechanism concern. Therefore, it was assumed/recognized that the additional increase (1.2E-2) in the random failure probability is the common cause failure probability due to the

PLTB mechanism irrespective of combination (2/2, 2/3, 2/4, etc.). This additional common cause failure probability for PLTB was added to the calculated CY PRA common cause failure due to other mechanisms to yield a new common cause failure probability for purposes of this analysis (see Table 1).

The core damage change for the LOCA cases without a consequential LNP was calculated by requantifying (Appendix B) the event trees for the large & medium LOCA cases (Ref. 5, C2-517-1041-RE). This was accomplished by accounting for the possible increased valve failure rate (Table 1) due to pressure locking (Appendix B).

large LOCA from 2.69E-5/yr to 3.33E-5/yr **6.4E-6/yr**

medium LOCA from 1.64E-5/yr to 2.65E-5/yr **1.0E-5/yr**

For comparison purposes, if the assumption is made that these valves are failed, the associated CDF is equivalent to the large and medium event initiator frequencies (3.9E-4/yr and 6.1E-4/yr, respectively).

LOCA with LNP

The large and medium LOCA cases with a coincidental LNP were also identified as a potential concern.

Given a LOCA with a coincidental LNP the differential pressures within the SI valves would be greater than in the non-LNP cases. This is due to the additional 10 second time delay for EDG start and load, prior to these SI valves receiving power to start opening.

·The potential of a large or medium LOCA with a coincidental LNP is calculated as follows:

large LOCA with coincidental LNP

(9.0E-2/yr)X(3.9E-4/yr)X(1/365) = **9.6E-8/yr**

where;

HNP LNP frequency	(9.0E-2/yr)
large LOCA frequency	(3.9E-4/yr)
adjustment factor	(1yr/365day)

medium LOCA with coincidental LNP

(9.0E-2/yr)X(6.1E-4/yr)X(1/365) = **1.5E-7/yr**

where;

medium LOCA frequency	(6.1E-4/yr)

These events are considered for design basis, however they have a very small probability of occurance from the PRA analysis perspective.

CH-MOV-292B & C

CH-MOV-292B & C are Westinghouse 3 inch flexible wedge gate valves and are not directly modeled in the PRA (Ref. 7). These valves are normally open and their operation (closure and latter reopening) is dependent upon the transient initiator. Review of Ref. 5 identified several transients for which these valves are credited. However the only transient that PRA determined to be applicable is the loss of control air (CA). For this transient these valves are indirectly

credited by PRA via operator actions to isolate charging to prevent pressurizer overfill. The other identified transients credit closure and reopening of these valves in the latter stages of these transients to reach a cold shutdown condition. PRA currently only models CDF for failure to reach a safe hot shutdown condition. However, these valves failing due to PL would not be expected to have any measurable impact on core damage in these latter stages of a transient. This is primarily due to operators having 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

To determine the potential impact upon CDF the operator actions which credit these valves were revised and assumed to be a 50% increase in the failure probability (Table 1). This value is considered conservative based on significantly increasing the failure of the operator action and on the previous discussion of the SI valves potential failure due to PLTB.

To calculate the change in CDF the applicable transient of Ref. 7 was reviewed, the new conditional failure rate for these valves from Table 1 were applied, and the following changes in CDF were calculated (Appendix B):

loss of CA - from 6.54E-6/yr to 7.13E-6/yr <u>5.9E-7/yr</u>

This change in CDF is considered conservative since it does not consider operators having: 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

RHR-MOV-780, 781, 803 & 804

RHR-MOV-780 & 781 and RHR-MOV-803 & 804 are two sets of Westinghouse 10 inch flexible wedge in series gate valves that are the RCS to RHR suction and return valves, respectively. These valves are normally closed and a review of Ref. 5 identified that these valves are potentially susceptible to PLTB when placing the RHR system in service per NOP 2.9-1 (Ref. 8) or AOP 3.2-53 (Ref. 9). Ref. 5 also notes that the conditions that these valves are normally operated at under NOP 2.9-1 are the same that could result in PLTB of these valves and that no failures due to the PLTB phenomenon have ever been credited to these valves. Based upon Ref. 5, AOP 3.2-53 is only entered into for transients which would require plant shutdown form outside the control room. For this situation pressure locking is the identified failure mechanism. Since these valves are in series it is considered reasonable that only one of the two valves in the series is exposed to high RCS pressure and thus potentially susceptible to the pressure locking failure mechanism.

PRA credits/models these valves in the internal events model (Ref. 7) for the early establishment of long term cooling for the steam generator tube rupture (STGR) initiator. PRA also reviewed Ref. 10 for the external events model for situations where shutdown from the outside the control room is credited. In the external events analysis only CDF associated with failing to reach a safe hot shutdown condition were considered. As in the internal events model the external events model does not model bringing the plant to a cold shutdown condition. However, these valves failing due to PL would not be expected to have any measurable impact on core damage in these latter stages of a transient. This is primarily due to operators having 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

To quantify the potential significance of these valves for the SGTR event the valves failure rate was increased by 50% (Table 1) and the calculated change in CDF for the internal events model envelopes the external events model chance in CDF. This is considered conservative since PL would have to occur under what are considered the valves normal operating conditions, and by assuming that PL occurs in the early stages of the transient. However, to balance these conservative assumptions only one valve in the series is assumed susceptible to PL.

Combinations of these valves are credited in the PRA for the SGTR initiator. To calculate this change the applicable transient of Ref. 7 was reviewed, the new conditional failure rate for these valves from Table 1 was applied, and the following change in CDF was calculated (Appendix B):

SGTR - from 7.78E-6/yr to 8.40E-6/yr <u>6.2E-7/yr</u>

This change in CDF is considered very conservative since it does not consider operators having: 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

<u>SI-MOV-854A & B and SI-MOV-873</u>

These valves are not modeled by PRA since at the initiation of a transient these valves are in the open position. Pressure locking of these valves is of concern in the latter stages of a transient (not in the early stages) after these valves have been closed and are then required to reopen to reach a cold shutdown condition. PRA currently only models CDF for failure to reach a safe hot shutdown

condition. However, these valves failing due to PL would not be expected to have any measurable impact on core damage in these latter stages of a transient. This is primarily due to operators having 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

4.0 Results

PRA wishes to again acknowledge/recognize the significance of the PLTB failure mechanism, the importance of some of these previously discussed valves to safe shutdown given a transient initiator (ie., LOCAs, SGTR, etc.), and the resultant potential dire consequences should they fail. However based upon the previous analyses/discussions, to assume that these valves are failed with a certainty of one fcr all cases is overly conservative and is not considered representative of what the potential significance associated with PLTB failure mechanism truly is. This analysis is PRA's effort to quantify this potential significance based upon uncertainties associated with both the knowns and unknowns of PLTB and CY plant operations.

The total CDF change due to pressure locking was calculated to be 1.76E-5/yr. This increase is a summation of the following changes in the CDFs for the following transients:

large LOCA no LNP	6.4E-6/yr
medium LOCA no LNP	1.0E-5/yr
large LOCA with LNP	<1.0E-7/yr
medium LOCA with LNP	<1.5E-7/yr
loss of CA	5.9E-7/yr
SGTR	6.2E-7/yr

This change represents an approximate 14% increase in the calculated CY CDF of 1.3E-4/year from Reference 7.

Current PRA model only considers failure to establish hot shutdown in the determination of CDF. Many of the valves are only credited for the establishing cold shutdown from hot shutdown which is not currently modeled. Thus the impact on CDF from failing to go from hot shutdown to cold shutdown cannot be quantified. However, these valves failing due to PL would not be expected to have any measurable impact on core damage in these latter stages of a transient. This is primarily due to operators having 1) time to take action since the reactor is in a stable hot shutdown condition and 2) other potential alternate flow paths to bring the plant to a safe cold shutdown condition.

5.0 REFERENCES

1. "Operating Experience Feedback Report - Pressure Locking and Thermal Binding of Gate Valves," NUREG-1275, Vol. 9.

2. "Calculation to Predict the Required Thrust to Open a Flexible Wedge Gate Valve subjected to Pressure Locking," by Dana E. Smith, Entergy Operations Inc., Grand Gulf Nuclear Station, for NRC Public Meeting, Feb. 4, 1994.

3. Letter from D.J. Petrarca, Westinghouse to C.H. Wu, "Haddam Neck Plant Core Deluge/MOV Interlock Design," 93CY*-G-0072, Dec. 17, 1993.

4. Haddam Neck LER 95-010, "Pressure Locking of safety Injection Valves," docket Number 05000-213, Apr. 4, 1995.

5. Yankee Atomic Electric Company Report, "CY GL 89-10 MOV Pressure Locking Thermal Binding Evaluation," Rev. 0, Mar. 24, 1995, NU 95-089, WO 8233.

6. NRC Memorandum, "Intrem Inspection Guidance on Pressure Locking and Thermal Binding of Gate Valves," Dec. 20, 1993.

7. NUSCO PRA Calc. File "CY Final Quantification," C2-517-1041-RE, Rev. 1, July 4, 1995.

8. NOP 2.9-1, "Placing the Residual Heat Removal System in Service."

9. AOP 3.2-53, "Local Manual Operation of Residual Heat Removal System."

10. NUSCO PRA Calc. File "CY Fire - CDF Final Quantification," PRA94NQA-01182-SY, Rev. 0, Jan. 1, 1995.

11. Memo N.P. Sacco to R.S. VanSteenbergen, "Rise in Bonnet Pressure due to rise in Temperature during Plant Heat up for SI-MOV-861A,B,C, and D and SI-MOV-871A,B and RH-MOV-780,781,803 and 804," MOV-95-090, Rev. 1, March 15, 1995.

12. PI-20, Rev. 2, "MOV Program Pressure Locking and Thermal Binding Evaluation," NUSCO MOV Program, May 5, 1995.

13. NUSCO PRA Calc. File, "CY Reliability Database", C2-517-559-RE, Rev. 4, April 18, 1991.

14. PNO-1-80-49, "Inadvertant Plant Trip," March 27, 1980.

15. Memo R.S. VanSteenbergen to J.K. Rothert, "CY - Re-evaluation of SI-MOV-861A, B, C, D, SI-MOV-871A, B, SI-MOV-901 & 902 Subject to Pressure Locking," MOV-95-140, August 4, 1995.

Table 1

VALVE ID	DISCUSSION	PRA FAILURE RATE & MODE	PRESS. LOCKING (PL) FACTOR[1]		PL FAIL. RATE	PRA BASIC EVENT ID
SI-MOV-873 (locked open)	This valve is required for two path recirc. following the recirc. phase post LOCA. Pressure locking for this valve was a concern for latter stages of the transient when the valve is closed and then reopened to establish two path injection flow (procedures have been revised to keep this valve open). The line is normally fill-d with water prior to a transient. Failure due to low temperature induced PL not considered very credible.	Modeled for failing to close (not modeled for failing to open)	na		na	na
SI-MOV-861A, B, C, & D (normally closed)	HPSI injection valves are required to open for a LOCA. Given a LOCA event (no consequential LNP), the valves receive a SI signal to open. These valves would start to open prior to differences in RCS pressure resulting in pressure locking becoming a concern. Pressure locking was determined to be a primary concern in the event of a LOCA with a consequential LNP (or vise versa) due to the time required to recover power and then open these valves.	2.4E-2/D FTO	LOCA only	1.5	3.6E-2/D	HMVAV61(A,B,C,D) HMOD61(A,B,C,D)FTOV
		3.0E-3/D 2/4 CCF	LOCA only	na	1.5E-2/D	HMVAD861 HMODCCF612V
		2.3E-3/D 2/3 CCF	LOCA only	na	1.4E-2/D	HMVAB861 HMODCCF862V
		1.3E-4/D 3/4 CCF	LOCA only	na	1.2E-2/D	HMVAE861 HMODCCF861V
SI-MOV-871A & B (normally closed)	LPSI core deluge valves are required to open for a LOCA. Same as for SI-MOV-861A to D; however, LPSI injection does not occur until RCS pressure is significantly lower than 1135 psi.	2.4E-2/D FTO	LOCA only	1.5	3.6E-2/D	VMVAV71(A,B) VMODMV871(A,B)AV
		1.63E-3/D CCF	LOCA only	na	1.4E-2/D	VMVAA871
SI-MOV-901 & 902 (normally closed)	HPSI valves required to open for a LOCA during sump recirc. phase to align RHR to HPSI.	2.4E-2/D FTO	1.5		3.6E-2/D	HMVAO90(1,2)
		1.63E-3/D CCF	na		1.4E-2/D	HMVAA912
SI-MOV-854A & B (normally open)	HPSI/RWST isolation valves required to close and reopen for a LOCA. These valves are not modeled in the PRA as having to reopen.	Modeled for failing to close (not modeled for failing to open)	na		na	na
CH-MOV-292B & C (normally open)	CHG loop 2 cold leg injection valves. Credited for loss of inst. air and SGTR events. These valves are not directly modeled by PRA; however, they are considered enveloped by the OA/HI to establish charging two path recirc.	3.0E-2	1.5		4.5E-2/D	OARXCHGM
		1.0E-3	1.5		1.5E-3/D	HIRXCHGA

VALVE ID	DISCUSSION	PRA FAILURE RATE & MODE	PRESS. LOCKING (PL) FACTOR[1]	PL FAIL. RATE	PRA BASIC EVENT ID
RH-MOV 780 & 781 (normally closed)	RHR loop 1 hot leg suction valves. PL concern is for operation of these valves when shutdown from a transient is required from outside the control room. PL is not considered a concern for a transient when shutdown from the control room is possible. These valves are in series thus the upstream valve (780) is subject to PL.	2.4E-2/D FTO 2.66E-2/D	1.5	3.6E-2/D 3.96E-2/D	EMAVA780 EMODMOV780AIV
RH-MOV 803 & 804 (normally closed)	RHR loop 2 cold leg injection valves. Same as for SI-MOV 780 & 781. These valves are in series thus the upstream valve (803) is subject to PL.	2.4E-2/D FTO 2.66E-2/D	1.5	3.6E-2/D 3.96E-2/D	EMAVA803 EMODMOV803AIV

1 The pressure locking factor is an adjustment to the MOV failure rate to account for the potential of the MOV failing due to pressure locking (PL). The factor takes into consideration relevant pertinent data about the valve (presented in section 2), its potential to be exposed to conditions that could result in PL, and the uncertainty of whether or not the valve will operate. A 1.5 or 50% increase in failure rate is assumed for components which are considered to have a low probability of being potentially susceptible to pressure locking phenomenon. The 1.5 factor is applied to individual component failure rates. It is recognized that PLTB is primmarly a common cause failure mechanism concern. For CCF failure probability it was assumed/recognized that the additional increase (1.2E-2) in the random failure probability is the common cause failure probability due to the PLTB mechanism irrespective of combination (2/2, 2/3, 2/4, etc.). This additional common cause failure probability for PLTB was added to the calculated CY PRA common cause failure due to other mechanisms to yield a new common cause failure probability for purposes of this analysis.

Appendix A

Northeast
Utilities System

Memo

August 4, 1995
MOV-95-140

To: John Rothert

From: R. S. Van Steenbergen
MOV Group, CY, Ext. 3194

Subject: CY - Re-evaluation of SI-MOV-861A, B, C, D, SI-MOV-871A, B, SI-MOV-901 & 902 Subject to Pressure Locking

References:

1. Connecticut Yankee LER 50-213 95-010-00, "Pressure Locking of Safety Injection Valves", dated April 6, 1995
2. Dana E. Smith, "Calculation to Predict the Required Thrust to Open a Flexible Wedge Gate Valve Subjected to Pressure Locking", Entergy Operations Inc, Grand Gulf Nuclear Station, Port Gibson, MS 39150, Prepared for NRC Public Meeting February 4, 1994, New Orleans, LA
3. Westinghouse Electric Corporation Letter 93CY*-G-0072 "Haddam Neck Plant Core Deluge/MOV Interlock Design", D. J. Petrarca to C. H. Wu dated December 17, 1993
4. NUSCO Memo MOV-95-384 "CY-GL 89-10 MOV Program MOVs SI-MOV-861A, B, C, & D and SI-MOV-871A & B and RH-MOV-780, 781, 803 & 804-Bonnet Overpressurization", N. P. Sacco to R. S. Van Steenbergen dated July 14, 1995
5. Memo entitled "Use of Fig. 2 Hot Leg Pressure For Cold Leg Breaks", John Rothert to R. S. Van Steenbergen dated August 4, 1995 (attached)
6. Memo entitled "Pressure Distribution at Haddam Neck Following a LB LOCA", A. Chyra to J. K. Rothert dated August 4, 1995 (attached)

The following table lists required thrusts to open the valves of concern in Reference 1 when pressure locked as well as their open thrust capability and their open thrust limits. The assumptions used in this evaluation are more realistic than the original evaluation (Reference 1) which resulted in the valves being declared inoperable. The required thrusts where calculated using the Entergy method of Reference 2 which was used previously to determine historical operability of these valves.

Valve No.	Required Thrust	Actuator Open Thrust Capability	Open Thrust Limit
SI-MOV-861A	20332[1] to 32704[2]	18295	14912[3]
SI-MOV-861B	20332[1] to 32704[2]	18295	14912[3]
SI-MOV-861C	16944[1] to 25631[2]	17934	14912[3]
SI-MOV-861D	20332[1] to 32704[2]	17224	14912[3]
SI-MOV-871A	12116	29901	17100[4]
SI-MOV-871B	17822	28042	17100[4]
SI-MOV-901	9701	19693	15337[4]
SI-MOV-902	9701	20856	15337[4]

Notes: 1. Internal Bonnet Pressure = 5500 psi
2. Internal Bonnet Pressure = 10000 psi
3. Valve Limit
4. Operator Torque Limit

The range of required thrusts for SI-MOV-861A through D correlate to the range of possible bonnet pressures given in Reference 4. The bonnet pressure at which the required thrust would equal the most limiting valve's (SI-MOV-861D) open thrust capability is calculated to be 4374 psig.

Subsequent surface temperature measurements of SI-MOV-861A, B, C, and D where made when the RCS was at operating temperature. The maximum temperature measured under insulation at a valve's center line was 368°F. This is much less than the assumed 562°F uninsulated bonnet temperature which the above bonnet pressure range is based on. Thus, the range of bonnet pressures used in this analysis is conservative.

The following assumptions where used in the calculations:

SI-MOV-861A, B, C, D

- No motor torque derate due to high ambient temperature was applied due to the valves opening immediately upon initiation of a of a large break LOCA. It is assumed that the motor windings would not heat up significantly enough to effect motor output torque.

- No loss of offsite power is assumed. Motor undervoltage used based on normal offsite power available at time of LOCA initiation.

- Stem torque coefficient of friction equal to 0.15.

- Bonnet pressures between 5500 and 10000 lb. due to heating effect from RCS (Reference 4).

- Upstream pressure equal to 20 psig which is the elevation head due to the RWST. The HPSI pumps are on a 10 second start delay after receipt of a safety injection signal. SI-MOV-861A, B, C, and D would be partially open before the HPSI pumps started.

- Down stream pressure equal to 900 psig which would be the hot leg pressure at the time the pressurizer pressure SI setpoint is reached (1700 psig) after a large break LOCA per Reference 3, Figure 2. References 5 and 6 justify the use of hot leg pressure instead of the cold leg which SI-MOV-861A, B, C and D are connected to.

- Static pull out estimated at 9000 lb. from previous VOTES tests.

- Valve factors from PI-13 dynamic test evaluations or grouping if valve was not dynamically tested.

SI-MOV-871A, B

- No motor torque derate due to high ambient temperature was applied due to the valves opening immediately upon initiation of a of a large break LOCA. It is assumed that the motor windings would not heat up significantly enough to effect motor output torque.

- No loss of offsite power is assumed. Motor undervoltage used based on normal offsite power available at time of LOCA initiation.

- Upstream pressure equal to 20 psig which is the elevation head of the RWST. The LPSI pumps are on a 3 second start delay after receipt of a safety injection signal. SI-MOV-871A and B open immediately upon a SI signal.

- Down stream pressure equal to 900 psig which was determined from Reference 3, Figure 2.

- Bonnet pressure equal to normal RCS pressure of 2000 lb.

- Stem torque coefficient of friction equal to 0.15

SI-MOV-901, 902

- Motor torque derated due to an ambient temperature of 140 °F which is the PAB LOCA temperature.

- No loss of offsite power is assumed. Motor undervoltage used based on normal offsite power available at time of LOCA initiation.

- Internal bonnet pressure equal to 341 psig which is the shut off head of the LPSI pumps adjusted for elevation differences.

- Stem torque coefficient of friction equal to 0.15.

If you have any questions, please call.

cc: C. J. Gladding
R. T. Harris
S. T. Hodge
M. E. Long
N. P. Sacco
P. D. Mason

INTER OFFICE MEMO

TO	DEPARTMENT	LOCATION
Roger S. VanSteenbergen	MOV Group	CY
FROM: John Rothert	DEPARTMENT: SAB-PRA	LOCATION: ~~E~~ Berlin W-133
SUBJECT: Use Of Fig. 2 Hot Leg Profile For Cold Leg Breaks		DATE: Aug 4, 1995

MESSAGE

As Per Our Conversation This Morning Attached Is A Memo From A. Chyra (SAB-THA) Which States That The Pressure Profiles Between Hot And Cold Legs Are Similar And That Fig. 2 Can Be Used For Determining The Cold Leg Pressure.

SIGNATURE J. R. Rothert

ORIGINATOR - DO NOT WRITE BELOW THIS LINE

REPLY

SIGNATURE

DATE

OS445 REV 12-89

SEND PARTS 1 & 2 INTACT - PART 2 WILL BE RETURNED WITH REPLY
PART 3 - RETAIN FOR FOLLOW-UP

INTER OFFICE MEMO

TO	DEPARTMENT	LOCATION
J. K. ROTHERT	SAB-PRA	W-133
FROM A. CHVRA	DEPARTMENT SAB-THA	LOCATION W-133
SUBJECT PRESSURE DISTRIBUTION AT HADDAM NECK FOLLOWING A LBLOCA		DATE AUG. 4, 1995

MESSAGE

REF.: WESTINGHOUSE LETTER #93 CY*-G-0072, DEC. 17, 1993.

As per our discussion, Figure 2 in the above reference can be used to bound the pressure profile in the cold legs (intact) following a hypothetical double-ended LBLOCA. This is based on the following:

- the hot leg pressure will be always higher that the cold leg pressure during blowdown (the difference is approx. 8psi early in the blowdown, decreasing to less than 2 psi towards the end of blowdown)
- the above should be true regardless what critical flow model is used in the blowdown analysis

The above observation applies to large breaks (double-ended guillotine type) in the cold legs. The pressure profile is for the intact loops (hot and cold).

If you need more specific information, please let me know.

ORIGINATOR - DO NOT WRITE BELOW THIS LINE

SIGNATURE Albert Chyra

REPLY

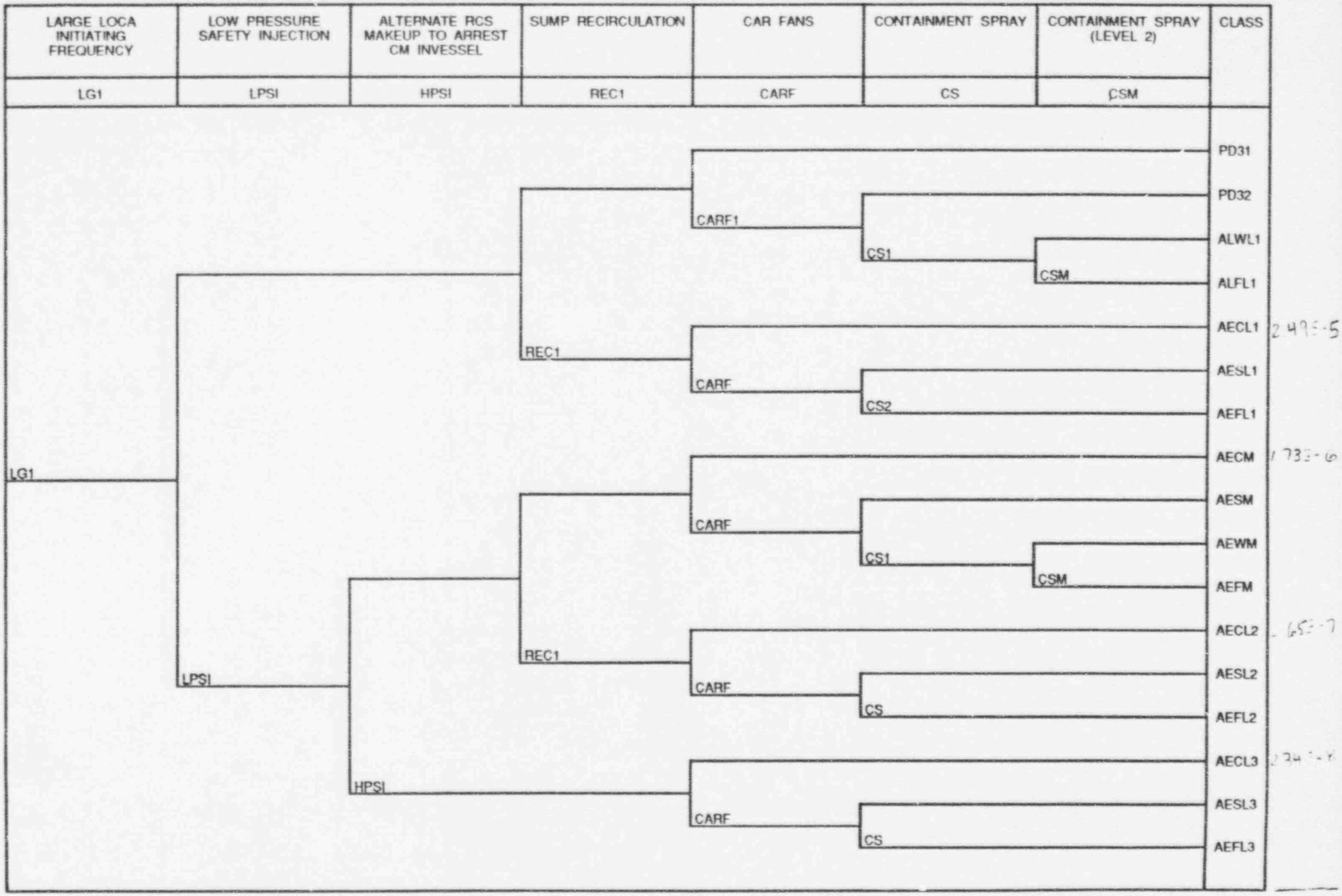
SIGNATURE

DATE

05445 REV. 12-88

SEND PARTS 1 & 2 INTACT - PART 2 WILL BE RETURNED WITH REPLY
PART 3 - RETAIN FOR FOLLOW-UP

Appendix B



LARGE BREAK LOCA EVENT TREE \ETA-IRCYLOCAL.TRE 5-12-94

CDF 3.33E-5 Δ= 5.2E-6

Filter: 'ALL'

	MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1)	AECL1					*2.58E-05
1)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.95E-05
	OAPREC1L	OPERATOR F[illegible]S TO TRANSFER TO RECIRC. FOLLOWING LARGE LOCA		5.0E-02	5.00E-02	
2)	HIPREC1L	OPERATOR [illegible] TO TRANSFER TO RECIRC. FOLLOWING A LARGE LOCA(SCREE		1.0E-02	1.00E-02	3.90E-06
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
3)	CBCNDLDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM GIVEN LARGE LOCA IN LOOP		.125	1.25E-01	5.85E-07
	HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
4)	CBCNDLDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM GIVEN LARGE LOCA IN LOOP		.125	1.25E-01	4.39E-07
	HMODCCFRECO	<module>CCF OF BOTH HPSI TRAINS TO OPERATE		9.0E-3	9.00E-03	
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
5)	EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	3.30E-07
	EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
6)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.99E-07
	VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
	VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
7)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.99E-07
	VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
	VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
8)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.24E-07
	XMODSIWLABI	<module>SIAS RESET FAILS		3.192E-04	3.19E-04	
9)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.06E-07
	WMVAA056	CCF COMMON CAUSE FAILURE OF SW-MOV-5 AND 6 TO OPEN	4.00E-3	6.8E-2	2.72E-04	
10)	ECVAA783	CCF COMMON CAUSE FAILURE OF RH-CV-783 AND RH-CV-808A TO OPEN	2.00E-4	.816	1.63E-04	6.36E-08
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
11)	CBCNDLDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM GIVEN LARGE LOCA IN LOOP		.125	1.25E-01	6.16E-08
	HMODPPATRFBIKO	<module>HPSI PUMP TRAIN A FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
	HMODPPBTRFAIJO	<module>HPSI PUMP TRAIN B FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
12)	EMODRHRCCFQ	<module>CCF OF BOTH RHR TRAINS		1.527E-04	1.53E-04	5.96E-08
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
13)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	5.32E-08
	VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
	VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
14)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	5.32E-08
	VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
	VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
15)	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	3.18E-08
	RCVAA225	CCF COMMON CAUSE FAILURE OF CC-CV-225A AND B TO OPEN	2.00E-4	.408	8.16E-05	
16)	CBCNDLDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM GIVEN LARGE LOCA IN LOOP		.125	1.25E-01	3.02E-08
	HMODCCFHPIO	<module>CCF OF BOTH HPSI TRAINS TO START AND OPERATE		6.192E-04	6.19E-04	
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
17)	EAVSQ602	RH-FCV-602 IS OPEN DUE TO VALVE STEM SEPARATION	5.20E-5	1	5.20E-05	2.03E-08
	LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	

9.0E-7

5.08
.09
.0308
.00764
5.20844

2.58
.0573
.00498
.681
3.32828

\CAFTA\SEQCUT\F-LLOCA.CUT CUTSET REPORT 7-26-95 11:21 Page 2
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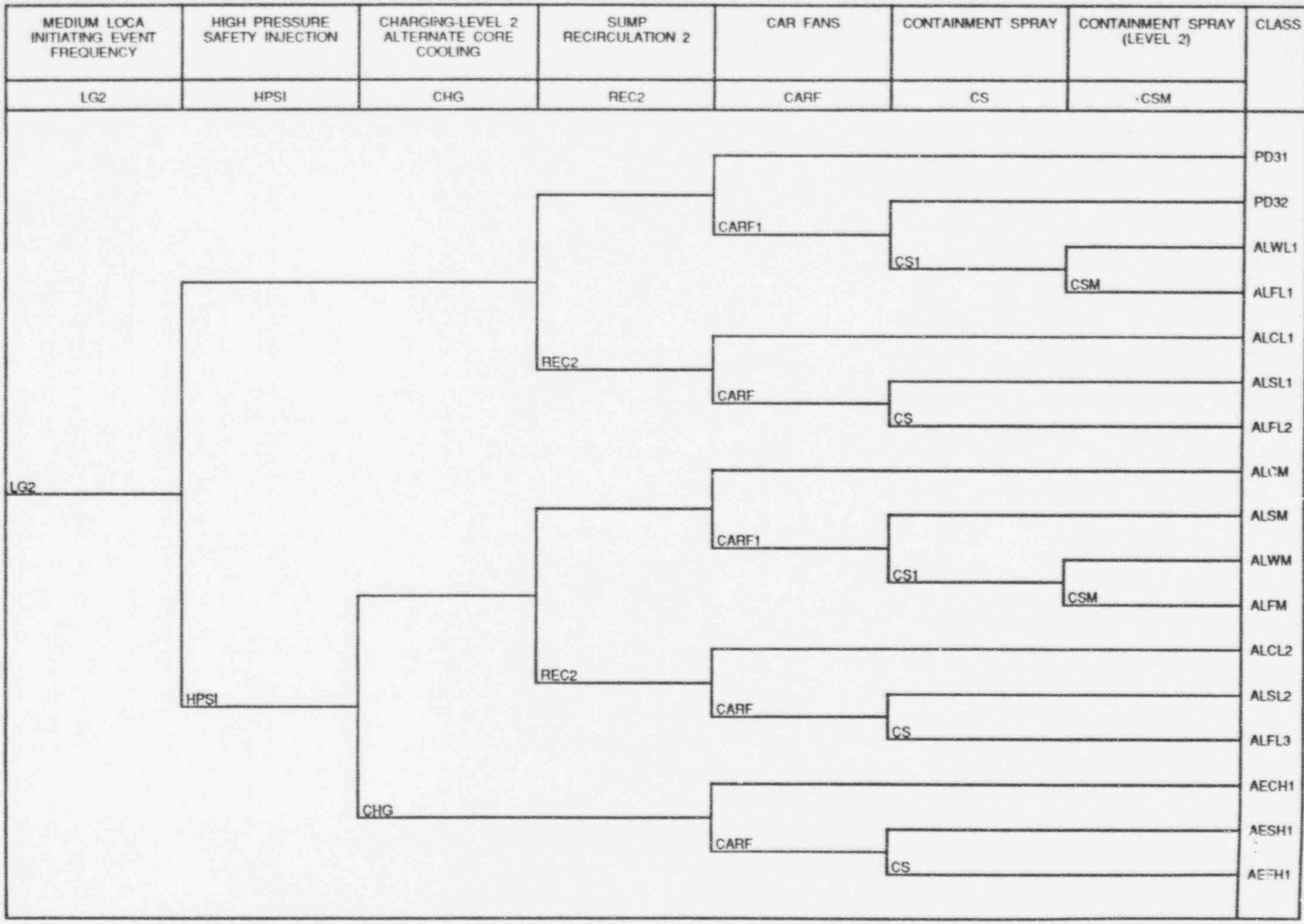
MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
2) AECL2					*5.73E-07
1) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	2.73E-07
OAPREC1L	OPERATOR FAILS TO TRANSFER TO RECIRC. FOLLOWING LARGE LOCA		5.0E-02	5.00E-02	
VMVAA871	CCF OF CORE DELUGE MOVS 871A AND 871B TO OPEN		1.4E-2	1.40E-02	
2) ERVDQ715	RELIEF VALVE RH-RV-715 PREMATURE OPEN	1.25E-5	24	3.00E-04	1.17E-07
LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
3) HIPREC1L	OPERATOR FAILS TO TRANSFER TO RECIRC. FOLLOWING A LARGE LOCA(SCREE		1.0E-02	1.00E-02	5.46E-08
LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
VMVAA871	CCF OF CORE DELUGE MOVS 871A AND 871B TO OPEN		1.4E-2	1.40E-02	
4) EMVSQ874	RH-MOV-874 FAILS TO BE CLOSED POSITION DUE TO VALVE STEM SEPARA	1.04E-4	1	1.04E-04	4.06E-08
LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
5) EMVRQ874	OPERATOR FAILS TO RESTORE RH-MOV-874 FOLLOWING T&M		1.00E-4	1.00E-04	3.90E-08
LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
6) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	2.53E-08
OAPREC1L	OPERATOR FAILS TO TRANSFER TO RECIRC. FOLLOWING LARGE LOCA		5.0E-02	5.00E-02	
VMODMV871AAV	<module>SI-MOV-871A FAILS TO OPEN		3.6E-2	3.60E-02	
VMODMV871BAV	<module>SI-MOV-871B FAILS TO OPEN		3.6E-2	3.60E-02	
7) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	2.34E-08
OAPREC1L	OPERATOR FAILS TO TRANSFER TO RECIRC. FOLLOWING LARGE LOCA		5.0E-02	5.00E-02	
VCVAR103	CHECK VALVE CV-103 FAILS TO OPEN	2.00E-4	6	1.20E-03	
3) AECL3					*9.98E-08
1) HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	7.64E-08
LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	
VMVAA871	CCF OF CORE DELUGE MOVS 871A AND 871B TO OPEN		1.4E-2	1.40E-02	
2) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	2.34E-08
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
4) AECM					*6.81E-06
1) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	5.46E-06
VMVAA871	CCF OF CORE DELUGE MOVS 871A AND 871B TO OPEN		1.4E-2	1.40E-02	
2) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	5.05E-07
VMODMV871AAV	<module>SI-MOV-871A FAILS TO OPEN		3.6E-2	3.60E-02	
VMODMV871BAV	<module>SI-MOV-871B FAILS TO OPEN		3.6E-2	3.60E-02	
3) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	4.68E-07
VCVAR103	CHECK VALVE CV-103 FAILS TO OPEN	2.00E-4	6	1.20E-03	
4) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.77E-07
VMODP1VCCFO	<module>COMMON CAUSE FAILURE OF LPSI PUMP TRAINS		4.550E-04	4.55E-04	
5) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	4.06E-08
VMVSV873	SI-MOV-873 FAILS TO BE IN OPEN POSITION DUE TO VALVE STEM SEPARA	1.04E-4	1	1.04E-04	
6) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	3.90E-08
VMVRV873	OPERATOR FAILS TO RESTORE SI-MOV-873 TO OPEN POSITION FOLLOW		1.00E-4	1.00E-04	
7) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	3.90E-08
VMVRR102	OPERATOR FAILS TO RESTORE SI-V-102 TO OPEN POSITION FOLLOW		1.00E-4	1.00E-04	
8) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	3.18E-08
VCVAA872	CCF OF CORE DELUGE CHECK VALVES 872A AND 872B TO OPEN	2.00E-4	.408	8.16E-05	
9) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.68E-08
VCVAV72A	CHECK VALVE CV-872A FAILS TO OPEN	2.00E-4	6	1.20E-03	
VMODMV871BAV	<module>SI-MOV-871B FAILS TO OPEN		3.6E-2	3.60E-02	
10) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.68E-08

3.08E-7
7.64E-8
5.08E-6

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
VCVAV72B	CHECK VALVE CV-872B FAILS TO OPEN	2.00E-4	6	1.20E-03	
VMODMV871AAV	<module>SI-MOV-871A FAILS TO OPEN		3.6E-2	3.60E-02	
11) LG1	IE LARGE LOCA INITIATING EVENT FREQUENCY		3.9E-04	3.90E-04	1.27E-08
VMODLPIPPAIO	<module>LPSI PUMP TRAIN A FAILS		5.698E-03	5.70E-03	
VMODLPIPPBIO	<module>LPSI PUMP TRAIN B FAILS		5.698E-03	5.70E-03	



MEDIUM BREAK LOCA EVENT TREE \ETA-IN\CYLOCAM.TRE 5-12-94

Filter: 'ALL'

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) AECH1					*9.55E-08
1) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	3.66E-08
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
2) CMVBAVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.39E-08
HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
3) CMVAARWT	CCF 2/2 MOVs FAIL TO OPEN (MOVs 373 & 32).	4.00E-3	0.408	1.63E-03	1.39E-08
HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
4) CMOD409FTIN	<module>VCT NOT ISOLATED FROM P-18-1B- CV-409 FAILS TO ISOLATE		1.214E-03	1.21E-03	1.04E-08
HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
UUUNX000	LOSS OF CONTROL AIR		1.00	1.00E+00	
5) CMOD408FTIN	<module>VCT NOT ISOLATED FROM P-18-1A- CV-408 FAILS TO ISOLATE		1.214E-03	1.21E-03	1.04E-08
HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
UUUNX000	LOSS OF CONTROL AIR		1.00	1.00E+00	
6) CCVAU372	CHECK VALVE BA-CV-372 FAILS TO OPEN	2.00E-4	6	1.20E-03	1.02E-08
HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
2) ALCL1					*1.32E-05
1) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	7.81E-06
OAPREC2M	OA OPERATOR FAILS TO TRANSFER TO RECIRC. MEDIUM LOCA		1.28E-02	1.28E-02	
2) HIPREC2M	HI OPERATOR ERROR TO TRANSFER TO RECIRC. GIVEN MLOCA		3.0E-03	3.00E-03	1.83E-06
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
3) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	6.59E-07
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
4) EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	5.16E-07
EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
5) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	4.94E-07
HMODCCFRECO	<module>CCF OF BOTH HPSI TRAINS TO OPERATE		9.0E-3	9.00E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
6) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	3.11E-07
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
7) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	3.11E-07
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
8) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	1.95E-07
XMODSIWLABI	<module>SIAS RESET FAILS		3.192E-04	3.19E-04	
9) ERVDQ715	RELIEF VALVE RH-RV-715 PREMATURE OPEN	1.25E-5	24	3.00E-04	1.83E-07
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
10) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	1.66E-07
WMVAA056	CCF COMMON CAUSE FAILURE OF SW-MOV-5 AND 6 TO OPEN	4.00E-3	6.8E-2	2.72E-04	
11) ECVAA783	CCF COMMON CAUSE FAILURE OF RH-CV-783 AND RH-CV-808A TO OPEN	2.00E-4	.816	1.63E-04	9.96E-08
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
12) EMODRHRCCFQ	<module>CCF OF BOTH RHR TRAINS		1.527E-04	1.53E-04	9.31E-08

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
13) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	8.31E-08
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
14) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	8.31E-08
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
15) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	6.94E-08
HMODPPATRFBIKO	<module>HPSI PUMP TRAIN A FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
HMODPPBTRFAIJO	<module>HPSI PUMP TRAIN B FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
16) EMVSQ874	RH-MOV-874 FAILS TO BE CLOSED POSITION DUE TO VALVE STEM SEPARA	1.04E-4	1	1.04E-04	6.34E-08
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
17) EMVRQ874	OPERATOR FAILS TO RESTORE RH-MOV-874 FOLLOWING T&M		1.00E-4	1.00E-04	6.10E-08
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
18) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	4.98E-08
RCVAA225	CCF COMMON CAUSE FAILURE OF CC-CV-225A AND B TO OPEN	2.00E-4	.408	8.16E-05	
19) EAVSQ602	RH-FCV-602 IS OPEN DUE TO VALVE STEM SEPARATION	5.20E-5	1	5.20E-05	3.17E-08
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
20) EMODRH808AQ	<module>RH-V-808A PATH FAILS TO OPEN		2.525E-03	2.52E-03	1.30E-08
EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
21) EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	1.22E-08
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
XMOD4AX4BXI	<module>4AX/4BX RELAYS FAIL GIVEN SIAS RESET		2.000E-04	2.00E-04	
22) LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	1.21E-08
WMODSWMOV5AIP	<module>SW-MOV-5 FAILS TO OPEN		4.460E-03	4.46E-03	
WMODSWMOV6AIP	<module>SW-MOV-6 FAILS TO OPEN		4.460E-03	4.46E-03	
23) CMV[illegible]AVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.19E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
24) CMVA[illegible]RHR	CCF 2/2 RHRS MOVs FAIL TO OPEN. (MOVs-33A & 33B)	4.00E-3	0.408	1.63E-03	1.19E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
25) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	1.04E-08
HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	
HMODPPBTRFAIJO	<module>HPSI PUMP TRAIN B FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
26) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	1.04E-08
HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	
HMODPPATRFBIKO	<module>HPSI PUMP TRAIN A FAILS TO OPERATE (RECIRC)		3.556E-02	3.56E-02	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
3) ALCL2					*1.99E-07
1) HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	1.09E-07
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
OAPREC2M	OA OPERATOR FAILS TO TRANSFER TO RECIRC. MEDIUM LOCA		1.28E-02	1.28E-02	
2) CBCNDMDL	CONDITIONAL ADVERSE BSL FAILS THE SYSTEM- MEDIUM LOCA EVENT.COLD L		0.09	9.00E-02	3.40E-08
HMODCCFHPIO	<module>CCF OF BOTH HPSI TRAINS TO START AND OPERATE		6.192E-04	6.19E-04	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	

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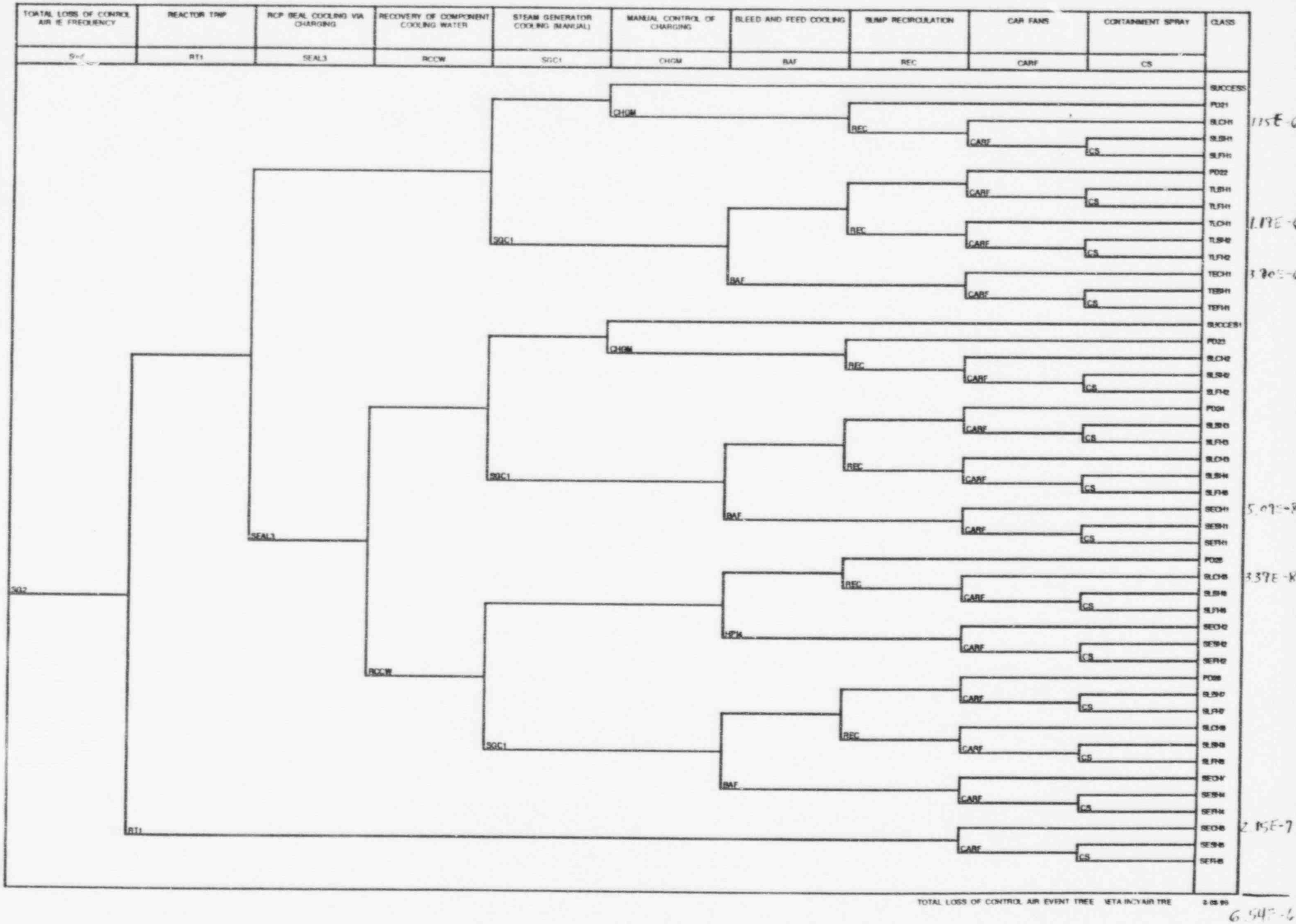
Filter: 'ALL'

	MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
3)	HIPREC2M	HI OPERATOR ERROR TO TRANSFER TO RECIRC. GIVEN MLOCA		3.0E-03	3.00E-03	2.56E-08
	HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
4)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	1.01E-08
	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
	OAPREC2M	OA OPERATOR FAILS TO TRANSFER TO RECIRC. MEDIUM LOCA		1.28E-02	1.28E-02	
5)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	1.01E-08
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
	OAPREC2M	OA OPERATOR FAILS TO TRANSFER TO RECIRC. MEDIUM LOCA		1.28E-02	1.28E-02	
6)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	1.01E-08
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
	OAPREC2M	OA OPERATOR FAILS TO TRANSFER TO RECIRC. MEDIUM LOCA		1.28E-02	1.28E-02	
4)	ALCM					*1.30E-05 8.78E-6
1)	HMODCCF862V	<module>CCF OF 2 OF 3 HPSI INJECTION VALVES TO OPEN		1.4E-2	1.40E-02	8.54E-06
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
2)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	7.91E-07
	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
3)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	7.91E-07
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
4)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	7.91E-07
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
5)	HMODCCFHPIO	<module>CCF OF BOTH HPSI TRAINS TO START AND OPERATE		6.192E-04	6.19E-04	3.78E-07
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
6)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
7)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
8)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
9)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
10)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
11)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	1.17E-07
	HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
12)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015B	OOS HPSI PUMP P-15-1B OUT OF SERVICE	4.10E-3	1	4.10E-03	

	MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
13)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015B	OOS HPSI PUMP P-15-1B OUT OF SERVICE	4.10E-3	1	4.10E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
14)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015A	OOS HPSI PUMP P-15-1A OUT OF SERVICE	4.10E-3	1	4.10E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
15)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015A	OOS HPSI PUMP P-15-1A OUT OF SERVICE	4.10E-3	1	4.10E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
16)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015A	OOS HPSI PUMP P-15-1A OUT OF SERVICE	4.10E-3	1	4.10E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
17)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	9.00E-08
	HP4Q015B	OOS HPSI PUMP P-15-1B OUT OF SERVICE	4.10E-3	1	4.10E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
18)	HBKBA61A	SI-MOV-861A BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
19)	HBKBA61C	SI-MOV-861C BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
20)	HBKBA61B	SI-MOV-861B BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
21)	HBKBA61A	SI-MOV-861A BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
22)	HBKBA61C	SI-MOV-861C BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
23)	HBKBA61B	SI-MOV-861B BREAKER FAILS TO CLOSE	3.00E-4	6	1.80E-03	3.95E-08
	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
24)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08
	HMODSIASPAI	<module>SIAS LOGIC FOR HPSI PUMP A FAILS		1.410E-03	1.41E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
25)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08
	HMODSIASPAI	<module>SIAS LOGIC FOR HPSI PUMP A FAILS		1.410E-03	1.41E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
26)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08
	HMODSIASPBI	<module>SIAS LOGIC FOR HPSI PUMP B FAILS		1.410E-03	1.41E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
27)	HMOD61CFTOV	<module>SI-MOV-861C OR CV-862C FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08
	HMODSIASPBI	<module>SIAS LOGIC FOR HPSI PUMP B FAILS		1.410E-03	1.41E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
28)	HMOD61AFTOV	<module>SI-MOV-861A OR CV-862A FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08
	HMODSIASPAI	<module>SIAS LOGIC FOR HPSI PUMP A FAILS		1.410E-03	1.41E-03	
	LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
29)	HMOD61BFTOV	<module>SI-MOV-861B OR CV-862B FAILS TO OPEN		3.6E-2	3.60E-02	3.10E-08

Filter: 'ALL'

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
HMODSIASPBI	<module>SIAS LOGIC FOR HPSI PUMP B FAILS		1.410E-03	1.41E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
30) HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	1.72E-08
HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
31) HMODHPIPPAKO	<module>HPSI PUMP TRAIN A FAILS		5.309E-03	5.31E-03	1.33E-08
HP4Q015B	OOS HPSI PUMP P-15-1B OUT OF SERVICE	4.10E-3	1	4.10E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	
32) HMODHPIPPBJO	<module>HPSI PUMP TRAIN B FAILS		5.309E-03	5.31E-03	1.33E-08
HP4Q015A	OOS HPSI PUMP P-15-1A OUT OF SERVICE	4.10E-3	1	4.10E-03	
LG2	IE MEDIUM LOCA INITIATING EVENT FREQUENCY		6.1E-04	6.10E-04	



TOTAL LOSS OF CONTROL AIR EVENT TREE \ETA INCYAIR.TRE

(7.13E-6) - (6.54E-6) = 5.97E-7 (Δ)

Filter: 'ALL'

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) SECH1					*5.09E-08
1) CRVAV408	RANDOM FAILURE OF RV-408 TO OPEN.	1.00E-3	20	2.00E-02	3.39E-08
OAPBAFRT	OA OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		1.0E-2	1.00E-02	
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
2) CRVAV408	RANDOM FAILURE OF RV-408 TO OPEN.	1.00E-3	20	2.00E-02	1.70E-08
HIPBAFRT	HI OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		5.0E-3	5.00E-03	
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
2) SECH5					*2.15E-07
1) RT1	AUTOMATIC REACTOR TRIP		3.8E-5	3.80E-05	2.15E-07
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
3) SLCH1					*1.73E-06
1) OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	5.09E-07
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
2) HIPRECRT	HI OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		1.0E-3	1.00E-03	2.54E-07
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
3) EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	2.15E-07
EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
4) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	1.30E-07
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
5) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	1.30E-07
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
6) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	8.12[illegible]
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
XMODSIWLABI	<module>SIAS RESET FAILS		3.192E-04	3.19E-04	
7) ERVDQ715	RELIEF VALVE RH-RV-715 PREMATURE OPEN	1.25E-5	24	3.00E-04	7.63E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
8) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	6.92E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
WMVAA056	CCF COMMON CAUSE FAILURE OF SW-MOV-5 AND 6 TO OPEN	4.00E-3	6.8E-2	2.72E-04	
9) ECVAA783	CCF COMMON CAUSE FAILURE OF RH-CV-783 AND RH-CV-808A TO OPEN	2.00E-4	.816	1.63E-04	4.15E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
10) EMODRHRCCFQ	<module>CCF OF BOTH RHR TRAINS		1.527E-04	1.53E-04	3.88E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
11) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	3.47E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
12) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	3.47E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
13) EMVSQ874	RH-MOV-874 FAILS TO BE CLOSED POSITION DUE TO VALVE STEM SEPARA	1.04E-4	1	1.04E-04	2.64E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
14) EMVRQ874	OPERATOR FAILS TO RESTORE RH-MOV-874 FOLLOWING T&M		1.00E-4	1.00E-04	2.54E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
15) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	2.08E-08
RCVAA225	CCF COMMON CAUSE FAILURE OF CC-CV-225A AND B TO OPEN	2.00E-4	.408	8.16E-05	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
16) OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	1.53E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
17) EAVSQ602	RH-FCV-602 IS OPEN DUE TO VALVE STEM SEPARATION	5.20E-5	1	5.20E-05	1.32E-08
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
18) HIRXCHGA	HI OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		1.5E-3	1.50E-03	1.70E-08
OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
4) SLCH2					*1.02E-08
1) CRVAV408	RANDOM FAILURE OF RV-408 TO OPEN.	1.00E-3	20	2.00E-02	1.02E-08
OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	
OARXCHGM	OA OPERATOR ACTION TO CONTROL CHARGING FLOW GIVEN A LOSS OF AIR		4.5E-2	4.50E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
5) SLCH5					*3.39E-08
1) CRVAV408	RANDOM FAILURE OF RV-408 TO OPEN.	1.00E-3	20	2.00E-02	2.26E-08
OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
UVMPPAIR	OPERATOR FAILS TO ALIGN BACKUP AIR SUPPLY (SCREENING VALUE)		1.0E-01	1.00E-01	
2) CRVAV408	RANDOM FAILURE OF RV-408 TO OPEN.	1.00E-3	20	2.00E-02	1.13E-08
HIPRECRT	HI OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		1.0E-3	1.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
UVMPPAIR	OPERATOR FAILS TO ALIGN BACKUP AIR SUPPLY (SCREENING VALUE)		1.0E-01	1.00E-01	
6) TECH1					*3.90E-06
1) OAPBAFRT	OA OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		1.0E-2	1.00E-02	1.70E-06
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
2) HIPBAFRT	HI OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		5.0E-3	5.00E-03	8.48E-07
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
3) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	4.54E-07
PMODPRVAIRV	<module>AIR SUPPLY TO THE PORVS FAILS		2.676E-03	2.68E-03	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
4) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	2.99E-07
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
5) HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	1.70E-07
OAPBAFRT	OA OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		1.0E-2	1.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
6) HIPBAFRT	HI OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		5.0E-3	5.00E-03	8.48E-08
HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
7) HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	4.54E-08
PMODPRVAIRV	<module>AIR SUPPLY TO THE PORVS FAILS		2.676E-03	2.68E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
8) FMODAFWPCV	CCF OF PUMPS AND DISCHARGE CHECK VALVES		6.869E-04	6.87E-04	3.88E-08
OAPBAFRT	OA OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		1.0E-2	1.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
9) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	3.06E-08
PMODBLV569AV	<module>PR-MOV-569 FAILS		4.299E-03	4.30E-03	
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
10) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	3.06E-08
PMODBLV567AV	<module>PR-MOV-567 FAILS		4.299E-03	4.30E-03	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
11) HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	2.99E-08
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
12) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	2.23E-08
PMODCCFPRVV	<module>CCF OF EITHER THE PORVS OR THE BLOCK VALVES TO OPEN		3.127E-03	3.13E-03	
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
13) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	2.23E-08
PMODCCFPRVV	<module>CCF OF EITHER THE PORVS OR THE BLOCK VALVES TO OPEN		3.127E-03	3.13E-03	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
14) FMODDWSTFDFGW	FLOW DIVERSION PATHS RESULTING IN LOSS OF DWST INVENTORY		3.480E-04	3.48E-04	1.97E-08
OAPBAFRT	OA OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		1.0E-2	1.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
15) FMODAFWPCV	CCF OF PUMPS AND DISCHARGE CHECK VALVES		6.869E-04	6.87E-04	1.94E-08
HIPBAFRT	HI OPERATOR ACTION TO INITIATE FEED AND BLEED COOLING (RT)		5.0E-3	5.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
16) CMVBAVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.16E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
17) CMVAARWT	CCF 2/2 MOVs FAIL TO OPEN (MOVs 373 & 32).	4.00E-3	0.408	1.63E-03	1.16E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
18) CMVAARWT	CCF 2/2 MOVs FAIL TO OPEN (MOVs 373 & 32).	4.00E-3	0.408	1.63E-03	1.16E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
19) CMVBAVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.16E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
20) FMODAFWPCV	CCF OF PUMPS AND DISCHARGE CHECK VALVES		6.869E-04	6.87E-04	1.04E-08
PMODPRVAIRV	<module>AIR SUPPLY TO THE PORVS FAILS		2.676E-03	2.68E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
21) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	1.02E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
22) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	1.00E-08
PMOD63X570I	<module>63X/570 LOGIC FAILS		1.410E-03	1.41E-03	
PMODPRV568IV	<module>PORV 568 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
23) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	1.00E-08
PMOD63X568I	<module>63X/568 LOGIC FAILS		1.410E-03	1.41E-03	
PMODPRV570IV	<module>PORV 570 FAILS TO OPEN		4.201E-02	4.20E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
7) TLCH1					*1.19E-06
1) OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	3.39E-07
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
2) HIPRECRT	HI OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		1.0E-3	1.00E-03	1.70E-07
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
3) EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	1.43E-07
EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
4) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	8.65E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
5) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	8.65E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMVPV873	OPERATOR FAILS TO CLOSE SI-MOV-873 TO ISOLATE CORE DELUGE LINES		1.0E-1	1.00E-01	
6) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	5.41E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
XMODSIWLABI	<module>SIAS RESET FAILS		3.192E-04	3.19E-04	
7) ERVDQ715	RELIEF VALVE RH-RV-715 PREMATURE OPEN	1.25E-5	24	3.00E-04	5.09E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
8) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	4.61E-08

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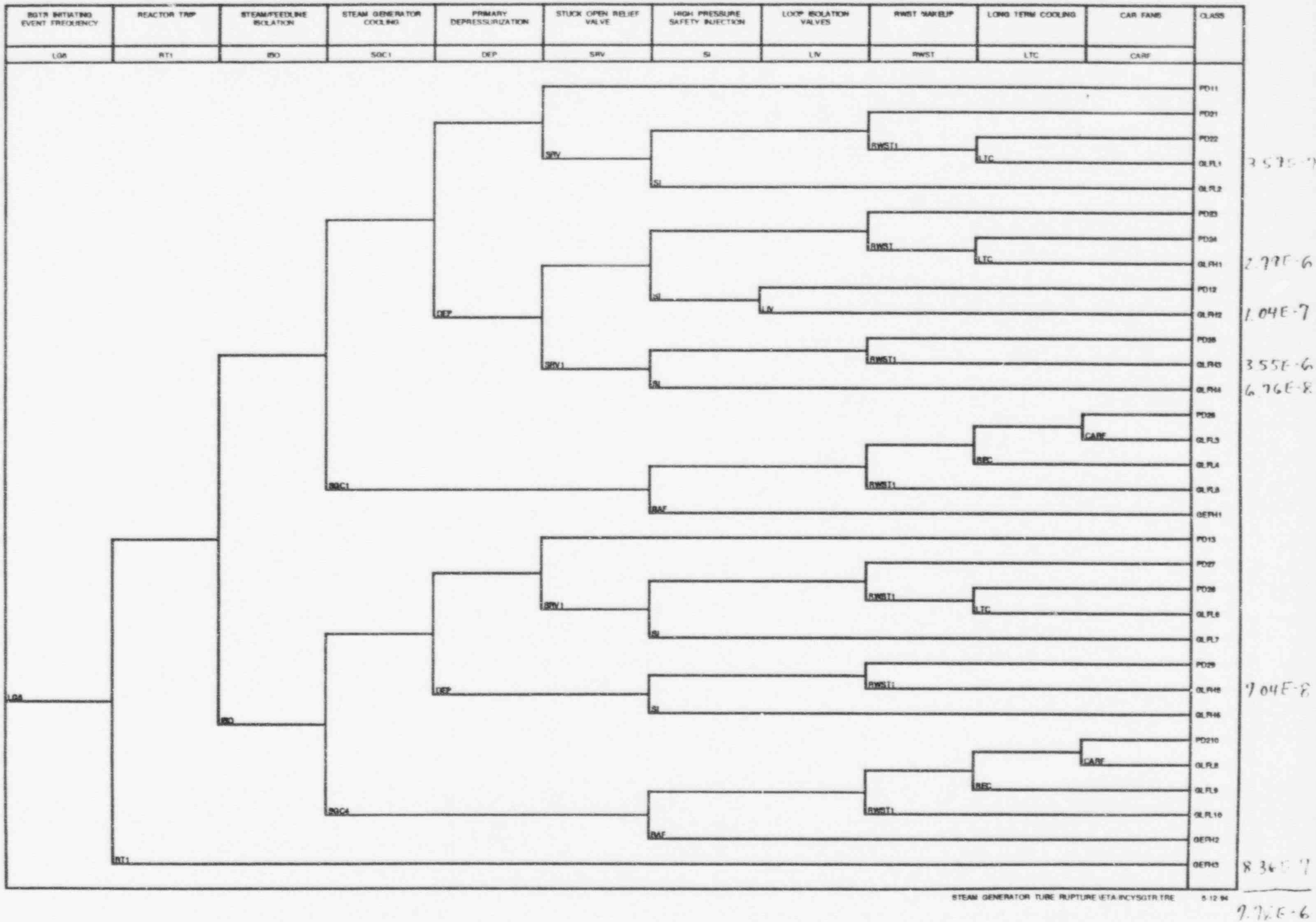
MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
WMVAA056	CCF COMMON CAUSE FAILURE OF SW-MOV-5 AND 6 TO OPEN	4.00E-3	6.8E-2	2.72E-04	
9) HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	3.39E-08
OAPRECRT	OA OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		2.00E-3	2.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5 [illegible]E-03	5.65E-03	
10) ECVAA783	CCF COMMON CAUSE FAILURE OF RH-CV-783 AND RH-CV-808A TO OPEN	2.00E-4		1.63E-04	2.77E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		[illegible]	3 00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.6[illegible]1E-03	5.65E-03	
11) EMODRHRCCFQ	<module>CCF OF BOTH RHR TRAINS		1.527E-04	1.53E-04	2.59E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
12) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-	3.00E-02	2.31E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871AFCAIV	<module>SI-MOV-871A FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
13) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	2.31E-08
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
VMOD871BFCAIV	<module>SI-MOV-871B FAILS TO RECLOSE		5.105E-03	5.11E-03	
VMODMOV873AIV	<module>SI-MOV-873 FAILS TO CLOSE		2.670E-02	2.67E-02	
14) EMVSQ874	RH-MOV-874 FAILS TO BE CLOSED POSITION DUE TO VALVE STEM SEPARA	1.04E-4	1	1.04E-04	1.76E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
15) EMVRQ874	OPERATOR FAILS TO RESTORE RH-MOV-874 FOLLOWING T&M		1.00E-4	1.00E-04	1.70E-08
OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
16) HIPRECRT	HI OPERATOR ACTION TO TRANSFER TO RECIRCULATION (RT)		1.0E-3	1.00E-03	1.70E-08
HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
17) EMODRHMV22AIQ	<module>RH-MOV-22 PATH FAILS TO OPEN		8.457E-03	8.46E-03	1.43E-08
EVMPQ808	OPERATOR FAILS TO OPEN RH-V-808A		1.00E-01	1.00E-01	
HIRMNSGC	HI OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW GIVEN A LOSS		3E-03	3.00E-03	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	
18) OARMNSGC	OA OPERATOR ACTION TO MANUALLY CONTROL FEEDWATER FLOW DUE TOLOSS O		3.0E-2	3.00E-02	1.38E-08
RCVAA225	CCF COMMON CAUSE FAILURE OF CC-CV-225A AND B TO OPEN	2.00E-4	.408	8.16E-05	
SG2	IE TOTAL LOSS OF INSTRUMENT AIR INITIATING EVENT FREQUENCY		5.651E-03	5.65E-03	



STEAM GENERATOR TUBE RUPTURE \ETA\NCYSGTR.TRE 5.12.94

(8.40E-6) - (7.78E-6) = 6.2E-7 (Δ)

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
1) GEFH3					*8.36E-07
1) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	8.36E-07
RT1	AUTOMATIC REACTOR TRIP		3.8E-5	3.80E-05	
2) GLFH1					*3.33E-06
1) EMODMOV803AIV	<module>RH-MOV-803 FAILS TO OPEN		3.964E-02	3.96E-02	8.37E-07
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
2) EMODMOV781AIV	<module>RH-MOV-781 FAILS TO OPEN		2.764E-02	2.76E-02	5.84E-07
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
3) EMODMOV780AIV	<module>RH-MOV-780 FAILS TO OPEN		3.949E-02	3.95E-02	8.34E-07
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
4) EMODMOV804AIV	<module>RH-MOV-804 FAILS TO OPEN		2.749E-02	2.75E-02	5.81E-07
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
5) HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	1.69E-07
HIPSGLTC	HI OPERATOR ACTION TO INITIATE LONG TERM COOLING		8.0E-3	8.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
6) EMODMOV803AIV	<module>RH-MOV-803 FAILS TO OPEN		3.964E-02	3.96E-02	5.58E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWSTM	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-04	2.00E-04	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
7) EMODMOV781AIV	<module>RH-MOV-781 FAILS TO OPEN		2.764E-02	2.76E-02	3.89E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWSTM	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-04	2.00E-04	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
8) HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	4.22E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWST1	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-03	2.00E-03	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
9) EMODFCV602IQ	<module>RH-FCV-602 FAILS TO OPERATE		1.940E-03	1.94E-03	4.10E-08
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
10) EMODMOV804AIV	<module>RH-MOV-804 FAILS TO OPEN		2.749E-02	2.75E-02	3.87E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWSTM	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-04	2.00E-04	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
11) EMODMOV780AIV	<module>RH-MOV-780 FAILS TO OPEN		3.949E-02	3.95E-02	5.56E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWSTM	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-04	2.00E-04	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
12) EMODFCV796IQ	<module>RH-FCV-796 FAILS TO OPERATE		1.797E-03	1.80E-03	3.80E-08

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
13) HIPSGLTC	HI OPERATOR ACTION TO INITIATE LONG TERM COOLING		8.0E-3	8.00E-03	1.13E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWSTM	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-04	2.00E-04	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
3) GLFH2					*1.42E-07
1) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	4.22E-08
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
OARSGLIV	OA OPERATOR ACTION TO CLOSE LOOP ISOLATION VALVES		1.0E-1	1.00E-01	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
2) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	2.53E-08
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
OARSGLIV	OA OPERATOR ACTION TO CLOSE LOOP ISOLATION VALVES		1.0E-1	1.00E-01	
XPTGB2/3	CCF OF 2/3 PRESSURIZER PRESS. TRANSMITTERS TO PROVIDE OUTPUT (SCRE	5.00E-6	7.200E+00	3.60E-05	
3) CMVBAVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.38E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
OARSGLIV	OA OPERATOR ACTION TO CLOSE LOOP ISOLATION VALVES		1.0E-1	1.00E-01	
4) CMVAARWT	CCF 2/2 MOVs FAIL TO OPEN (MOVs 373 & 32).	4.00E-3	0.408	1.63E-03	1.38E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
OARSGLIV	OA OPERATOR ACTION TO CLOSE LOOP ISOLATION VALVES		1.0E-1	1.00E-01	
5) AMODCCFDGS	<module>CCF of DGS		2.540E-03	2.54E-03	1.38E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
LOSPPROB	CONSEQUENTIAL LOSS OF OFFSITE POWER PROBABILITY		2.466E-04	2.47E-04	
6) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	1.15E-08
LMODDISLIVIV	<MODULE>RCP DISCH. LOOP ISOLATION VALVE FAILS TO ISOLATE		2.731E-02	2.73E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
7) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	1.15E-08
LMODSUCLIVIV	<MODULE>RCP SUCTION LOOP ISOLATION VALVE FAILS TO ISOLATE		2.731E-02	2.73E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
8) CCVAU372	CHECK VALVE BA-CV-372 FAILS TO OPEN	2.00E-4	6	1.20E-03	1.01E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
OARSGLIV	OA OPERATOR ACTION TO CLOSE LOOP ISOLATION VALVES		1.0E-1	1.00E-01	
4) GLFH3					*3.55E-06
1) HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	2.11E-06
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
2) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	1.41E-06

MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPRWST1	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-03	2.00E-03	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
3) HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	1.98E-08
HIPSGDEP	HI OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
4) HIPSGDEP	HI OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.0E-3	3.00E-03	1.32E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPRWST1	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-03	2.00E-03	
5) GLFH4					*1.05E-07
1) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	4.22E-08
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
XRCHA2/2	CCF OF SI RELAY 4A AND 4B COIL TO ENERGIZE (SCREENING VALUE)	1.00E-4	6.000E-01	6.00E-05	
2) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	2.53E-08
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
XPTGB2/3	CCF OF 2/3 PRESSURIZER PRESS. TRANSMITTERS TO PROVIDE OUTPUT (SCRE	5.00E-6	7.200E+00	3.60E-05	
3) CMVBAVCT	CCF OF 2/2 VCT TO CHG. SUCTION MOVs TO ISOL. MOVs 257 & 257B	4.00E-3	0.408	1.63E-03	1.38E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
4) CMVAARWT	CCF 2/2 MOVs FAIL TO OPEN (MOVs 373 & 32).	4.00E-3	0.408	1.63E-03	1.38E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
5) CCVAU372	CHECK VALVE BA-CV-372 FAILS TO OPEN	2.00E-4	6	1.20E-03	1.01E-08
HMODCCF861V	<module>CCF OF 3 OF 4 HPSI INJECTION VALVES TO OPEN		1.2E-2	1.20E-02	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSV1	STUCK OPEN SG SAFETY VALVE GIVEN SGTR AND SG OVERFILL		.1	1.00E-01	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
6) GLFH5					*7.04E-08
1) HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	4.22E-08
HIPSGTRI	HI OPERATOR ACTION TO ISOLATE THE FEED/STEAMLINES OF FAULTEDSG (SG		2.0E-3	2.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	
2) HIPSGTRI	HI OPERATOR ACTION TO ISOLATE THE FEED/STEAMLINES OF FAULTEDSG (SG		2.0E-3	2.00E-03	2.82E-08
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
OAPRWST1	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-03	2.00E-03	
OAPSGDEP	OA OPERATOR ACTION TO DEPRESSURIZE THE RCS FOLLOWING A SGTR		3.2E-01	3.20E-01	

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MODULE/EVENT NAME	DESCRIPTION	RATE	EXPOSURE	B.E. PROB.	MOD./CS. PROB.
7) GLFL1					*3.70E-07
1) LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	3.08E-07
NRVBDSRV	STUCK OPEN SAFETY VALVE GIVEN SGTR	7.00E-3	1	7.00E-03	
OAPRWST1	OA OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		2.0E-03	2.00E-03	
2) EMODMOV781AIV	<module>RH-MOV-781 FAILS TO OPEN		2.764E-02	2.76E-02	1.28E-08
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSRV	STUCK OPEN SAFETY VALVE GIVEN SGTR	7.00E-3	1	7.00E-03	
3) EMODMOV803AIV	<module>RH-MOV-803 FAILS TO OPEN		3.964E-02	3.96E-02	1.83E-08
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSRV	STUCK OPEN SAFETY VALVE GIVEN SGTR	7.00E-3	1	7.00E-03	
4) EMODMOV804AIV	<module>RH-MOV-804 FAILS TO OPEN		2.749E-02	2.75E-02	1.27E-08
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSRV	STUCK OPEN SAFETY VALVE GIVEN SGTR	7.00E-3	1	7.00E-03	
5) EMODMOV780AIV	<module>RH-MOV-780 FAILS TO OPEN		3.949E-02	3.95E-02	1.82E-08
HIPRWST1	HI OPERATOR ACTION TO ALIGN MAKEUP TO THE RWST		3.0E-3	3.00E-03	
LG5	IE SGTR INITIATING EVENT FREQUENCY		2.2E-02	2.20E-02	
NRVBDSRV	STUCK OPEN SAFETY VALVE GIVEN SGTR	7.00E-3	1	7.00E-03	