ENCLOSURE 4-2

Risk-Informed Closure of GSI-191

Volume 2

Probabilistic Risk Analysis

South Texas Project Risk-Informed GSI-191 Evaluation

Volume 2

Probabilistic Risk Analysis

Determination of Change in Core Damage Frequency and Large Early Release Frequency due to GSI-191 Issues

Document: STP-RIGSI191-VO2
Revision: 2
Date: October 22, 2013

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Notes on Revision 2

This document supplements information provided in the GSI-191 PRA analysis/assessment [8], the analysis of record. The purpose of the revision is to incorporate revised results provided by CASA GRANDE. The risk metrics shown in this document are consistent with the risk metrics given in Reference 8.

The changes made to Revision 1 of this report are listed below.

The following inputs from CASA GRANDE were updated as follows:

Data Variable	Description	Rev. 1 Mean Value	Rev. 2 Mean Value
BOLL1	BORON PRECIP, LLOCA, PUMP STATE 1	6.94E-04	1.25E-03
BOLL9	BORON PRECIP, LLOCA, PUMP STATE 9	1.82E-03	2.85E-03
BOLL22	BORON PRECIP, LLOCA, PUMP STATE 22	7.51E-05	2.54E-04
BOLL26	BORON PRECIP, LLOCA, PUMP STATE 26	6.15E-05	3.07E-04
BOLL43	BORON PRECIP, LLOCA, PUMP STATE 43	3.42E-06	1.04E-05
SLL1	SUMP PLUGGING LLOCA, PUMP STATE 1	2.45E-04	3.41E-03
SLL9	SUMP PLUGGING LLOCA, PUMP STATE 9	5.39E-04	7.22E-03
SLL22	SUMP PLUGGING LLOCA, PUMP STATE 22	1.32E-03	6.19E-03
SLL26	SUMP PLUGGING LLOCA, PUMP STATE 26	9.56E-04	1.02E-02
SLL43	SUMP PLUGGING, LLOCA, PUMP STATE 43	4.45E-03	1.93E-02

Changes in the CASA GRANDE inputs impacted the following split fraction values.

SF Name	Split Fraction Description	Rev 1 SF Value	Rev. 2 SF Value
BLL1S	LLOCA, PUMP STATE 1, HLEG=S, WITH GSI-191 ISSUES	6.93E-04	1.25E-03
BLL9S	LLOCA, PUMP STATE 9, HLEG=S, WITH GSI-191 ISSUES	1.82E-03	2.85E-03
BLL22S	LLOCA, PUMP STATE 22, HLEG=S, WITH GSI-191 ISSUES	7.50E-05	2.54E-04
BLL26S	LLOCA,, PUMP STATE 26, HLEG=S, WITH GSI-191 ISSUES	6.11E-05	3.07E-04
BLL43S	LLOCA, PUMP STATE 43, HLEG=S, WITH GSI-191 ISSUES	3.42E-06	1.04E-05
SULL1	SUMP PLUGGING STATE 1, LARGE LOCA	2.45E-04	3.40E-03
SULL9	SUMP PLUGGING STATE 9, LARGE LOCA	5.39E-04	7.22E-03
SULL22	SUMP PLUGGING STATE 22, LARGE LOCA	1.32E-03	6.19E-03
SULL26	SUMP PLUGGING STATE 26, LARGE LOCA	9.55E-04	1.02E-02
SULL43	SUMP PLUGGING STATE 43, LARGE LOCA	4.44E-03	1.93E-02

One other change to the model was made in updated the model for Revision 2. Pump State H1L3S3SUCC is now (Rev. 2) mapped to CASA GRANDE sump strainer failure Case 22. In Rev. 1 this pump state was mapped to Case 9. This change had no impact on the quantification results.

1 Purpose and Scope

The purpose of this assessment is to determine the change in the core damage frequency and large early release frequency due to the potential effects of GSI-191 phenomena at STP. The change in core damage frequency and large early release frequency is determined by comparing the results of two models: one with no source material in the containment capable of producing any GSI-191 effects and one representing the current plant conditions that includes both fibrous insulation that might be liberated following a LOCA and latent material found in the containment.

The results of the comparison become one input to an assessment of the significance of the GSI-191 issue at STP. The assessment of the significance uses the framework specified in Regulatory Guide 1.174.

2 Method

2.1 Quantification Considerations

The PRA model developed to support the consideration of GSI-191 phenomena has been developed from the approved PRA model for STP, Revision 7.1 (Reference 1). This approved model builds on a legacy of previous PRA models used for risk informed applications and other regulatory requirements. Revision 7.1 is the current manifestation benefiting from investments in PRA at STP dating back 25 years.

The PRA model developed to address GSI-191 concerns does differ from Revision 7.1, however. These modifications are discussed fully below. Key differences include:

- Revision 7.1 is designed to yield estimates of the core damage frequency and Level 2 plant damage state frequencies. Success criteria developed to support Revision 7.1 addressed whether at least the minimum equipment was available to satisfy key functions. For example, for long term heat removal in scenarios involving recirculation, the model asks whether the minimum contingent of fan coolers or RHR is available. To address the GSI-191 phenomena, it is necessary to determine specific combinations of plant equipment availability. The number of pumps taking suction from the sump influences the approach velocity of containment water at the screens. This velocity is a key parametric value in describing the interaction of debris laden water with the screens. In addition, injection flow can influence in-vessel phenomena. The GSI-191 PRA model includes the determination of the number of pumps taking suction from the sump, rather than only determining whether at least the minimum number of pumps is available to provide adequate core injection and cooling. One modeling change was the addition of the determination of the status of the high head safety injection pumps to the large LOCA response model; the status of these pumps do not influence the likelihood of core damage directly, but they could influence the approach velocity of the sump water at the screens.

- Revision 7.1, as is common in PWR PRAs, does require the operators to switch over to hot leg injection per procedures and training late in response to a large LOCA to prevent significant boron precipitation. Moreover, Revision 7.1 requires this switchover to occur without differentiating between hot leg and cold leg breaks, a conservative approach. Revision 7.1 does not require this late switchover for medium LOCAs. This requirement was added to the medium LOCA response model for the GSI-191 PRA. In addition, the GSI-191 model only requires switchover to be accomplished for cold leg breaks.

- Both Revision 7.1 and the GSI-191 PRA use the information contained in NUREG 1829 as a basis for the characterization of the frequency of small, medium and large LOCAs. The two models, however, use the information derived from NUREG 1829 differently. Revision 7.1 uses information as developed by Idaho National Laboratory to characterize the prior distributions for small, medium and large LOCA frequencies. This is essentially a top-down use of the NUREG 1829 information. The GSI-191 PRA uses the framework developed in NUREG 1829 in a hybrid plant-specific characterization of LOCA frequencies. The primary LOCA frequency characterization is based on a top-down interpretation of the results of NUREG 1829. The bottom-up portion of the analysis provided a consistent basis for the assignment of the relative failure likelihoods for specific welds and is necessary to support location-specific characterization of LOCAs. Additional discussion of the characterization of initiating event frequency is found in Reference 2 and Reference 3.

During a review of Revision 7.1, a modeling error resulting in the overestimation of the core damage frequency and the large early release frequency at STP was identified (CR 12-31272). The specific error imposed a dependency on EAB HVAC that is not correct. The specific 480V load center that was modeled in error actually has no dependency on EAB HVAC. This conservative modeling error was carried over into the PRA models developed to address GSI-191 issues. Actually, the specific 480V load center in question has no role in the response to medium or large LOCAs. Since the plant response models of interest are limited to medium and large LOCAs, the error does not significantly impact the determination of changes in core damage frequency or large early release frequency due to GSI-191 phenomena.

The error discussed above will affect values of CDF and LERF. Correcting the error will result in a lower CDF and LERF values.

2.2 Computer Input/Output

The PRA models used in the determination of the change in core damage frequency and large early release frequency were derived from STP PRA Revision 7.1. Specific model changes are documented in Appendix A and Appendix B of this assessment.

3 Assumptions

Assumptions remain the same as those in the Revision 7.1 model. However, modeling changes necessary for this study are made and documented in the body of the analysis. Key assumptions made in the PRA evaluations for GSI-191 are as follows:

1. Boron precipitation is assumed possible for medium LOCA, even though we believe this is not true due to the refill of the RCS within 1 or 2 hours, even for the largest size range of the MLOCA category.

2. Unanalyzed pump state combinations not explicitly analyzed by CASA GRANDE are assumed to result in sump blockage with a failure probability of 1.0.

3. The assumption that a mission of time 24 hours is conservative for GSI-191 evaluations is justified by arguing that this assumption conservatively increases the change in core damage frequency caused by GSI-191 phenomena; i.e., if pump failures after 24 hours do not already lead to core damage then the GSI-191 phenomena have a greater base success sequence frequency at risk of becoming core damage.

4. The CASA GRANDE models assume containment systems are successful (containment purge isolation, isolation of small containment penetrations, that at least two of six fan coolers operate, and that CCW is available to the RHR heat exchangers) for purposes of evaluating sump failure probabilities. This is assumed justified because the failure of such systems is either relatively low frequency or has minimal impact on the computed failure probabilities.

5. Steam line break sequences will not challenge the pressurizer PORVs to open even if the high pressure injection pumps are not secured due to the relatively low shutoff head of the HHSI pumps at STP. This assumption was also made in Version 7.1 of the STP PRA. This explains why steamline breaks resulting in the need for sump recirculation are particularly low in frequency at STP.

6. For medium and large break LOCAs in the base PRA model and in the model with GSI-191 phenomena considered, the failure to switch over to hot leg injection as directed by procedures is assumed to result in core damage due to boron precipitation for cold leg breaks only. Hot leg breaks are assumed to not require hot leg switchover.

7. Uncertainties: The variable distributions for most phenomena of interest are sampled inside CASA GRANDE. The PRA model is then passed the probabilities of failure from GSI-191 phenomena (mean values). The only uncertainty instead captured by the uncertainty distribution of the failure probabilities is that caused by the shape of the LOCA break exceedance frequency curves. The LOCA frequency uncertainties

sampled in the PRA uncertainty analysis are assumed independent of the probabilities of failure from the uncertainty analysis of CASA GRANDE.

8. A key parameter of the CASA GRANDE is the status of the number of pumps running and taking suction from the sumps. It is assumed sufficient to evaluate the failure probabilities from CASA GRANDE in the PRA by considering only the pump state combination and the size of the break. Other variations on the sequences are assumed less important and are not distinguished.

9. We assume that the NUREG-1829 LOCA frequencies apply.

10. The split of cold leg versus hot leg breaks is assumed in the PRA to be the same as that modeled in CASA GRANDE for each break range when summed over all breaks modeled in CASA GRANDE. The highest cold leg fraction for the three break sizes is assumed in the PRA for all break ranges; i.e., they do not differ significantly between break ranges, but they are also not a 50-50 split. The cold leg fractions for LLOCA = .256 and for MLOCA are .381

11. We assumed credit for pump train symmetry when reducing the pump state combination to those analyzed; if only one spray pump train is available, it does not matter which specific single spray pump train it is.

12. The charging pumps at STP are assumed to have too low of a flow rate capacity to affect the GSI-191 analysis.

13. Pre-existing containment leaks are assumed small enough as to not affect the GSI-191 phenomena due to lower containment back pressure.

14. One out of three each from HHSI and LHSI pumps is assumed required for mitigation of medium LOCAs.

15. If just one LHSI pump train is aligned for hot leg recirculation and it is to the broken RCS loop, we assume that this is a failure of hot leg recirculation due to flow diversion.

16. Assumed that one HHSI pump operating in hot leg recirculation (as opposed to one higher capacity LHSI pump) is not sufficient to avoid boron precipitation affects for cold leg breaks.

4 Results

A comparison of the mean values of the distributions used to characterize the initiating event frequencies for medium and large LOCAs in Revision 7.1 and the GSI-191 PRAs is shown in Table 4-1. Transient induced LOCAs are not included in these frequencies.

Table 4-1 Comparison of Medium and Large LOCA Initiating Event Frequencies (mean values, year^{-1})

	STP PRA Revision 7.1	GSI-191 PRA
Small LOCA	3.45×10^{-4}	1.59×10^{-3}
Medium LOCA	4.95×10^{-4}	3.05×10^{-4}
Large LOCA	1.37×10^{-6}	5.20×10^{-6}

A summary comparison of the results of the three PRA models (STP PRA Revision 7.1, the GSI-191 PRA – Base Case, and GSI-191 PRA – with GSI-191 Phenomena) is shown in Table 4-2. The GSI-191 PRA – Base Case represents a hypothetical STP plant with all fibrous insulation removed. The results in this table were generated using the sample mean outputs from a Monte Carlo simulation of each initiating event and split fraction in a single point estimate of the PRA sequence models; i.e., only the sample means were used in the quantification of sequence frequencies through the event trees. The individual sequence quantification cutoff used during quantification was 1.0×10^{-14} per year. For the GSI-191 PRA point estimate quantifications, the same approach was used. However, only the small LOCA, medium LOCA, and large LOCA sequence frequencies were reevaluated as the LOCA initiator frequencies have changed. The contributions from the other initiating events in the STP PRA were assumed to be the same as in STP PRA Revision 7.1 because the impact of GSI-191 phenomena on those initiators is negligible. As a result of the 1.0×10^{-14} per year cutoff applied, the aggregated amount truncated for medium and large LOCA initiators was 6.6×10^{-9} per year.

Table 4-2 Comparison of Core Damage Frequency and Large Early Release Frequency (mean values, year^{-1})

	STP PRA Revision 7.1	GSI-191 PRA – Base Case (without GSI-191 Phenomena)	GSI-191 PRA – (with GSI-191 Phenomena)
Core Damage Frequency	7.80×10^{-6}	9.20×10^{-6}	9.23×10^{-6}
Large Early Release Frequency	5.73×10^{-7}	5.78×10^{-7}	5.78×10^{-7}

The changes in core damage frequency and large early release frequency are derived by comparing the results from the GSI-191 PRA (with GSI-191 Phenomena) to those of the GSI-191 Base Case, without GSI-191 phenomena:

Change in core damage frequency: 2.88×10^{-8} per year.

Change in large early release frequency: 4.70×10^{-11} per year.

These CDF and LERF changes are very small. To better understand the robustness of this conclusion, an uncertainty analysis was performed. Since only the medium and large LOCA initiating events potentially are affected by GSI-191 phenomena, only these initiating events were included in the Monte Carlo uncertainty analysis; i.e., and not all the other initiating events modeled in the STP PRA. Of interest are the uncertainty distributions for the differences in CDF and LERF contributions from these two initiating events. A single initiating event batch was constructed that considers medium and large LOCAs for both the core damage and large early release end states (i.e., with an added containment event tree) and considering separately GSI-191 phenomena. The list of initiating events consider in the single batch are listed below in Table 4-3.

By including these eight initiating events in the same batch and applying the sampled data variables each trial to all eight initiating events, proper correlation of the sampled data is preserved. The trial initiating event results are then summed by end state. Also, the results for each trial are saved so that differences between the total end state frequencies for each trial can also be computed, again preserving the correlation between the end states. All split fractions used in the medium and large LOCA event trees are recalculated each trial. The sequence frequency cutoff used in the Monte Carlo simulation was kept at 1×10^{-14} per year.

Table 4-3 Initiating Events Considered in Uncertainty Analysis

Initiating Event ID	Description	End State
MLOCA	Medium LOCAs evaluated for success or core damage with GSI-191 phenomena included	CDF W/ GSI-191
MLOCA2	Medium LOCAs evaluated for release categories with GSI-191 phenomena included	LERF W/GSI-191
LLOCA	Large LOCAs evaluated for success or core damage with GSI-191 phenomena included	CDF W/ GSI-191
LLOCA2	Large LOCAs evaluated for release categories with GSI-191 phenomena included	LERF W/GSI-191
MLBASE	Medium LOCAs evaluated for success or core damage without GSI-191 phenomena included	CDF W/O GSI-191; BASE CASE
ML2BAS	Medium LOCAs evaluated for release categories without GSI-191 phenomena included	LERF W/O GSI-191, BASE CASE
LLBASE	Large LOCAs evaluated for success or core damage without GSI-191 phenomena included	CDF W/O GSI-191, BASE CASE
LL2BAS	Large LOCAs evaluated for release categories without GSI-191 phenomena included	LERF W/O GSI-191, BASE CASE

The results are provided in Table 4-4 for core damage frequency (CDF) and Table 4-5 for large early release frequency (LERF). The uncertainty distribution for the difference in core damage frequency attributed to GSI-191 phenomena has a mean value of 2.99×10^{-8} per year. This is consistent with the mean point estimate difference of 2.88×10^{-8} per year, reported above. The uncertainty analysis allows us to conclude that we are 95% confident that the difference is less than 1.3×10^{-7} per year. The uncertainty distribution for the difference in large early release frequency attributed to GSI-191 phenomena has a mean value of 5.31×10^{-11} per year. This difference is consistent with the mean point estimate difference of 4.70×10^{-11} per year, reported above.

Table 4-4 Uncertainties in Core Damage Frequency from Medium and Large LOCAs (Samples = 1500)

Uncertainty Percentiles	Sample Minimum	5%	50%	95%	Sample Maximum	Mean
GSI-191 PRA – Base Case (without GSI-191 Phenomena)	9.12×10^{-09}	2.19×10^{-08}	4.07×10^{-07}	7.25×10^{-06}	1.70×10^{-05}	1.49×10^{-06}
GSI-191 PRA – (with GSI-191 Phenomena)	9.35×10^{-09}	2.22×10^{-08}	4.15×10^{-07}	7.40×10^{-06}	1.72×10^{-05}	1.52×10^{-06}
Change in CDF (WITH GSI-191 Phenomena – BASE CASE)	0	3.30×10^{-10}	7.23×10^{-09}	1.30×10^{-07}	7.18×10^{-07}	2.99×10^{-08}

Table 4-5 Uncertainties in Large Early Release Frequency from Medium and Large LOCAs (Samples = 1500)

Uncertainty Percentiles =>	Sample Minimum	5%	50%	95%	Sample Maximum	Mean
GSI-191 PRA – Base Case (without GSI-191 Phenomena)	2.92×10^{-12}	8.20×10^{-12}	1.91×10^{-10}	3.73×10^{-09}	8.76×10^{-09}	7.48×10^{-10}
GSI-191 PRA – (with GSI-191 Phenomena)	2.92×10^{-12}	8.26×10^{-12}	2.00×10^{-10}	4.02×10^{-09}	8.95×10^{-09}	8.01×10^{-10}
Change in LERF (WITH GSI-191 phenomena – BASE CASE)	0	0	1.00×10^{-11}	2.55×10^{-10}	1.38×10^{-09}	5.31×10^{-11}

Table 4-6 displays the GSI-191, Fussell-Vesely contributors to the core damage frequency from medium and large LOCAs. All other GSI-191 related split fractions have zero contributions. In-core flow blockage split fractions (i.e., Top Event FLBK) all have zero split fraction values and hence no importance to core damage frequency. Split fractions BORML and BORLL consider the potential for boron precipitation caused core flow blockage from cold leg breaks, given failure of hot leg switchover during long term sump recirculation. Their split fraction values are governed by the cold leg fractions and not by the probability of plugging prior to the required time of hot leg recirculation switchover. The assumption that these sequences result in core damage due to long term boron precipitation is likely conservative for medium LOCAs because the RCS is likely to refill eventually, thereby ending further boron precipitation. These split fractions contribute equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but are included in Table 4-6 for completeness.

Split Fractions SULL1, SULL22, SULL26, SULL43 and SULL9 represent the sump and strainer plugging failures following a large LOCA for the five different Pump Combination States 1, 22, 26, 43, and 9, respectively. Split Fraction SULL1 represents the highest ranked core damage contributor analyzed by CASA GRANDE. Sump or strainer contributions from other pump states had considerably lower Fussell-Vesely importance measures.

The importance of Split Fraction BLL1S for boron precipitation caused flow blockage indicates the contribution for large LOCAs when hot leg switchover is successful and for the most likely pump state combination; i.e., Pumps State 1. The equivalent split fraction for medium LOCAs has zero occurrence probability and therefore does not appear. Split Fractions BLL9S, BLL22S and BLL26S represent boron precipitation caused flow blockage for lower frequency pump combination state conditions; i.e., States 9, 22 and 26, respectively.

Split Fraction SUMPZ represents the potential for sump and strainer failure mechanisms for all pump combination states that are not explicitly analyzed or bounded. Conservatively, a split fraction value of 1.0 was used for all 48 of these pump combination states. Clearly, a more detailed evaluation of these pump combination states in CASA GRANDE would reduce the evaluated impact of the GSI-191 phenomena. Since core damage is conservatively assumed for all such unevaluated pump combination states in top event SUMP, there are no added impacts for top events FLBK or BORON for these same pump combination states. Note that in the current analysis, these unevaluated pump state combinations contributed approximately 22 percent of the reported increase in core damage frequency.

Split Fractions HLEGA, HLEGB, and HLEGAB also appear on the high ranking Fussell-Vesely importance contributors. These split fractions represent failures to successfully switch from cold leg to hot leg recirculation for different classes of sequences. The GSI-191 phenomena are not directly captured by these importance measures. Rather, the occurrence of boron caused core flow blockage is increased in probability, for cold leg breaks if hot leg switchover fails. This is the reason for including them in the table.

Table 4-7 displays some of the key sequences contributing to core damage frequency from medium and large LOCAs when the GSI-191 phenomena are included. There are many sequences that contribute so only some illustrative ones are listed. They are presented ranked by frequency with the sequence ranking shown to the left. The percent of CDF column presents the sequence frequency as a percentage of the total CDF for large and medium LOCAs.

The first five sequences are the highest frequency sequences involving medium LOCAs. The first three of these are undergoing preventative maintenance on one train of ECCS at the time of the break, which occurs on a different RCS loop from that undergoing maintenance. One train of ECCS fails and a second one is diverted out the broken loop when aligned for hot leg recirculation. The failure of the two trains of ECCS during recirculation means that hot leg recirculation switchover fails. The third train of ECCS is left aligned to cold leg recirculation in accordance with procedures. Core damage occurs because of excessive boron precipitation in that fraction of the medium LOCA break frequency which is in the cold legs. There are no sequences of this type with the break in loop C because of a modeling assumption. The operators are assumed to preferentially align trains A and B for hot leg recirculation keeping

Train C aligned for cold leg recirculation. Therefore, flow from train C is never lost out the break for hot leg recirculation. These sequences contribute equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but are included in Table 4-7 for completeness.

Sequences ranked 4 and 5 are similar to the above except that there is initially no planned maintenance at the time of the break. Instead, an independent failure occurs in a LHSI pump train that is not aligned to the broken loop. These sequences contribute equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but are included in Table 4-7 for completeness.

Rather than include additional variations on similar sequences, the table then skips to the next medium LOCA sequences in which the key split fractions from the importance ranking in Table 4-6 appear.

The sequence ranked 13th, involves a medium LOCA with the break in RCS Loop A. There is no planned maintenance but with one train lost, a second LHSI pump train fails to be switched over; i.e., Split Fraction HLEGB fails. Again there is excessive boron precipitation which results in core damage for the fraction of the break frequency involving cold leg breaks. This sequence contributes equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but is included in Table 4-7 for completeness.

The sequence ranked 14th, involves a medium LOCA with the break in RCS Loop B. There is no planned maintenance but with one train lost, a second LHSI pump train fails to be switched over; i.e., split fraction HLEGA fails. Again there is excessive boron precipitation which results in core damage for the fraction of the break frequency involving cold leg breaks. This sequence contributes equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but is included in Table 4-7 for completeness.

Sequences ranked 46, 47, and 48 are the highest ranked large LOCA sequences that contribute to core damage. They are exactly analogous to the three highest medium LOCAs except that they are initiated by large LOCAs. Sequences ranked 46, 47 and 48 are the five highest ranked sequences to core damage from large LOCAs. Again, these sequences contribute equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but are included in Table 4-7 for completeness.

The sequence ranked 97th, involves a large LOCA with the break in RCS loop D. Therefore, ECCS flow is not aligned to the broken loop. There is no planned maintenance at the time of the break. The pump state combination is, therefore, three HHSI, three LHSI, and three trains of containment spray available. This combination is analyzed as Case 1 of the CASA GRANDE runs; i.e., Split Fraction SULL1=3.40E-03 fails. This is the highest ranked sequence involving core damage for the pump state combinations analyzed by CASA GRANDE. There are eleven more similar sequences (ranked 98th through 108th) of nearly equal frequency not listed in table 4-7 that also involve failure of Split Fraction SULL1.

The sequence ranked 243rd, involves a medium LOCA with the break in RCS Loop D. No EECS loop is aligned to RCS Loop D. There is no planned maintenance at the time of the break. In this sequence there is a failure to switchover to hot leg recirculation from either Train A or B; (i.e., Split Fraction HLEGAB fails). The C train of LHSI is left aligned for cold leg recirculation. Again there is excessive boron precipitation which results in core damage for the fraction of the break frequency involving cold leg breaks. This sequence contributes equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but is included in Table 4-7 for completeness.

The sequence ranked 257th, involves a large LOCA with the break in RCS Loop D. Therefore, ECCS flow is not aligned to the broken loop. There is also no planned maintenance at the time of the break. All three ECCS train are available. However, in this sequence, excessive boron precipitation occurs prior to the time of hot leg recirculation; i.e., split fraction BLL1S fails. Split Fraction BLL1S corresponds to Pump Combination State 1 in which all three trains of HHSI, LHSI, and containment spray are available to be aligned to the sump for recirculation. The "S" in split fraction name BLL1S indicates that this is for the sequence that hot leg recirculation would have been successful if core flow blockage did not occur earlier in the sequence. Again there is excessive boron precipitation which results in core damage for the fraction of the break frequency involving cold leg breaks. This fraction is accounted for in the value of Split Fraction BLL1S. This is the highest ranked sequence involving excessive boron precipitation leading to core damage for any pump state combination.

The sequences ranked 298th and 307th are also the fourth and fifth highest ranked large LOCA sequence resulting in core damage. The break occurs in RCS Loop B in both of these sequences. There is no planned maintenance at the time of the break, but different sets of pumps are initially running at the start of the accident. Train A of LHSI pump fails. This fails two trains of LHSI from being aligned for hot leg recirculation. Train C is left aligned for cold leg recirculation. Again, without hot leg recirculation switchover, there is eventual excessive boron precipitation which results in core damage for the fraction of the break frequency involving cold leg breaks. These sequences contribute equally to the core damage frequency for the base case model and the model with GSI-191 phenomena included but are included in Table 4-7 for completeness.

The sequence ranked 809th, involves a medium LOCA with the break in RCS Loop D. Therefore, ECCS flow is not aligned to the broken loop. There is planned maintenance on ECCS Train A at the time of the break. Independently, the cold leg injection check valve on ECCS Train B fails to open. This is assumed to take out the HHSI and LHSI pumps on Train A. The pump state combination is, therefore, one HHSI, one LHSI, and two trains of containment spray available. This combination is not analyzed as one of the CASA GRANDE runs and so is conservatively assigned a sump plugging value of 1.0; i.e., Split Fraction SUMPZ=1.0 fails. This is the highest ranked sequence involving core damage for the unanalyzed pump state combinations.

The sequence ranked 1070th, involves a large LOCA with the break in RCS Loop D. Therefore, ECCS flow is not aligned to the broken loop. There is planned maintenance on ECCS Train B at the time of the break. The pump state combination is, therefore, two HHSI, two LHSI, and two trains of containment spray available. This combination is analyzed as Case 22 of the CASA GRANDE runs; i.e., Split Fraction SULL22=6.19E-3 fails. This is the second highest ranked sequence group involving sump strainer failure leading to core damage.

The sequence ranked 9480th, involves a large LOCA with the break in RCS Loop D. Therefore, ECCS flow is not aligned to the broken loop. There is planned maintenance on ECCS Train B at the time of the break. The pump state combination is, therefore, two HHSI, two LHSI, and two trains of containment spray available. This combination is analyzed as Case 22 of the CASA GRANDE runs; i.e., Split Fraction BLL22S=2.54E-4 fails.

Of the five other split fractions ranked in Table 4-6 (i.e., BLL9S, BLL26S, SULL9, SULL26, and SULL43), the highest ranking sequences involving failure of any one of them had frequencies less than 1E-12 per year. None are in the top 15,000 sequences ranked.

Table 4-6 GSI-191Contributors; Split Fraction Importance to Medium and Large LOCA CDF

RANK	Split Fraction	Top Event	Fussell-Vesely Importance	RAW	SF Value	Description
1	BORML	BORON	9.02E-01	2.46	3.81E-01	BORON BLOCKAGE: MLOCA CL FRACTION GIVEN HLEG=F, NO GSI ISSUES
2	HLEGA	HLEG	2.70E-02	19.63	1.45E-03	TRAIN A HOT LEG RECIRCULATION FAILS
3	HLEGB	HLEG	2.59E-02	18.82	1.45E-03	TRAIN B HOT LEG RECIRCULATION FAILS
4	SULL1	SUMP	1.02E-02	3.97	3.40E-03	SUMP PLUGGING: PUMP STATE 1, LARGE LOCA
5	BORLL	BORON	1.01E-02	1.03	2.56E-01	BORON BLOCKAGE: LLOCA CL FRACTION GIVEN HLEG=F, NO GSI 1091 ISSUES
6	SUMPZ	SUMP	5.42E-03	1.0	1.0	SUMP PLUGGING ALL UNANALYZED PUMP STATES LARGE AND MEDIUM LOCAS
7	BLL1S	BORON	3.71E-03	3.97	1.25E-03	BORON BLOCKAGE: LLOCA, PUMP STATE 1, HLEG=S, WITH GSI-191 ISSUES
8	HLEGAB	HLEG	1.92E-03	34.97	5.66E-05	TRAIN A,B HOT LEG RECIRCULATION FAILS
4	SULL1	SUMP	1.02E-02	3.97	3.40E-03	SUMP PLUGGING: PUMP STATE 1, LARGE LOCA
9	SULL22	SUMP	9.53E-04	1.15	6.19E-03	SUMP PLUGGING: PUMP STATE 22, LARGE LOCA

Table 4-6 GSI-191Contributors; Split Fraction Importance to Medium and Large LOCA CDF (Continued)

RANK	Split Fraction	Top Event	Fussell-Vesely Importance	RAW	SF Value	Description
10	BLL9S	BORON	1.45E-04	1.05	2.85E-03	BORON BLOCKAGE: LLOCA, PUMP STATE 9, HLEG=S, WITH GSI-191 ISSUES
11	BLL22S	BORON	1.79E-05	1.07	2.54E-04	BORON BLOCKAGE: LLOCA, PUMP STATE 22, HLEG=S, WITH GSI-191 ISSUES
12	SULL26	SUMP	1.52E-05	1.00	1.02E-02	SUMP PLUGGING: PUMP STATE 26, LARGE LOCA
13	SULL43	SUMP	5.04E-06	1.00	1.93E-02	SUMP PLUGGING: PUMP STATE 43, LARGE LOCA
14	SULL9	SUMP	1.53E-06	1.00	7.22E-03	SUMP PLUGGING: PUMP STATE 9, LARGE LOCA
15	BLL26S	BORON	1.36E-07	1.00	3.07E-04	BORON BLOCKAGE: LLOCA, PUMP STATE 26, HLEG=S, WITH GSI-191 ISSUES

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
1	MLOCA	3.05E-04	Medium LOCA	1.9433E-07	12.98
	BRKSA	2.50E-01	STEAM LINE BREAK FRACTION, LOOP A		
	TMEECA	7.50E-03	PLANNED MAINTENANCE TRAIN B		
	PBZ	1.00E+00	SI COMMON TRAIN B		
	HBZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN B		
	LBZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN B		
	CS3AC	9.91E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RBZ	1.00E+00	SI RECIRCULATION TRAIN B		
	OFFSZ	1.00E+00	OPERATORS SECURE ALL CONTAINMENT SPRAY FOR LATE RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
2	MLOCA	3.05E-04	Medium LOCA	1.9431E-07	12.98
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEEBC	7.50E-03	PLANNED MAINTENANCE TRAIN A		
	PAZ	1.00E+00	SI COMMON TRAIN A		
	HAZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN A		
	LAZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN A		
	CS4AB	9.92E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RAZ	1.00E+00	SI RECIRCULATION TRAIN A		
	OFFSZ	1.00E+00	OPERATORS SECURE ALL CONTAINMENT SPRAY FOR LATE RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
3	MLOCA	3.05E-04	Medium LOCA	1.9429E-07	12.98
	BRKSA	2.50E-01	STEAM LINE BREAK FRACTION LOOP A		
	TMEEAB	7.50E-03	PLANNED MAINTENANCE TRAIN C		
	PZZ	1.00E+00	SI COMMON TRAIN C		
	HCZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN C		
	LCZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN C		
	CS2AE	9.92E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RCZ	1.00E+00	SI RECIRCULATION TRAIN C		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
4	MLOCA	3.05E-04	Medium LOCA	3.0362E-08	2.03
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAINS A&C RUNNING		
	LAA	4.51E-03	LOW HEAD SAFETY INJECTION TRAIN A		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
5	MLOCA	3.05E-04	Medium LOCA	3.0276E-08	2.02
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEBBC	2.66E-01	NO MAINTENANCE TRAINS B&C RUNNING		
	LAA	4.51E-03	LOW HEAD SAFETY INJECTION TRAIN A		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
13	MLOCA	3.05E-04	Medium LOCA	9.8898E-09	0.66
	BRKSA	2.50E-01	STEAM LINE BREAK FRACTION LOOP A		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAINS A&C RUNNING		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGB	1.45E-03	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
14	MLOCA	3.05E-04	Medium LOCA	9.8823E-09	0.66
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAINS A&C RUNNING		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGA	1.45E-03	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
46	LLOCA	5.20E-06	Large LOCA	2.2072E-09	0.15
	BRKSA	2.50E-01	STEAM LINE BREAK FRACTION LOOP A		
	TMEECA	7.50E-03	PLANNED MAINTENANCE TRAIN B		
	PBZ	1.00E+00	SI COMMON TRAIN B		
	HBZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN B		
	LBZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN B		
	CS3AC	9.91E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RBZ	1.00E+00	SI RECIRCULATION TRAIN B		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORLL	2.56E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
47	LLOCA	5.20E-06	Large LOCA	2.2071E-09	0.15
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEEBC	7.50E-03	PLANNED MAINTENANCE TRAIN A		
	PAZ	1.00E+00	SI COMMON TRAIN A		
	HAZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN A		
	LAZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN A		
	CS4AB	9.92E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RAZ	1.00E+00	SI RECIRCULATION TRAIN A		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORLL	2.56E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
48	LLOCA	5.20E-06	Large LOCA	2.2068E-09	0.15
	BRKSA	2.50E-01	STEAM LINE BREAK FRACTION LOOP A		
	TMEEAB	7.50E-03	PLANNED MAINTENANCE TRAIN C		
	PZZ	1.00E+00	SI COMMON TRAIN C		
	HCZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN C		
	LCZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN C		
	CS2AE	9.92E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RCZ	1.00E+00	SI RECIRCULATION TRAIN C		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORLL	2.56E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
97	LLOCA	5.20E-06	Large LOCA	1.0387E-09	0.07
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAINS A&C RUNNING		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	SULL1	3.40E-03	SUMP STRAINER DURING RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
243	MLOCA	3.05E-04	Medium LOCA	3.8576E-10	0.03
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAIN A&C RUNNING		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGAB	5.66E-05	SI HOT LEG RECIRCULATION		
	BORML	3.81E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
257	LLOCA	5.20E-06	Large LOCA	3.8008E-10	0.03
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEBCA	2.67E-01	NO MAINTENANCE TRAINS A&C RUNNING		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	BLL1S	1.25E-03	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
298	LLOCA	5.20E-06	Large LOCA	3.4486E-10	0.02
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEBCA	2.67E-01	NO PLANNED MAINTENANCE TRAINS A& C RUNNING		
	LAA	4.51E-03	LOW HEAD SAFETY INJECTION TRAIN A		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORLL	2.56E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		
307	LLOCA	5.20E-06	Large LOCA	3.4388E-10	0.02
	BRKSB	2.50E-01	STEAM LINE BREAK FRACTION LOOP B		
	TMEBBC	2.66E-01	NO MAINTENANCE TRAINS B&C RUNNING		
	LAA	4.51E-03	LOW HEAD SAFETY INJECTION TRAIN A		
	CS1AA	9.87E-01	CONTAINMENT SPRAY - RECIRCULATION		
	HLEGZ	1.00E+00	SI HOT LEG RECIRCULATION		
	BORLL	2.56E-01	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
809	MLOCA	3.05E-04	Medium LOCA	8.0237E-11	0.01
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEEBC	7.50E-03	PLANNED MAINTENANCE TRAIN A		
	SI38BA	1.56E-04	SI38 PATH B		
	PAZ	1.00E+00	SI COMMON TRAIN A		
	HAZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN A		
	HBZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN B		
	LAZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN A		
	LBZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN B		
	CS4AB	9.92E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RAZ	1.00E+00	SI RECIRCULATION TRAIN A		
	SUMPZ	1.00E+00	SUMP STRAINER DURING RECIRCULATION		
1,070	LLOCA	5.20E-06	Large LOCA	5.3834E-11	0.00
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEECA	7.50E-03	PLANNED MAINTENANCE TRAIN B		
	PBZ	1.00E+00	SI COMMON TRAIN B		
	HBZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN B		
	LBZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN B		
	CS3AC	9.91E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RBZ	1.00E+00	SI RECIRCULATION TRAIN B		
	SULL22	6.19E-03	SUMP STRAINER DURING RECIRCULATION		

Table 4-7 Medium and Large LOCA Sequences Ranked to Core Damage (Continued)

Rank	IE/SF	Value	Sequence Event Descriptions; IE and SFs	Sequence Frequency	% of CDF
9,480	LLOCA	5.20E-06	Large LOCA	2.1941E-12	0.00
	BRKSD	2.50E-01	STEAM LINE BREAK FRACTION LOOP D		
	TMEECA	7.50E-03	PLANNED MAINTENANCE TRAIN B		
	PBZ	1.00E+00	SI COMMON TRAIN B		
	HBZ	1.00E+00	HIGH HEAD SAFETY INJECTION TRAIN B		
	LBZ	1.00E+00	LOW HEAD SAFETY INJECTION TRAIN B		
	CS3AC	9.91E-01	CONTAINMENT SPRAY - RECIRCULATION		
	RBZ	1.00E+00	SI RECIRCULATION TRAIN B		
	BLL22S	2.54E-04	BORON PRECIPITATION FOLLOWING SUMP RECIRCULATION		

5 References

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4. Jan F. Grobbelaar, "Human Reliability Analysis Update," May 1, 2006, prepared by Scientech for South Texas Project.

5. Wakefield, D.J., et al., "RISKMAN™, Celebrating 20+ Years of Excellence!," presented at PSAM10, Seattle, Washington, June 7–10, 2010.

6. ASME RA-Sa-2009, Addenda to ASME/ANS RA-S-2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," February 2, 2009.

7. STP Nuclear Operating Company, "South Texas Project, Units 1 and 2, Docket Nos. STN 50-498, STN 50-499," Response to NRC Requests for Additional Information on STPNOC Proposed Risk Managed Technical Specifications (TAC Nos. MD 2341 & MD 2342), February 28, 2007, NOC-AE-07002112.

8. "PRA Analyses/Assessments," 0PGP05-ZE-0001, PRA-13-001, Rev. 0.

9. NOC-AE-13002954/STI 33648174.

10. STP Calculation NC-7136, "Hot Leg Switchover Time Following LOCA", STI #31518267.

6 Description of Sequences Introduced by GSI-191 Phenomena

The GSI-191 phenomena apply for accident sequences that, following RCS injection of the RWST contents, require sump recirculation for successful mitigation. The specific LOCA classes modeled in the STP PRA and requiring sump recirculation are described in Section 11. Early on in the assessment of GSI-191 phenomena it was determined that the only sequence classes requiring sump recirculation that would be affected are medium LOCAs (2"–6" diameter breaks) and large LOCAs (>6" diameter breaks).

Changes to the STP PRA models to accommodate the assessment of GSI-191 phenomena were therefore restricted to the sequence models for these two initiating events. The STP PRA already includes the modeling of injection and sump recirculation functions in response to medium and large LOCAs. However, it was necessary to revise the plant sequence model so that the status of all pumps taking suction from the sump during recirculation would be known so that the plant conditions under which the GSI-191 phenomena are defined. Further discussion of pump state combinations is provided in Section 9. Similarly, the status of containment systems were also changed to be evaluated prior to the sequence models questioning sump recirculation events. This allows the sump pool temperature and containment pressures to be known at the start of sump recirculation and following. A further discussion of containment system states is provided in Section 10.

The specific GSI-191 failure mechanisms of interest are those described in Reference 2; namely:

1. Strainer $\Delta P \geq NPSH_{margin}$
2. Strainer $\Delta P \geq P_{buckle}$ for Structural Failure
3. Strainer Void Fraction, $F_{void} \geq 0.02$
4. Core Fiber Load $\geq$ Cold Leg Break Fiber Limit for Boron Precipitation, Prior to Switchover to Hot Leg Recirculation
5. Core Fiber Load $\geq$ Hot Leg Break Fiber Limit for Boron Precipitation, Prior to Switchover to Hot Leg Recirculation
6. Core Fiber Load $\geq$ Cold Leg Break Fiber Limit for Flow Blockage
7. Core Fiber Load $\geq$ Hot Leg Break Fiber Limit for Flow Blockage

Failure Mechanisms 1, 2, and, 3 are grouped into a failure probability represented in the PRA via Top Event SUMP. Failure Mechanisms 4 and 5 are grouped into a failure probability represented in the STP PRA by Top Event BORON. Finally, Failure Mechanisms 6 and 7 are grouped into a failure probability represented in the STP PRA by Top Event FLBK.

The plant response models following sump recirculation swap-over were then modified to question new event tree Top Events SUMP, FLBK, and BORON. A detailed description of the modified plant response models for medium and large LOCAs is provided in Appendix A.

The only scenarios identified as arising from GSI-191 phenomena that result in core damage are initiated by break sizes assigned to large LOCAs. The increase in core damage frequency due to GSI-191 phenomena is small, 2.88×10^{-8} per year. The added sequences predominately involve an intact, isolated containment, with containment heat removal so that the increase in large early release frequency is very small, less than 1×10^{-10} per year.

As indicated in Tables 4-6 and 4-7 above, the dominate GSI-191 issue leading to an increase in core damage frequency is associated with the increased likelihood of loss of NPSH at the sump strainer. Exceeding the cold leg fiber limit for boron precipitation is a small contribution by comparison.

7 Comparison to Regulatory Guide 1.174 Metrics

Regulatory Guide 1.174 provides numerical guidelines to characterize the core damage frequency, the frequency of large early release and the changes in core damage frequency and large early release. These measures are used as input to the risk-informed process judging the acceptability of the plant change. Regulatory Guide 1.174 defines changes judged to be 'very small' to be characterized by the following:

- The baseline core damage frequency does not 'significantly exceed' 10^{-4} per year.
- The change in core damage frequency is less than 10^{-6} per year.
- The baseline large early release frequency does not 'significantly exceed' 10^{-5} per year.
- The change in large early release frequency is less than 10^{-7} per year.

Changes that meet all these requirements are said to be in 'Region III'. The inclusion of GSI-191 phenomena into the STP PRA yields results that are characterized as being in Region III, thereby implying that these phenomena result in 'very small changes' in these risk metrics.

Regulatory Guide 1.174 also requires consideration of risk from 'all modes and all initiators'. The STP risk models consider all initiators; e.g., a comprehensive set of internal event initiators, fires, seismic and internal flooding. Only medium and large LOCAs were found to potentially be affected by GSI-191 phenomena, so the effort described here is focused on these initiators. Additional discussion of other initiators involving recirculation is found in Section 11, below. Only internal initiators are considered further; the contribution of medium and large LOCAs from external events, such as seismic activity, is negligibly small.

The risk models employed consider explicitly only Modes 1 and 2. Although not explicitly modeled, the assessment is bounding for Modes 3 and 4, when the primary system is still pressurized. Modes 5, 6, and 'Defueled' do not contribute to GSI-191 phenomena scenarios as the primary system is depressurized. Procedures instruct the operators to disable containment spray shortly after entering Mode 5 on cool down. On startup, sprays are enabled upon entering Mode 4.

8 On the Representation of Scenarios Beyond 24 Hours

The STP PRA adopts the common convention in PRA that specifies a 24-hour mission time for active equipment. The rationale for this accepted convention is the assumption that it appropriately balances the likelihood of active system failures after 24 hours with the additional resources that might become available and the longer response times that would characterize most 'late' failures.

Some of the GSI-191related phenomena could manifest over a time frame that extends beyond 24 hours. The impacts of such phenomena are fully represented in the GSI-191PRA. All failures predicted by CASA GRANDE are incorporated into the PRA.

The interface between CASA GRANDE and the PRA—the specification of the conditional likelihood of failure due to any of the GSI-191phenomena—is characterized by the status of the pump trains taking suction from the sumps. The pump train status is determined by their availability over the first 24 hours.

Any core damage events that are caused by GSI-191 phenomena are in addition to core damage events from other causes, such as failure of all vessel injection or failure of decay heat removal. From this point of view, the addition of GSI-191 phenomena to the PRA model can be viewed as potentially resulting in otherwise 'success' sequences in the absence of the GSI-191 phenomena going to core damage when such phenomena is considered. Therefore, any overestimation of success sequence frequencies that result from omitting active system failures after 24 hours would result in an overestimate of GSI-191 phenomena related core damage frequency. We believe, based on the rationale behind the conventional 24-hour mission time for active equipment, that this effect is small.

CASA GRANDE analyses indicate that the conditional likelihood of failure due to GSI-191 phenomena can be greater for cases involving less than three pump trains available as compared to the case of all trains available. These analyses were performed assuming that any unavailable train became unavailable at the beginning of the scenario. Although pump failures can occur after 24 hours, the loading of the debris on the sump strainers is well established by 24 hours, when the interface conditions between CASA GRANDE and the PRA are defined. The debris loading conditions on the strainers would therefore not be affected by active system failures after 24 hours. Active system failures occurring after 24 hours would most likely affect a single pump train. Such failure would actually reduce the strainer approach velocities thereby reducing the potential for sump and strainer failures. Active system failures affecting multiple trains would likely affect all pump trains thereby causing core damage, in the absence of GSI-191 affects.

For GSI-191 phenomena that potentially manifest downstream of the strainers, a key consideration of whether core damage occurs is the timing of switchover to hot leg injection. For cold leg breaks, the PRA currently requires switchover to be successful and this action would occur within 7.5 hours (Reference 10). Active system failures following successful switchover are included in the PRA via the 24 hour mission time assumption. Any such failure is not a GSI-191 issue. For hot leg breaks, successful switchover to hot leg injection is not required. Any active system failures occurring after hot leg switchover or later are also not downstream of the strainers GSI-191 issues. Therefore, any train failures after 24 hours would not significantly impact the conditional likelihood of core damage due to GSI-191 phenomena.

9 On the Frequency of Success States Involving Different Numbers of Pumps Operating

The STP PRA model developed for the GSI-191 project (GSI-191 PRA) identifies the number of pumps operating during both the injection and sump recirculation phases within each sequence. The CASA GRANDE models develop the failure probabilities for each of the GSI-191 phenomena for a specified list of sequence conditions. A key attribute of these sequence conditions is the number of ECCS pumps specified as operating in both the injection and sump recirculation phases. For medium and large LOCAs where the containment spray pumps are actuated, conceptually there are at least 64 different combinations of such pump states; i.e., there may be 0, 1, 2, or 3 pumps operating for each of the HHSI pumps, the LHSI pumps and the containment spray pumps; i.e., 4x4x4=64 combinations. Conceivably, we could have identified 2^9 = 512 pump states if each pump was substantially different and the flows to the three sumps were asymmetrical. However, at STPEGS, the flows to each sump are symmetrical and the pump types are all judged essentially the same; i.e., the pump flow characteristics of the three LHSI pumps are the same. For these reasons, the simpler approach adopting 64 states was taken.

Considering the operator actions directed by procedures, the situation is actually more complicated. Early in the accident sequences, the operators are directed to turn off one train of containment spray if initially all three are running to conserve RWST water inventory for the remaining pumps. Later in the accident sequence, after containment pressure drops below 6.5 psig and the Technical Support Center (TSC) determines that containment iodine levels are sufficiently low (i.e., estimated at 6.5 hours after the break for the design basis large LOCA event), all containment spray pumps are shut off. The operators are very likely to successfully perform these actions but there is also some probability that they do not. Further, the timing of these operator actions may affect the assessed evaluation of the GSI-191 phenomena issues.

Fortunately not all of these ECCS pump combinations needed be considered. The study team recognizes that some cases can be bounded by others; e.g., the result for two HHSI pumps operating is likely bracketed by one or three operating; i.e., the failure probability for the two HHSI pumps running case likely lies between the failure probabilities for one pump operating and three pumps operating cases. Another basis for choosing the pump combinations to evaluate is to assess their frequency of occurrence. The GSI-191 PRA model provides a tool to do this. For this exercise we are interested only in those sequences which, in the absence of the GSI-191 phenomena, are mapped to success rather than to core damage. By restricting the sequences to success conditions, those pump combinations which lead to core damage even without considering the GSI-191 phenomena are eliminated. The STP PRA models for this exercise involve only MLOCA and LLOCA events because only in those events is sump recirculation at issue and the containment spray pumps are expected to be actuated by a high containment pressure condition.

Table 9-1 presents the results from three sensitivity cases evaluated using the GSI-191 PRA model with no impact from the GSI-191 phenomena. The sequence quantification was run with a cutoff value of 1.0×10^{-14} per year. In each sensitivity case the success end state was divided into 64 different sub-bins according to the possible combinations of the nine different ECCS pumps of interest. The status of the charging pumps, on the other hand, is not tracked in the

STP PRA and not believed to provide sufficient flow to be of interest in this evaluation. The status of each pump is dependent on the availability of the pump itself, its RWST and containment sump suction valves, and associated supporting systems. It is not dependent on the break loop location since whether the LHSI or HHSI pump injects to the RCS is not relevant to the flow rates from the three sumps. The sump flow rate is the key parameter in evaluating the GSI-191 phenomena.

The first sensitivity evaluates the sequences when the operators do not act early (Top Event OS1=F) or late (Top Event OFFS=F) to secure the containment spray pumps. In this sensitivity, the most likely pump state (H3L3S3SUCC) involves all three HHSI, LHSI, and spray pumps operating. The next most likely state is when one ECCS train is disabled (such as for planned maintenance) and two trains of HHSI, LHSI and spray pumps are available. The next most likely pump states involve just single pump train failures of HHSI, LHSI, or spray pump trains. All other successful pump state combinations are less likely than the total core damage frequency from the MLOCA and LLOCA initiating events; i.e., CDF. CDF from medium and large LOCAs only is not a pump combination state but is included in Table 9-1 for ease of comparison. There are many different ECCS pump successful combinations with some frequency above $4x10^{-13}$ though less than the CDF frequency. All other pump combinations not shown in the first three columns were assessed as having zero frequency. Not all such pump combinations occur because some pumps must operate to prevent core damage and we are restricting the pump state combination frequencies to success sequences.

The second sensitivity run is similar to the first except that the operators are assumed to have secured one train of spray early in the injection phase if all three spray trains are initially running. This reduces the number of pump state combinations with non-zero frequency. It also changes the most likely pump combinations since now there are no pump combination states with all three trains of spray operating. The most likely pump combination state involves three HHSI pumps, three LHSI pumps, and two spray pumps operating; i.e., the same as in the first sensitivity except that one train of spray is secured. The next most likely is when one ECCS train is disabled (such as for planned maintenance) and two trains of HHSI, LHSI, and spray pumps are available. In this state only two trains of spray are running initially so that they are both left running. The next most likely pump states involve just single pump train failures of either HHSI or LHSI pump trains with the third spray train being secured. With a frequency just less than the core damage frequency, is one additional pump state involving failure of one train of ECCS with an added spray pump train failure. All other pump state combinations in this sensitivity are individually less likely than the total core damage frequency from MLOCA and LLOCA; i.e., CDF. There are some pump states combinations with individual frequencies above $8x10^{-13}$ but less than the CDF frequency. The number of such pump state combinations is lower than in the first sensitivity shown in the first two columns of Table 9-1 because there are none which have all three spray pumps operating. All other pump state combinations not shown in the second sensitivity were assessed as having zero frequency.

The third sensitivity run is similar to the first except that the operators are assumed to secure all three trains of spray approximately 6.5 hours after the break in accordance with procedures. This assumption greatly reduces the number of pump state combinations with non-zero frequency. It also changes the most likely pump combinations since now there are no pump combination states with any trains of spray operating. The most likely pump combination state involves three HHSI pumps, three LHSI pumps, and zero spray pumps operating; i.e., the same as in the first sensitivity run except that all trains of spray are secured. The next most likely is when one ECCS train is disabled (such as for planned maintenance) and two trains of HHSI and LHSI and all spray pumps are secured. The next most likely pump states involve just single pump train failures of either HHSI or LHSI with again all spray pump trains secured. All other successful pump state combinations are less likely than the total core damage frequency from MLOCA and LLOCA; i.e., CDF in the table. There are many different ECCS pump successful combinations with some frequency above 3×10^{-13} though less than the MELT frequency. All other pump combinations not shown in the third sensitivity were assessed as having zero frequency for this sensitivity.

Another way to look at this set of results from the three sensitivity runs is to consider them as time sequenced. The first sensitivity run defines the frequency of pump states during early injection before the operators secure one of three operating spray trains. The second sensitivity defines the frequency of pump states later during injection after the operators secure one of three operating spray trains. This condition would persist through sump recirculation switchover up until 6.5 hours after the break. Finally the third sensitivity run defines the frequency of pump states assuming the operators act to secure all spray trains after 6.5 hours. One deviation from this time sequencing of pump states is that when assessing whether the pump trains are operating, both the RWST suction and sump recirculation valves are required for pump operability in all three sensitivity runs. If the first sensitivity truly represented only the conditions during early injection, then failures of the sump valves would not be counted. This consideration has a minor impact on the results, however.

Results from the first sensitivity case only in Table 9-1 were used in the mapping of CASA GRANDE result cases to pump state combinations. Pump State Combinations 1, 9, 22, 26, and 43 are evaluated explicitly in CASA GRANDE. We then conservatively bound other combinations of specific pumps failing by choosing one of the five CASA GRANDE evaluated cases. Different pump combination states may be identified as bounding for strainer failures as opposed to in-vessel failures caused by GSI-191 phenomena. Typically a bounding case is one that has greater strainer flow and debris to a given strainer than the pump state being evaluated. For pump combination states that could not be easily bounded and for very low frequency pump combination states (i.e., 48 pump state combinations in all), the GSI-191 phenomena were assumed to cause core damage in all associated sump recirculation sequences.

Table 9-1 Frequency of Success Sequence Pump Combination States; No Impact of Break Location

Contribution from MLOCA and LLOCAs Only; Model GSI-191 PRA; MFF=G191MC							
No Credit for Securing Spray Pumps; OS1=OFFS=F		**Bounding Case for Strainer Failure**	**Bounding Case for Vessel Failure**	**Secure One Spray Pump Early Only (OS1=S and OFFS=F)**		**Secure One Spray Pump Early and Others after 6.5 Hours (OS1=S and OFFS=S)**	
Total:				**Total:**	**Frequency**	**Total:**	**Frequency**
H3L3S3SUCC	2.64E-04	CASA GRANDE Run-Case 1	CASA GRANDE Run-Case 1	H3L3S2SUCC	2.67E-04	H3L3S0SUCC	2.67E-04
H2L2S2SUCC	9.16E-06	CASA GRANDE Run-Case 22	CASA GRANDE Run-Case 22	H2L2S2SUCC	8.64E-06	H2L2S0SUCC	9.36E-06
H3L2S3SUCC	3.49E-06	Case 22	Case 9	H3L2S2SUCC	3.53E-06	H3L2S0SUCC	3.53E-06
H3L3S2SUCC	3.32E-06	Case 1	Case 1	H2L3S2SUCC	1.97E-06	H2L3S0SUCC	1.97E-06
H2L3S3SUCC	1.94E-06	Case 22	Case 9	CDF	1.47E-6	CDF	1.47E-6
CDF	1.47E-6			H2L2S1SUCC	7.12E-07	H2L1S0SUCC	6.16E-08
H2L2S3SUCC	1.17E-07	Case 22	Case 22	H3L3S1SUCC	7.53E-08	H1L1S0SUCC	4.52E-08
H2L2S1SUCC	7.81E-08	Case 26	Case 26	H2L1S2SUCC	5.69E-08	H1L2S0SUCC	3.64E-08
H3L3S1SUCC	7.53E-08	Case 22	Case 9	H1L1S1SUCC	4.11E-08	H3L1S0SUCC	3.26E-08
H2L1S2SUCC	6.03E-08	CASA GRANDE Run-Case 26	CASA GRANDE Run-Case 26	H1L2S2SUCC	3.29E-08	H1L3S0SUCC	2.71E-08
H3L2S2SUCC	4.38E-08	Case 22	Case 9	H3L1S2SUCC	3.26E-08	H0L3S0SUCC	5.90E-11
H1L1S1SUCC	4.34E-08	CASA GRANDE Run-Case 43	CASA GRANDE Run-Case 43	H1L3S2SUCC	2.71E-08	H0L1S0SUCC	3.89E-11

Table 9-1 Frequency of Success Sequence Pump Combination States; No Impact of Break Location (Continued)

Contribution from MLOCA and LLOCAs Only; Model GSI-191 PRA; MFF=G191MC (Continued)							
No Credit for Securing Spray Pumps; OS1=OFFS=F		**Bounding Case for Strainer Failure**	**Bounding Case for Vessel Failure**	**Secure One Spray Pump Early Only (OS1=S and OFFS=F)**		**Secure One Spray Pump Early and Others after 6.5 Hours (OS1=S and OFFS=S)**	
Total:				**Total:**	**Frequency**	**Total:**	**Frequency**
H1L2S2SUCC	3.54E-08	Case 26	Case 26	H3L3S0SUCC	9.77E-09	H0L2S0SUCC	3.55E-11
H3L1S3SUCC	3.22E-08	CASA GRANDE Run-Case 9	CASA GRANDE Run-Case 9	H2L1S1SUCC	4.66E-09		
H1L3S3SUCC	2.67E-08	Case 22	Case 9	H1L2S1SUCC	3.40E-09		
H2L3S2SUCC	2.44E-08	Case 22	Case 9	H1L1S0SUCC	2.56E-09	HiLjSk = i HHSI TRAINS S, j LHSI TRAINS , k SPRAY TRAINS	
H3L3S0SUCC	9.77E-09	Case 1	Case 9	H1L1S2SUCC	1.53E-09		
H1L1S2SUCC	1.63E-09	Not bounded	Not bounded	H2L2S0SUCC	1.19E-09		
H2L2S0SUCC	1.19E-09	Not bounded	Not bounded	H3L2S1SUCC	9.80E-10		
H3L2S1SUCC	9.80E-10	Not bounded	Not bounded	H2L3S1SUCC	5.39E-10		
H2L1S3SUCC	7.65E-10	Not bounded	Not bounded	H3L2S0SUCC	1.25E-10		
H1L2S3SUCC	6.43E-10	Not bounded	Not bounded	H2L3S0SUCC	6.95E-11		
H2L3S1SUCC	5.39E-10	Not bounded	Not bounded	H0L3S2SUCC	5.90E-11		
H2L1S1SUCC	4.93E-10	Not bounded	Not bounded	H0L1S1SUCC	3.36E-11		
H3L1S2SUCC	3.95E-10	Not bounded	Not bounded	H0L2S1SUCC	1.98E-11		
H1L3S2SUCC	3.26E-10	Not bounded	Not bounded	H0L2S2SUCC	1.57E-11		

Table 9-1 Frequency of Success Sequence Pump Combination States; No Impact of Break Location (Continued)

Contribution from MLOCA and LLOCAs Only; Model GSI-191 PRA; MFF=G191MC (Continued)							
No Credit for Securing Spray Pumps; OS1=OFFS=F		Bounding Case for Strainer Failure	Bounding Case for Vessel Failure	Secure One Spray Pump Early Only (OS1=S and OFFS=F)		Secure One Spray Pump Early and Others after 6.5 Hours (OS1=S and OFFS=S)	
Total:				Total:	Frequency	Total:	Frequency
H1L2S1SUCC	2.84E-10	Not bounded	Not bounded	H3L1S1SUCC	7.59E-12		
H1L1S0SUCC	1.76E-10	Not bounded	Not bounded	H1L3S1SUCC	6.18E-12		
H3L2S0SUCC	1.25E-10	Not bounded	Not bounded	H2L1S0SUCC	6.16E-12		
H2L3S0SUCC	6.95E-11	Not bounded	Not bounded	H0L1S0SUCC	5.27E-12		
H0L3S3SUCC	5.84E-11	Not bounded	Not bounded	H1L2S0SUCC	3.01E-12		
H0L1S1SUCC	3.89E-11	Not bounded	Not bounded	H3L1S0SUCC	9.85E-13		
H0L2S2SUCC	3.50E-11	Not bounded	Not bounded	H1L3S0SUCC	8.02E-13		
H1L1S3SUCC	9.96E-12	Not bounded	Not bounded				
H3L1S1SUCC	7.59E-12	Not bounded	Not bounded				
H1L3S1SUCC	6.18E-12	Not bounded	Not bounded				
H2L1S0SUCC	6.16E-12	Not bounded	Not bounded				
H1L2S0SUCC	3.01E-12	Not bounded	Not bounded				
H3L1S0SUCC	9.85E-13	Not bounded	Not bounded				

Table 9-1 Frequency of Success Sequence Pump Combination States; No Impact of Break Location (Continued)

Contribution from MLOCA and LLOCAs Only; Model GSI-191 PRA; MFF=G191MC (Continued)							
No Credit for Securing Spray Pumps; OS1=OFFS=F		Bounding Case for Strainer Failure	Bounding Case for Vessel Failure	Secure One Spray Pump Early Only (OS1=S and OFFS=F)		Secure One Spray Pump Early and Others after 6.5 Hours (OS1=S and OFFS=S)	
Total:				Total:	Frequency	Total:	Frequency
H1L3S0SUCC	8.02E-13	Not bounded	Not bounded				
H0L3S2SUCC	6.24E-13	Not bounded	Not bounded				
H0L2S3SUCC	4.92E-13	Not bounded	Not bounded				

10 On the Status of Containment Systems

The GSI-191 PRA model incorporates the probabilities of sump blocking, fuel blockage, and boron precipitation as a function of the number and types of High Head Safety Injection (HHSI), Low Head Safety Injection (LHSI), and containment spray pumps operating. The number of pumps operating both in the injection phase when debris in the containment is transported to the sumps and in the sump recirculation phase when the number of pumps operating determines the approach velocity at the sump strainers are of interest. The GSI-191 PRA model focuses on MLOCA and LLOCA events because only in those events is sump recirculation at issue and the containment spray pumps are expected to be actuated by a high containment pressure condition. For small LOCAs, the containment sprays are not actuated.

The status of three other containment system top events are questioned in the early response MLOCA event tree; i.e., purge line isolation (Top Event CP), smaller containment isolation lines (Top Event CI), and the response of the reactor containment fan coolers (Top Event CF). Conceivably, these three top event states could impact the GSI-191 issues by changing the containment back pressure, or altering the sump pool temperatures during sump recirculation. Table 10-1 provides the results of medium and large LOCA success sequence frequency contributions divided among sequence groups representing different states of these three top events plus a fourth top event appearing in the LTMLOCA event tree; i.e., RX which stands for component cooling to the RHR heat exchangers used to cool the sump. Only MLOCA or LLOCA sequences not already assigned to core damage in the absence of the GSI-191 phenomena are considered in these totals because only those sequences are candidates to be reassigned to core damage when the GSI-191 phenomena are considered. The values in Table 10-1 were generated using the event trees in model GSI-191 PRA with mean values collected in a Monte Carlo master frequency file (G191MC). The sequence quantification cutoff selected was 1×10^{-14} per year.

Table 10-1 shows that the by far the most likely outcome of the containment function top events is that all are successful; i.e., that the purge line (CP=S) and smaller containment penetrations (CI=S) all isolate, that at least 2 of the 6 containment fan coolers operate to remove decay heat from the containment (CF=S) and that component cooling water is available to the RHR heat exchangers (RX=S). Therefore, this state of the containment systems is generally assumed in CASA GRANDE when developing the GSI-191 issue failure probabilities.

The second ranked containment system function success state involves failure of smaller containment isolation lines (CI=F) and success of both the purge lines to isolate (CP=S) and of the fan coolers to function (CF=S). By far the largest contributor to small containment isolation failure is that of a pre-existing containment leak; i.e., 98.6%per the STP PRA evaluation of Top Event CI. Such leaks are too small to affect the containment response in any measureable way. For other containment isolation failures (i.e., 1.4% of the total failure probability) yet still less than equivalent 3-inch diameter lines that fail to isolate (i.e., excluding pre-existing leaks), the frequency is then only 1.6×10^{-8} year; (i.e.,$1.1\times10^{-6}\times.014=1.6\times10^{-8}$ per year). This frequency is already just a fraction of the success state frequency from medium and large LOCA, and of the core damage frequency from these events. Also, such small size containment isolation failures are not expected to significantly impact the containment response.

The next containment function state (SRXF) considers the failure of component cooling to any of the RHR heat exchangers through which a LHSI pump is operating in the sump recirculation mode and injecting into the RCS. Since these sequences still successfully avoid core damage, for this containment state at least one LHSI pump must be operating in the recirculation mode injecting through an intact loop into the RCS, and two or more containment fan coolers are being relied on to provide containment and sump water cooling. Since at least two containment fan coolers are successful, not all three trains of component cooling water are failed. The frequency of such sequences is only 1.55×10^{-7} per year which is less than 0.1% of the total success bin frequency. Consequently, the impact of such sequences relying on the containment fan coolers for heat removal is small. Further, since the containment fan coolers also depend on component cooling water, the most likely success sequences of this type involve loss of component cooling water to one train of RHR (whose LHSI pump train still successfully injects sump water to the RCS), maintenance on a second ECCS train (i.e., maintenance assumed to also fail that same train of CCW), and failure of the third LHSI train to inject to the RCS because of losing flow out the break. RCS injection by the LHSI train which loses RHR cooling still protects the core so long as the sump temperatures are limited by the fan coolers. The point is that the third LHSI train whose flow is diverted through the break is still cooling the sump water since its train has not lost CCW to the RHR heat exchanger. While such sequences are conservatively counted in the above total for SRXF, the actual frequency in which only the fan coolers are providing cooling is even lower.

The next most likely containment state is when the containment is completely isolated but at least two fan coolers do not operate to provide containment heat removal; i.e. bin SCPSCISCF. Recall that since sequences in this bin are successful, decay heat removal via the RHR heat exchangers operating in sump recirculation must be successful. Since the frequency of this containment system state is just less than 1×10^{-8} per year (i.e., a fraction of the core damage frequency) and the presence of one to three trains of RHR decay heat removal is assured, the impact of success sequences involving loss of all fan coolers on the sump pool temperatures is judged to be of low significance.

The final two ranked containment system states involve failure of both small containment isolation along with failure of the fan coolers (i.e., CI=F and CF=F) or failure of the large purge line to successfully isolate (CP=F). These two states are each of such low frequency that they cannot significantly impact the assessment of GSI-191 issues.

Table 10-1 Containment Function States within Success Bin (results do not include GSI-191 effects)

BINS	(Quantified)*	Bin Summary Description
SCPSCISCFS	2.81E-04	CP,CI,CF=S AND SEQUENCE SUCCESS
SCPSCIFCFS	1.12E-06	CI=FAILED AND SEQUENCE SUCCESS
MELT	1.60E-07	MELT SEQUENCES
SRXF	1.55E-07	RX=FAILED WITH SEQUENCE SUCCESS
SCPSCISCFF	9.88E-09	CF=FAILED AND SEQUENCE SUCCESS
SCPSCIFCFF	3.59E-11	CI=FAILED*CF=FAILED AND SEQUENCE SUCCESS
SCPF	1.56E-11	CP=F and SEQUENCE SUCCESS
SUCC	2.82E-04	TOTAL MLOCA AND LLOCA SUCCESS FREQUENCY
*The quantification was performed assuming an individual sequence cutoff of 1E-14 per year		

11 On the Frequency of Success States Involving Different Initiators and Numbers of LHSI Pumps Operating

The STP PRA considers a large number of internal initiating events many of which may result in successful sump recirculation as a means of successfully avoiding core damage. In support of the GSI-191 project, a summary of these sequences is provided in Table 11-1. Frequencies of successful sump recirculation are provided for the following categories:

- RCP Seal LOCAs
- Isolable Smalls LOCAs (pressurizer power operated relief valve [PORV] path)
- Small LOCAs (not isolable)
- Medium LOCAs
- Feed and Bleed Sequences
- Large LOCAs
- Steamline Breaks inside Containment Leading to Need for Sump Recirculation
- Unisolated Letdown Line
- ATWS (successful recirculation following ATWS)

Many different initiating events can contribute to specific categories above; e.g., feed and bleed sequences resulting in successful sump recirculation can occur from any of a number of initiating events. The sequence group feature of RISKMAN™ was used to define the sequence logic that would identify those sequences that are members of one of the above categories, involve sump recirculation, and end in successful sump recirculation. As an example, for the category feed and bleed; the sequence logic must satisfy OB=S*N2=S where Top Event OB=S represents successful feed and bleed cooling, Top Event N2=S, means the sequence requires recirculation from the sump, and the sequence must eventually be mapped to the SUCCESS end state instead of to a core damage state. Similar logic is used for all the above groups.

Note that some of the above sequence group frequencies may overlap. For example, feed and bleed sequences or RCP seal LOCAs may be initiated by sequences that begin with steam line breaks inside containment. Steam line breaks inside containment may lead to pressurizer PORV challenges caused by a safety injection signal and resulting high head safety injection pumps actuating in response to the RCS overcooling. At other PWRs. the pressurizer PORVs may be challenged because the mass addition causes RCS pressure relief prior to termination of the safety injection. However, at STP this is not the case because the HHSI pumps have a shutoff head of approximately 1,500 psi. It is still possible that the mass addition would eventually lead to RCS overpressure as the RCS gradually heats up, but this occurs much more slowly, providing ample time for operator intervention at STP. The STP PRA assumes that such steam line breaks would not cause a pressurizer PORV challenge. Instead the sump recirculation sequences initiated by steam line breaks inside containment at STP occur due to subsequent RCP seal LOCAs or, if auxiliary feedwater fails, then successful feed and bleed cooling.

The sequence group categories listed above and in Table 11-1 are sorted in decreasing order of successful sump recirculation frequency. These are the groups of sequences that can potentially transfer to core damage when the GSI-191 phenomena are considered; e.g., sump plugging, air ingress, fuel flow blockage, etc. These results were mostly obtained from the Revision 7.1 STP PRA model using point estimate split fraction values and a quantification cutoff of $1.0x10^{-14}$ per year. The medium (MLOCA) and large LOCA (LLOCA) sequence group frequencies were evaluated from a revised model developed to support the GSI-191 project. The MLOCA and LLOCA initiators were given special consideration since they are the focus of the GSI-191 project. The STP PRA model was restructured to allow the status of all nine ECCS pumps to be tracked in each sequence. Further, the RCS break sizes for these two initiators are large enough that even though a LHSI pump may be operating in the sump recirculation mode, the pump flow may not be injected into the RCS. Rather, it may be diverted out the break in the broken loop to containment, never entering the reactor vessel. To evaluate the potential for GSI-191 phenomena, the total pump flow from the sump is most important consideration, whether or not the pump flow is injected into the RCS. Therefore, the frequencies provided in Table 11-1 are for trains of LHSI operating even if flow from one of the pumps is diverted out the break. The MLOCA and LLOCA results in Table 11-1 were obtained from the restructured STP PRA model and quantified with split fractions derived from Monte Carlo means and a sequence quantification cutoff of $1.0x10^{-14}$ per reactor year.

Table 11-1 also breaks down the contribution to these category frequencies as to whether there is one, two, or three trains of LHSI pumps operating in the sump recirculation mode. Logic was appended to the total category frequency logic in order to collect the results by number of LHSI pump trains operating. For example, the logic for three trains of LHSI pumps operating that must be satisfied to map the sequence to three trains operating would be LA=S*LB=S*LC=S where the Top Events LA, LB, and LC represent the three trains of LHSI pumps in the STP PRA. Generally more than 95% of the total sequence group frequency involves successful operation of all three LHSI pumps and the frequency of just one LHSI pump operating is a tiny (~0.001) fraction of the total sequence group frequency.

Table 11-1 Revision 7.1 Sequence Group Frequencies Involving Sump Recirculation

GROUP ID	FREQUENCY (PER REACTOR YEAR)	SEQUENCE GROUP DESCRIPTION, ALL MAPPED TO SUCCESS END STATES
SE	2.48E-03	RCP SEAL LOCA
SE1	2.42E-05	1 TRAIN LHSI=S, RCP SEAL LOCA
SE2	3.89E-04	2 TRAINS LHSI=S, RCP SEAL LOCA
SE3	2.05E-03	3 TRAINS LHSI=S, RCP SEAL LOCA
ILOCA	8.40E-04	ISOLABLE SMALL LOCA, ISOLATION NOT CREDITED FOR SUCCESS SEQUENCES
ILOCA1	5.46E-07	1 TRAIN LHSI -ISOLABLE SMALL LOCA
ILOCA2	3.86E-05	2 TRAINS LHSI=S,ISOLABLE SMALL LOCA
ILOCA3	7.96E-04	3 TRAINS LHSI=S,ISOLABLE SMALL LOCA
SLOCA	3.28E-04	SMALL LOCA
SLOCA1	2.12E-07	1 TRAIN LHSI=S, SMALL LOCA
SLOCA2	1.50E-05	2 TRAINS LHSI=S, SMALL LOCA
SLOCA3	3.10E-04	3 TRAINS LHSI=S, SMALL LOCA
PR	1.05E-05	NON-ISOLABLE PORV LOCA - CREDIT FOR BLOCK VALVE CLOSURE TAKEN
PR1	2.33E-07	1 TRAIN LHSI=S, NON-ISOLABLE PORV LOCA-CREDIT FOR BLOCK VALVE CLOSURE TAKEN
PR2	2.67E-06	2 TRAINS LHSI=S, NON-ISOLABLE PORV LOCA-CREDIT FOR BLOCK VALVE CLOSURE TAKEN
PR3	7.50E-06	3 TRAINS LHSI=S, NON-ISOLABLE PORV LOCA-CREDIT FOR BLOCK VALVE CLOSURE TAKEN
MLOCA	2.78E-04	MEDIUM LOCA
MLOCA1	1.33E-07	1 TRAIN LHSI=S, MEDIUM LOCA
MLOCA2	8.56E-06	2 TRAINS LHSI=S, MEDIUM LOCA
MLOCA3	2.65E-04	3 TRAINS LHSI=S, MEDIUM LOCA
OB	5.08E-06	FEED AND BLEED
OB1	5.31E-09	1 TRAIN LHSI=S, FEED AND BLEED
OB2	2.29E-07	2 TRAINS LHSI=S, FEED AND BLEED
OB3	4.84E-06	3 TRAINS LHSI=S, FEED AND BLEED

Table 11-1 Revision 7.1 Sequence Group Frequencies Involving Sump Recirculation (Continued)

GROUP ID	FREQUENCY (PER REACTOR YEAR)	SEQUENCE GROUP DESCRIPTION, ALL MAPPED TO SUCCESS END STATES
LLOCA	4.67E-06	LARGE LOCA
LLOCA1	0.00E+00	1 TRAIN LHSI=S, LARGE LOCA
LLOCA2	1.62E-07	2 TRAINS LHSI=S, LARGE LOCA
LLOCA3	4.51E-06	3 TRAINS LHSI=S, LARGE LOCA
SLBI	1.18E-07	STEAMLINE BREAKS INISDE CONTAINMENT
SLBI1	1.05E-11	1 TRAIN LHSI=S, STEAMLINE BREAK INSIDE CONTAINMENT
SLBI2	6.78E-09	2 TRAINS LHSI=S, STEAMLINE BREAK INSIDE CONTAINMENT
SLBI3	1.11E-07	3 TRAINS LHSI=S, STEAMLINE BREAK INSIDE CONTAINMENT
LI	8.05E-09	LETDOWN UNISOLATED
LI1	7.50E-09	1 TRAIN LHSI=S, LETDOWN UNISOLATED
LI2	4.14E-10	2 TRAINS LHSI=S, LETDOWN UNISOLATED
LI3	1.34E-10	3 TRAINS LHSI=S, LETDOWN UNISOLATED
ATWSRECIRC	1.01E-09	ATWS SUCCESS
ATWSRRC1	0.00E+00	ATWS SUCCESS 1 TRAIN RECIRCULATION
ATWSRRC2	7.88E-11	ATWS SUCCESS 3 TRAIN RECIRCULATION
ATWSRRC3	9.28E-10	ATWS SUCCESS 1 TRAIN RECIRCULATION

12 On the Consideration of Different Hazard Groups

A nuclear power plant can experience a broad range of initiating events. Simply speaking, an initiating involves any potential occurrence that could disrupt plant operations to a degree that a response by the plant and/or the operating staff is required to avoid an undesired outcome. For the undesired outcomes of core damage or large early release and with the plant originally producing power, an initiating event would cause disruption of power production. Successful mitigation would require managing power production (for example, tripping the reactor), pressure control (for example, operation of safety valves), inventory control (for example, use of safety injection) and heat removal (for example, use of auxiliary feedwater with atmospheric dump).

Initiating events, or initiators, can be characterized as originating from two hazard groups: internal hazards and external hazards.

This section describes how each hazard group in Reference 6 has been considered in the evaluation of GSI-191 phenomena at STP.

Internal hazards include system failures or phenomena that originate within the plant. Internal initiators can further be characterized as internal events, internal plant fires and internal plant flooding.

External hazards include those phenomena that originate outside of the plant. Examples include external flooding, external fires, seismic events, extreme metrological events, landslide, tsunami, and aircraft crash. The consideration of external hazards begins with the characterization of the hazard potential and frequency and proceeds, if the hazard potential and frequency are found to warrant further analysis, to the direct plant impact due to realization of the hazard. That damage is then combined with the plant response model resulting in an integrated understanding of the impact of the external event.

The PRA can be thought of as an organized set of scenarios. Each scenario begins with an initiating event includes a representation of the response of the plant and operators to that initiating event. The identification of relevant PRA elements therefore begins with a consideration of the initiators included in the PRA.

Selection criteria are established to characterize the PRA scenarios. The scenarios of interest in an evaluation of GSI-191 must meet four criteria:

1. The scenario response model for the initiator includes taking credit for recirculation to provide core cooling.

2. The scenario involves the potential to liberate a significant amount of insulation inside primary containment.

3. The scenario includes a mechanism that transports the liberated insulation debris to the sump(s).

4. In the absence of GSI-191 phenomena, the scenario would have been evaluated as successfully terminated.

A plant-specific evaluation is necessary in the evaluation of the PRA against these criteria. This evaluation is done for both internal and external hazards.

12.1 Internal Hazards (Part 2 of Reference 6)

Initiating events belonging to the internal hazard group include internal events, internal flooding, and internal fires.

12.1.1 Internal Events

The internal events that are explicitly considered in the STP PRA are:

1. RCP Seal LOCA
2. Very Small LOCA
3. Non-Isolable Small LOCA
4. Isolable Small LOCA
5. Open SRV (one)
6. Open SRV (two or more)
7. Medium LOCA
8. Large LOCA
9. Steam Line Break inside Containment
10. Steam Line Break outside Containment
11. Other LOCAs
12. Other Transient Initiators Including Support System Failure Initiators

The last item listed is not strictly speaking an initiator. What this item represents is the collection of transient initiators, such as loss of feedwater or loss of offsite power, which includes feed-and-bleed as a potential success path, or results in a transient induced LOCA that requires recirculation from the containment sump. The frequency of these initiators leading to scenarios involving successful sump recirculation are presented in Section 11.

Initiators 1 through 5 involve modest openings in the primary system. These events do not meet the Necessary Criteria 2 and 3. Groups 1 through 4 result in only a modest amount of insulating material being liberated (with the amount associated with Group 1 small). Small and very small LOCAs, by definition, do not result in spray initiation, so they lack a mechanism to transport material to the sump. Initiators 5 and 6 involve the opening of pressurizer SRVs. One SRV opening is equivalent to a small LOCA, so the above argument holds for this group also. In other words, Necessary Conditions 2 and 3 are not satisfied for Initiator 5. In addition, engineering analysis indicates that the location of the SRVs is such that a relatively small amount of target insulation is found near the SRVs. This would mean that Necessary Condition 2 is not met for either Initiator 5 or 6. In summary, Initiators 1 through 6 do not result in conditions necessary to result in GSI-191 phenomena.

Initiators 7 and 8 (medium and large LOCAs) involve plant responses that potentially meet all three necessary conditions. These initiators are therefore retained for further evaluation.

Initiators 9 through 12 include consideration of sump recirculation for those sequences involving feed-and-bleed, RCP seal LOCAs do to loss of seal cooling, or a stuck open PORV whose flow is directed to the PRT which eventually overpressurizes. In the same way that Group 1, RCP seal LOCA initiators were screened, so are the transient induced seal LOCA from Initiators 9 through 12. For feed-and-bleed and stuck open PORV scenarios, engineering assessments indicate that little insulation material is found in the vicinity of the pressurizer relief tank (PRT) rupture disk, so that little material would be made available to potentially be transported to the containment sumps (Necessary Condition 2). In addition, the containment sprays will not actuate for Initiators 10, 11, and 12 so that no transport mechanism will be available to transport any liberated material to the sumps (Necessary Condition 3). Initiators 9 through 11 are screened from further evaluation at STP as they do not meet Necessary Conditions 2 and 3. Initiator Groups 9 through 11 do not result in conditions necessary to result in GSI-191 phenomena. In addition, at STP, the high head injection pump shutoff head is below the pressure necessary to inadvertently open the PORV, reducing the likelihood of inducing a stuck open PORV.

Initiator 11 considers other LOCAs inside containment. At STP, the RHR system is wholly within containment, so that under the very unlikely conditions of an interfacing system pressurization, the RHR piping could become overpressurized. The consequences of this unlikely scenario are bounded by the scenarios explicitly considered.

So, from the point of view of potentially meeting the three requirements for enabling GSI-191 phenomena, only medium and large LOCAs are retained from the internal events group of initiators for further evaluation.

12.1.2 Internal Plant Fires (Part 4 of Reference 6)

No internal fires were identified that lead directly to a loss of primary coolant. Fire induced transients leading to opening of the pressurizer PORV or reactor vessel head vents, or any of the transient induced LOCAs defined in Initiator Group 12 – other transient initiators, including support system failure initiators, are, in principle, possible. The same arguments discussed above for internal events also apply to these. These scenarios are screened from further consideration because they do not meet Necessary Conditions 2 and 3. Further consideration of internal fires with respect to GSI-191 phenomena is therefore not warranted.

12.1.3 Internal Plant Floods (Part 3 of Reference 6)

Internal flooding represents a hazard that, as far as GSI-191 phenomena are concerned, is identical to Initiator Group 12 – other transients or support system failures. Similar to the arguments for internal plant fires, internal flooding scenarios are screened from further consideration because they do not meet Necessary Conditions 2 and 3.

12.2 External Hazards (Parts 5, 7, 8, and 9 of Reference 6)

The STP PRA evaluated a spectrum of external hazards and screened them for inclusion in the quantitative analysis. Most were screened from further analysis. Others, such as high winds, cannot result directly in primary system leaks and so they do not meet Necessary Conditions 2 and 3.

For seismic events, a common, perhaps conservative, assumption is that for even modest accelerations, one or more instrument tubes may fail resulting in the equivalent of a very small LOCA. This family of seismic scenarios is screened based on failure to meet Necessary Conditions 2 and 3. The robust nature of the primary system, all Class I, makes other seismically induced LOCAs requiring sump recirculation (i.e., equivalent to medium or large LOCAs) very unlikely. Such LOCAs are of very small frequency. In addition, while small, medium or large LOCAs are possible at sufficiently high accelerations, the common PRA assumption is that redundant components are fully correlated. Under this assumption, for example, a medium LOCA on one primary loop would be assumed to be accompanied by medium LOCA on all other loops. The result is that seismically induced medium and large LOCAs are modeled as being excessive LOCAs-which have no success sequences by definition. Since the goal of the risk-informed GSI-191 effort is to evaluate the frequency of scenarios, otherwise identified as successfully terminated, that fail due to GSI-191 phenomena, then Necessary Criteria 4 is not met, as these scenarios would be mapped to failure.

For modest accelerations, the bounding assumption of a small or very small LOCA does not trigger GSI-191 phenomena as they would not meet Necessary Criteria 2 or 3. Scenarios involving larger accelerations are of very small frequency.

12.3 Conclusion

Medium and large LOCAs from internal events only are retained for further consideration with respect to core damage resulting from GSI-191 phenomena.

13 On the Disposition of Findings and Observations from Peer Review

Reference 6 documents the status of the findings and observations identified for the STP PRA. Reference 6 documents the response to RAIs associated with STP's proposed risk managed technical specifications. All but three findings and observations were determined to be closed. The three not fully closed were determined not to be relevant to the STP risk managed technical specification submittal. These three have been determined also not to be relevant to the risk-informed resolution of GSI-191.

Table 2 from Reference 7 is reproduced below.

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
HR-06	A	There is no process developed in the HRA to perform a systematic examination of dependent human actions, credited on individual sequences. Current HRA practices generally require a systematic process to identify, assess and adjust dependencies between multiple human errors in the same sequence, including those in the initiating events.	There is no documented process, however part of model signoff is a review of PRA accident sequences to ensure that they accurately reflect the plant and that no errors such as this finding describe exist. As part of the risk ranking, sensitivity analysis on operator actions are also performed and are described in the risk ranking procedure. Selected sequences (down to 1E-11) were re-reviewed as a result of this finding, and no instances of linked operator actions that are not accurately quantified could be found. STP accident sequences are dominated (>90%) by single operator actions with equipment failure or multiple (e.g., common cause) equipment failures. The Revision 5 PRA model HRA notebook provides the necessary guidelines to perform a dependency analysis of human actions contained in the STP accident sequences.	Closed
DA-01	B	The common cause MGL parameters are based on outdated generic data, available at the time of the IPE. The common cause analysis included plant specific screening of generic common cause events and mapping to plant specific system sizes, but does not include any plant specific collection of common cause data.	A limited review of the INEEL database for diesel generators and check valves was performed. No significant changes were identified for the current diesel generator common cause factors given the factors currently in use. The check valve review indicated that the practice of not modeling common cause failure of fresh water check valves is valid. Based on this review, the INEEL database was not reviewed for the STP_REV4 update. A complete review of the INEEL common cause failure (CCF) database has been completed in support of the Revision 5 PRA model. No change to the STP MGL parameters was required. A previous review of common cause factors for motor-operated valves was completed for the STP_1996 model.	Closed

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
DA-03	B	There is no specific guidance document developed for the data analysis. The data analysis notebook and IPE data analysis sections provide guidance for the data analysis. But, the component boundaries were not defined, the method used for plant data collection and analysis was not described, and the generic data sources used for the 1999 model update were not presented in the notebook.	In general, generic data sources have not been used for data update since the original IPE. Operating experience data is reviewed for every model update and a decision on update based on plant operating experience is made. Initiating event data update for STP_1999 used the latest NRC NUREG on initiating event frequencies for data update as described in the IE notebook. As generic sources are published (such as the IE data), they are reviewed for inclusion in the PRA as part of the model update process. As a generic source is identified, a tracking CR is generated under an update CR to review the data for applicability to the current or next PRA model. General component boundaries for use in data collection have been developed and are contained in the STP_REV5 Data notebook.	Closed
HR-07	B	It is not apparent that the use of sequence timing in the development of HEPs is done. The HEPs were based on operator interviews, for which the input and output information is not available for this review. The available documentation for sequence timing is simplistic. The reference for the timing is not stated. Whether the "available time" was subdivided into fractions for diagnosis, action, and execution is not documented in the analysis. The time for the first "cue" is not stated. The only available data is the time from reactor trip to the time of the undesired event.	Sequence timing is included in all plant specific operator response actions in the PRA. The time availabilities listed on each HRA worksheet. This time is based upon the identified need for the action (a cue, plant conditions, etc.) and the time to damage once the condition occurs. For example, feed and bleed is based upon the time available once steam generator low level occurs until the steam generator inventory is essentially gone (dryout). The worst case time is used in almost all cases. Loss of offsite power recovery uses time of failure modeling (e.g., for EDGs). The Rev. 5 HRA update provides detailed timing information.	Closed
QU-02	B	The Level 1 quantification summary document provides the top sequences and the contribution to CDF from individual initiators and initiator groups. It also provides a comparison of results between the current model and the previous version of the PRA model. The summary document does not, however, provide any sensitivity analyses for the PRA model. Further, textual descriptions are provided in the summary for only a few of the top sequences and should be included for more of the important sequences. The above are important aspects to examine in order to gain a full understanding of the results.	Additional sequence detail has included in the Revision 4 update. Numerous sensitivity studies are performed and documented to support GQA risk ranking.	Closed

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
QU-03	B	Uncertainty analysis was performed by using RISKMAN. The statistical parameters such as mean, variance and 5th, 50th and 95th percentile were calculated (CNAQ 01-17305-1, Uncertainty Analysis for STP 1999). Five sensitivity studies were performed and the results were documented (0PGP01-ZA-0304, PSA Risk Ranking Sensitivity Study). However, there is no evidence that the causes of uncertainty in the model (e.g., associated with data, modeling assumptions, success criteria analyses, etc.) were studied and were linked to the sensitivity analysis	Key sources of uncertainty have been identified and selected sensitivity studies to bound these assumptions are described in the Uncertainty Analysis notebook.	Closed
ST-01	B	The ISLOCA analysis does not consider probabilistic failure of pipes and other components. The fault tree includes "success events" for the rupture of the RHR HX tubes or the RHR pump seals. The assumption is that failure of the RHR seals or RHR HX will relieve pressure in the system thus preventing the ISLOCA pipe failure. This is not substantiated and may be not true. The pressure relief provided by these failure paths are not sufficient to reduce pressure in the event of the complete check valve failure. Probability of pipe rupture should address the design margins in the pipe, as indicated in NUREG/CR-5102 and other documents. The method used in the PRA increases the probability of certain valve failures by a factor of 10 to account for the higher pressure. No basis or justification for this approach is provided.	There is a misunderstanding the South Texas interfacing systems LOCA model. The STP RHR system is contained entirely within the containment building. Any failure of the RHR piping within the containment building with a concurrent overpressure event from the RCS will result in a LOCA inside containment. For this reason, failure of the RHR piping is not considered. This event is similar to the LOCAs already modeled and not included in the interfacing systems LOCA analysis. An interfacing system LOCA at STP that results in a containment bypass can only result from an RCS pressure boundary failure AND: 1: Failure of RHR heat exchanger tubes such that the overpressure event carries over into the CCW system, or; 2. Failure of the containment isolation check valves for the LHSI trains. The most likely scenario quantified is the failure of the RHR heat exchanger tubes with consequential failure of the CCW system outside containment with failure of the operator to isolate. Operator action to isolate the CCW system after tube failure (value equal to 0.1) or isolation of the LHSI piping after piping failure is considered in the model. Failure of the RHR heat exchanger tubes serves to direct an interfacing systems LOCA to the CCW system. Success of the heat exchanger tubes challenges the LHSI piping.	Closed

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
SY-06	B	Justification for not modeling Power Conversion System (PCS) (Main Feedwater, Condensate, and steam dump to the condenser) was not provided. It is not typical among other similar PWR PRAs to have excluded the PCS from the scope of modeled systems.	Justification for not crediting PCS should be added to the STP_REV5 General Transient notebook. PCS does not significantly reduce core damage frequency at STP based on a sensitivity study.	Modeling issue is closed. Update of notebook remains, but is not required for RMTS.
AS-03	C	Reactor trip is not modeled for several of the initiating events, including the SGTR and MLOCA. In the case of the SGTR initiating event, this has been identified as an open item in the SGTR Notebook documentation (page v of FNTLSGTR.DOC, Rev. 1, 4/30/97). However, in the case of the MLOCA, no justification for its deletion is provided. Generic analyses have shown that trip is required at the lower end of the medium LOCA break range, especially for the case of MLOCA without auxiliary feedwater available because the amount of borated RWST water that can be injected into the RCS is limited.	At a high level, the likelihood of reactor trip failure and MLOCA occurrence is approximately 1E-10. With successful safety injection, no core damage would be expected. Based on frequency, inclusion of reactor trip failure (ATWS) in Medium LOCA is not necessary. Inclusion of reactor trip failure for other LOCA initiating events is still under review, but reactor trip failure during LOCAs would not be risk significant because of the low frequency of occurrence. Reactor trip was added to SLOCA and SGTR event trees in the Revision 5 PRA model update.	Closed
DA-04	C	Although generic and plant specific databases are available for use, the data sources used for the generic database is not easily traceable. The generic data used for the Bayesian update in the current model update has been updated few times since the first PRA model was developed.	Creating a direct link to data used in the original IPE for select variables has been noted in past updates. In general, the data in the current PRA is based on an extensive data update for the 1994 model update and is documented in that data notebook. Since the 1996 update, the link to data is documented in the data analysis notebook and also noted in the PRA data module.	Closed
HR-01	C	Pre-initiator operator errors are included in the model and the method for quantifying these error rates is sufficiently documented in the IPE. However, there is no written evidence of a systematic approach for identifying which pre-initiator errors to include in the model.	The screening method currently in use is not described well in the documentation. In general, each system notebook contains a review of all plant procedures with a potential to affect the system as modeled in the PRA. The effect of the procedure is identified during the review and modeled as appropriate (see the AFW system). Potential miscalibration for actuation systems is included in the reactor protection notebook. Miscalibration of individual sensors is implicitly included in the component failure rate if applicable. The HRA update process for STP_REV5 includes a complete pre-initiator analysis.	Closed

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
SY-01	C	Formal guidance describing the current process for updating and revising fault trees was not found. In addition, guidance for generic modeling assumptions (e.g., when to model diversion flow paths), naming conventions or standard component failure modes was not found.	The current STP fault tree models and system notebooks are used to train new PRA engineers. As part of the training cycle, new engineers are given responsibility for several of the system model notebooks and associated documentation. However, the suggestion is well founded in that a guide for new and recently qualified PRA engineers will ensure consistent standards for fault tree models. System modeling guidance is expected to be complete prior to the next PRA model update.	Partial Remaining action to develop guidance does not affect implementation of RMTS
SY-03	C	Simplified schematics (piping & instrumentation diagrams) of systems showing system boundaries were not found during the review.	P&IDs were included with the model up until Revision 3 (STP_1999). Given the flexibility of LAN access to P&IDs, etc, and concerns about maintaining marked-up drawings current, these drawing were removed from the system notebooks. The descriptions in the notebooks concerning boundaries are sufficient for a qualified reviewer/analyst to mark up the P&IDs if necessary. P&ID references are contained in the PRA system notebooks.	Closed
SY-05	C	No evidence was found that operating experience with each system was reviewed to ensure that important system characteristics were modeled appropriately.	Operating experience review is incorporated in the GQA process. A PRA member is also a member of the GQA working group. Actual review experience indicates questions concerning operating experience effects on the PRA model is being incorporated into the	Closed
			changes are reviewed for impact on system model. The Database of Inputs provides the evidence of operating experience review.	
TH-02	C	The IPE system notebooks include reference to room heat-up analyses that were performed using an STP code called HEATUP. No documentation of this code was available for the peer review. The HEATUP analyses appear to still be the basis for the current PRA room cooling modeling decisions for some rooms. If this is the case, the analyses, including documentation of the HEATUP code capabilities and limitations, should be retrieved and retained with the PRA documentation.	Added as an action for the REV 5 model	Open Documentation issue with no impact to implementation of RMTS.

F&O OBS ID	LEVEL OF SIGNIFICANCE	OBS TEXT	PLANT RESPONSE	STATUS
SY-04	D	No evidence that a search for plant specific failure modes was performed for PRA updates subsequent to the IPE. STP PRA staff indicates that feedback from Maintenance Rule operating experience has been factored into the PRA as a means of capturing plant-specific failures.	A guidance document for reviewing MR failures is not necessary. The PRA staff sits on the MR expert panel and reviews all MR failures for inclusion in the PRA. Each failure is coded as PSAFF (a PSA functional failure), kept for general PRA data update, or not applicable to PRA. Given the emphasis in the ASME standard on guidance documents, and the expectation for qualifying new data analysts, guidance for data analysis has been added to the Rev. 5 data notebook.	Closed

Appendix A: Detailed Description of Medium and Large LOCA Sequence Models

A.1 Introduction

The information regarding description of events and the Event Sequence Diagram were taken from the South Texas Project Electric Generating Station Level 2 Probabilistic Safety Assessment and Individual Plant Examination Revision 7.1. This information was then modified to describe the sequence logic for both the GSI-191 Base model (i.e., with GSI-191 assumed to lead to zero failures) and the GSI-191 model itself; i.e., with the GSI-191 phenomena considered. Both the base model and GSI-191 model contain the restructured event sequence models needed for the GSI-191 project. The Base model assumes the GSI-191 failure mechanisms to be set to zero probability of occurrence. The GSI-191 model is similar to the Base model, except that the added failure mechanisms specific to GSI-191 (e.g., sump plugging) have been incorporated specifically for the STP plant. The same RISKMAN model, GSI-191 PRA, is used to represent both the Base model and GSI-191 model. Model GSI-191 PRA is the same as Revision 7.1 of the STP model for all but the medium LOCA and large LOCA plant response models. The initiating event frequencies for the small LOCA, medium LOCA, and large LOCA initiating event frequencies have also been changed specifically for the GSI-191 project.

The event trees presented have been largely revised to identify the status of the High Head Safety Injection (HHSI), Low Head Safety Injection (LHSI), and containment spray pumps at the time of injection and sump recirculation for sequences that may be susceptible to GSI-191. Further, the LOGIC of the medium LOCA event trees has been generalized to make the set also applicable to large LOCAs.

A.2 Medium LOCA Event Model Overview

The medium LOCA initiating event applies to those reactor coolant system (RCS) pressure boundary breaks with blowdown rates equivalent to pipe breaks between approximately 2 and 6 inches in diameter. In support of the GSI-191 project, this model has been enhanced to enable it to also model large LOCAs; i.e., greater than 6 inches in diameter up to the double-ended guillotine breaks in the RCS loops. Selected inserts are provided to explain where model differences occur for large LOCAs.

The reactor coolant flowing through the break is sufficient to remove core decay heat without any additional cooling required via the steam generators. Therefore, the most important system function to be included in modeling plant response is an adequate supply of makeup flow to replace the coolant inventory lost through the break. In this range of ruptures, it is possible for two cases to occur. The break could be at the smaller end of the break spectrum where RCS pressure remains relatively high; e.g., a stuck-open pressurizer safety valve at a 2.3-inch diameter. In this case, RCS pressure could remain above the LHSI pump design pressure during the initial blowdown phase. Thus, successful accident mitigation requires operation of the HHSI pumps to account for those pipe breaks in the smaller medium LOCA range. For the larger size medium LOCA breaks, it is assumed that the event sequence would closely resemble the large break LOCA cases where rapid RCS depressurization occurs. In these events, operation of the LHSI pumps is required to account for a situation in which HHSI makeup flow is limited by the HHSI pump run-out characteristics.

The HHSI system success criteria for medium LOCAs are bounded in the plant response model by requiring one of the three pump trains to deliver injection flow to an intact RCS loop. If the HHSI pumps cannot maintain adequate coolant inventory with the RCS at high pressure, operator actions may rapidly depressurize the RCS by overcooling the primary system with the steam generators. The rapid depressurization may enable RCS pressure to be reduced below the shutoff head of the LHSI pumps, which could then still provide sufficient RCS makeup. However, for all medium LOCA sizes within the defined range, we conservatively require success of at least one HHSI pump for high pressure injection and omit credit for this rapid depressurization alternative. One of the three LHSI pump trains can provide adequate makeup flow for the full range of medium LOCA break sizes, if RCS pressure is reduced below approximately 250 psig. The centrifugal charging pumps alone are not modeled, since, by medium LOCA definition, they do not supply adequate RCS makeup; however, it is acknowledged that charging pumps could possibly be used in conjunction with HHSI and LHSI to control RCS inventory and pressure.

Once the medium LOCA initiating event occurs, pressurizer pressure quickly drops to the low pressurizer pressure setpoint, and a reactor trip signal would be generated at 1,870 psig. A safety injection (SI) signal will be generated when pressurizer pressure reaches 1,869 psig or when containment pressure reaches 3.0 psig, actuating all safety-related equipment. With pressurizer pressure and level dropping and containment pressure increasing, operator response for diagnosing the LOCA situation would occur early in the transient.

Also at this time, the SI actuation would isolate the main feedwater system as well as initiate auxiliary feedwater to provide steam generator makeup. Main steam isolation will occur as a result of a high-2 containment pressure condition at 3.0 psig. The reactor trip and the void formation from the blowdown phase would function to keep the reactor in a subcritical state, in addition to the borated injection water. Although the accumulators will inject when RCS pressure decreases below approximately 600 psig, the volume of water injected is not sufficient for long-term coolant inventory control. The effect of accumulator injection is to provide an intermediate makeup supply for limiting peak cladding temperatures during the transition from HHSI injection to LHSI injection. If the accumulators fail to inject, some transient fuel cladding damage may occur, but no significant fuel damage is expected before RCS pressure falls below 300 psig. For the purposes of medium LOCA quantification, failure of all accumulators is assumed to lead to core damage, regardless of the success of HHSI and LHSI functions. For large LOCAs, two of the three accumulators are required to inject into an intact loop, again regardless of the success of HHSI and LHSI functions.

Once RCS makeup is established, operator actions may be required to reduce RCS pressure below the LHSI design pressure for continued RCS makeup. If the break is small enough, RCS pressure remains above the LHSI shutoff head. Larger medium LOCAs and all large LOCA breaks are likely to cause rapid RCS depressurization so that LHSI can quickly inject. Therefore, for large LOCAs, HHSI injection is not required for successful inventory control. Successful sump recirculation requires the containment sump valves to open and the Residual Heat Removal (RHR) heat exchanger to be available for establishing long-term cooling. To account for the possibility that the RHR heat exchangers are not available to provide cooling to at least one operating LHSI pump train, the Reactor Containment Fan Coolers (RCFC) are modeled to determine long-term cooling success as an alternative cooling mechanism to the RHR heat exchangers. Credit for the RCFCs to provide heat removal is assumed to still require at least one LHSI pump operating in the sump recirculation mode; i.e., operation of just one HHSI pump with no LHSI is assumed insufficient

Normal steam generator cooling is not necessary in the medium LOCA event, since, by definition, core decay heat is removed by the medium LOCA break. Steam generator cooling is not modeled for medium LOCAs or large LOCAs.

The medium LOCA early tree also evaluates the status of containment isolation functions (Top Events CP for the purge lines and CI for smaller, normally open containment isolation lines) and the reactor containment fan coolers (Top Event CF), for containment heat removal.

A.3 Medium LOCA Event Sequence Diagram

The preceding paragraphs briefly describe the plant systems and operator responses after a medium LOCA, as generalized for a large LOCA event. Each event sequence ends in stable long-term recirculation cooling at low pressure or a core damage state. The following section briefly describes each event modeled in the generalized medium LOCA ESD, shown in Figure A.3-1. The event numbers correspond to the numbered event blocks in the original IPE Figure as modified to accommodate the changes for this study. The success criteria for each event block are provided in Table A.3.-1. This section has been modified for the GSI-191 project, both in substance and to generalize the ESD to apply to both medium and large LOCAs. The events are described largely as they appear from left to right along the most likely success path on Page 1, and then continuing on Page 2. The remaining events on failure sequences are described at the end of A.3. The corresponding top events in the MLOCA event tree appear above the associated ESD events. ESD events without such top events are not modeled in the event trees. The generalized medium LOCA event tree has also been greatly modified from that in Revision 7.1 as discussed later on in Section A.4.

- **Event 1 – Reactor Trip.** The first event block models the response of the reactor protection system to automatically shut down the reactor. Success from this block indicates that a sufficient number of control rods have been automatically inserted to bring the reactor to a subcritical state. Major pieces of equipment included in this event block are the analog trip signal transmitters, the reactor protection logic channels, the reactor trip breakers, the control rod drive mechanisms, and the control rods. For the medium and large LOCA initiating events, the major inputs to the reactor protection logic are generated from low pressurizer pressure and high containment pressure. Failure of this event block indicates that reactor trip has not occurred. Subsequent events along this failure path would be contained in the ESD for initiating events during which the reactor trip fails; i.e., Anticipated Transients without SCRAM (ATWS).

- **Event 2 – ESFAS.** This event questions the engineered safety features actuation system (ESFAS) to diagnose the medium or large LOCA as a SI actuation condition and to generate the necessary control signals to ESF equipment. Major pieces of equipment included in this event block are the analog signal transmitters, the solid state protection system (SSPS), the ESFAS logic channels, and the master and slave relay circuits that transmit the output actuation signals. The pressurizer low pressure signal is the primary input for a MLOCA or LLOCA initiating event. A containment high pressure signal is also expected after a short time delay. Failure of ESFAS requires the operators to manually initiate the SI signal (Event 3) and/or start injection and cooling water systems, and to manually isolate important containment penetrations. The ESF-generated safety injection signal causes the following isolations:

- ***Turbine Trip.*** Implies that all signals and equipment (i.e., all turbine throttle valves and turbine governor valves close) necessary to shut off steam flow to the main turbine are successful.

- ***Letdown Line Isolation.*** Implies that at least one of two letdown isolation valves closes upon receipt of the ESFAS signal.

- ***Main Feedwater (MFW) Isolation.*** Valves close on medium LOCA as a result of reactor trip and Low T_{avg} setpoint being reached from the overall effects of feedwater flow characteristics and steam generator shrink.

- ***Containment Isolation Phase A.*** All components and equipment assigned for Phase A isolation successfully isolate.

- ***Containment Ventilation Isolation.*** All ventilation equipment assigned to isolate is successful.

- **Event 27.** This event represents the automatic isolation of all normally open "large" containment penetrations (≥ 3-inch diameter) before or at the time of vessel failure. The containment penetrations of particular concern are the large containment supplementary purge lines. Success of this event implies that there is no immediate venting of fission products, and that the RCFCs are capable of removing heat and radioactivity from the containment atmosphere through the condensation process, while also preserving water inventory in the containment. Failure of this event implies there is an immediate venting of the fission products in the containment atmosphere. With at least one of the containment purge lines unisolated, the containment remains atmospheric limiting some of the margin for NPSH.

- **Event 28.** This event models the automatic isolation of the containment penetrations that connect the containment atmosphere to the outside atmosphere, that are open before or at the time of reactor vessel failure, and have a flow area less than an equivalent 3-inch diameter hole. The penetrations explicitly considered in the analysis of this event include:

  - Containment Radiation Monitor Sampling Lines

  - Pressurizer Relief Tank (PRT) Vent Line

  - PRT Post-Accident Sampling

  - Reactor Coolant Drain Tank (RCDT) Vent Line

- RCDT to Liquid Waste Penetration Space (LWPS) Holdup Tank Flow Path
- Containment Normal Sump Drain Line
- Seal Return and Letdown Line

- **Event 3 – Manual Safety Injection or Manual Start.** This event block is associated with block 2 whenever ESFAS fails to generate a safety injection signal. Operator action to manually actuate safety injection or to manually start equipment required to mitigate the effects of a medium or large LOCA are modeled in the ESD for ESFAS failures. Success of this block indicates that all necessary equipment starts and that isolation signals are available. The failure path from this block is mapped to early core damage, because neither HHSI nor LHSI flow is available to make up for the inventory lost through the medium or large LOCA.

- **Event 4 – MSIV Closure.** This event tracks the signals to automatically close the main steam isolation valves (MSIV) after the reactor trip signals are generated from a potential high-high containment pressure condition. Success of this event block indicates that all four MSIVs close automatically in response to these signals. This isolates the steam generators from the main turbine and the steam dumps, and it decouples operation of these components from affecting subsequent plant cooldown. Failure of this event block indicates that at least two MSIVs remain open. The effects from this failure are bounded in the ESD by assigning the failure path to a condition where full-rated steam flow can be removed from each steam generator. If the MSIVs and either the main turbine fails to trip or the steam dumps stick open, an additional signal for automatic MSIV closure will be generated from low compensated steam line pressure. To keep the medium and large LOCA ESD logic structure as simple as possible, this additional signal has been conservatively omitted in the excessive secondary heat removal scenarios. Beginning in Revision 7.1 and included in the GSI-191 project model, the MSIV closure model has been expanded to include the possibility that one MSIV may fail to close and that the feedwater isolation and control bypass valves may both fail to close on that same line; i.e., leading to an excessive cooldown without requiring the failure to close of a second MSIV. The logic involving the MSIVs and feedwater isolation valves are now modeled in a separate Top Event SGI instead of as part of Top Event TT. Successful turbine trip (Block 5) and steam dump closure (Block 6) will also limit the cooldown from this added failure combination.

- **Event 5 – Turbine Trip.** This block questions the response of the turbine trip mechanisms to provide the control signals to close all turbine throttle valves and turbine governor valves. Successful departure from this event block indicates that the turbine throttle valves and turbine governor valves or combinations of these valves have closed to isolate all four high pressure turbine steam inlet lines. Major pieces of equipment in this event block are the turbine trip logic circuitry, the turbine throttle valve and governor valve hydraulic pressure dump valves, and the high pressure turbine throttle and governor valves. The primary turbine trip signal is initiated from the open reactor trip breakers; however, several redundant turbine and generator trip signals are produced as reactor power decreases. Failure of this block indicates that steam continues to flow through the main turbine. The impact from this failure is bounded in the medium and large LOCA ESD by a rapid cooldown condition in which full steam demand remains immediately after the reactor has tripped. In the event that turbine trip also fails following a large LOCA, the ESD transfers to Event Block 29. For medium LOCAs, the ESD instead first considers the potential for pressurized thermal shock conditions.

- **Event 6 – Steam Dump Closed.** The medium or large LOCA break flow is sufficient to remove core decay heat. However, if RCS average temperature is above the no-load setpoint when the turbine trips, the steam dumps will receive an automatic signal to open. The steam dump control system will automatically reclose the valves when T_{avg} falls below the no-load setpoint. Success of Event Block 6 indicates that the steam dump valves successfully reclose (or remain closed) to limit RCS cooldown from steam flow to the main condenser. The success path models a condition in which RCS cooldown and depressurization are controlled by the medium or large LOCA break flow into the containment. Failure of this event block occurs if at least one steam dump valve sticks fully open. Since the MSIVs have failed to close in the scenarios where Event Block 6 is asked, the effects from steam dump failures are bounded in the medium or large LOCA ESD by assigning the failure path to a rapid overcooling condition. Although this condition is less severe than that caused by failure to trip the main turbine, the ESD logic structure is simplified by combining both overcooling scenarios.

  Event 29 – Injection Common to LHSI and Accumulator. This event models questions whether the cold leg injection check valves SI38A, SI38B, and SI38C are open. These valves are common to the LHSI, HHSI, and the RCS accumulators' injection flow paths. Success of this block indicates that the three valves are open and able to provide a pathway for their respective trains. In the event tree, a separate top event is used to represent each of the three injection paths. The failure path of this block is mapped directly to early core damage, because only insufficient amounts of water can be injected into the core. If containment spray also fails, the resulting plant damage state is designated as a "dry" condition because no water is injected into the containment sump from the HHSI, LHSI, or containment spray.

- **Event 30 – Accumulator Injection.** The accumulators provide the initial injection into the RCS. This block contains the three accumulators in the ECCS. The accumulators each discharge into one of the RCS cold legs in loop A, B, or C. Success of this block, for a large LOCA, requires at least two of three accumulators inject into an intact RCS loop. Failure of this top event indicates two or more accumulators fail to inject into the RCS. For a medium LOCA, success requires just one of the three accumulators inject into an intact RCS loop. The failure path of this block is mapped directly to early core damage, because only insufficient amounts of water can be injected into the core. If containment spray also fails, the resulting plant damage state is designated as a "dry" condition because no water is injected into the containment sump from the HHSI, LHSI, or containment spray.

- **Event 8 – RWST/ECCS Common.** The RWST provides the borated water supply for makeup to the RCS. The HHSI, LHSI, and containment spray pumps take suction from the RWST. This event block also includes the common suction piping and valves for each train of the HHSI, LHSI, and containment spray pumps. Success of the block indicates that the RWST and the common equipment are available. The failure path from this block is mapped directly to early core damage, because no water can be injected into the RCS to make up for the inventory lost through the large LOCA break. The resulting plant damage state is designated as a "dry" condition because no water is injected into the containment sump from the HHSI, LHSI, or containment spray.

- **Event 17 – Containment Spray.** This event block questions the availability of flow from the containment spray pumps. It is used in the medium or large LOCA ESD to determine whether RWST water is delivered to the containment sump for post-melt debris bed cooling. For the GSI-191 project model, the event representing the availability of containment spray injection has been moved up to the early response trees. The status of all three train spray trains is tracked by a single, multi-state top event, CS. For core damage scenarios, if RWST water is injected from the HHSI, LHSI, or CS pumps, the core debris will be flooded, and the resulting plant damage state is designated as a "wet" condition. If no RWST water is injected before or after core damage occurs, only the normal RCS inventory and water from the accumulators are available in the containment. These plant damage states are designated as "dry" conditions. Success of this block indicates that at least one CS train delivers flow to the containment spray headers. This flow may not be adequate for core debris cooling after vessel breach. Subsequent containment pressure control is evaluated for each core damage scenario in the late response event tree and in the Level 2, CET tree.

- **Event 7 – Reactor Pressure Vessel (RPV) Pressure above LHSI Shutoff Pressure.** The medium LOCA initiating event category includes a range of RCS breaks with flow rates equivalent to those from ruptures of piping approximately 2 inches to 6 inches in diameter. At the smaller end of this range, the RCS blowdown is extended long enough to require HHSI injection flow to maintain coolant level above the core before pressure decreases below the LHSI pumps shutoff head. At the larger end of the medium LOCA range, RCS pressure decreases very rapidly, and only LHSI injection flow is required to maintain coolant inventory. This event block is used as a flag in the medium or large LOCA ESD to note the differences in plant response for this range of break sizes. The success path from this block occurs if the medium LOCA is relatively small and there is no overcooling scenario. Subsequent events in this path require operation of the HHSI pumps for makeup during the transition blowdown and later operation of the LHSI pumps when pressure falls below their shutoff head. The failure path from this event block occurs if the medium LOCA is relatively large so that HHSI is not required. This event is always failed for large LOCAs. This path bypasses HHSI operation and requires rapid injection from the LHSI pumps. As a bounding treatment of medium LOCA events for this study, the event trees conservatively include only the success path requirements from this block; i.e., HHSI is required for all ranges of the medium LOCA breaks. For the entire range of large LOCAs, the HHSI pumps are not required.

- **Event 31 – Operators Secure third train of containment spray.** If the RCS is not intact as indicated by containment conditions then the operators are directed to procedure 0POP05-EO-EO10, LOSS OF REACTOR OR SECONDARY COOLANT, The procedure then directs the operators that if all three spray pumps are injecting, to secure one train of containment to conserve RWST water. This event does not directly enter the sequence logic for success criteria. It is included for subsequent sensitivity analysis should it be necessary to consider. Currently, the CASA GRANDE models assume credit for this action whenever three trains of spray are initially operating.

The following descriptions refer to events on Page 2 of the ESD, at Entry Point A.

- **Event 9 – HHSI.** If the initiating event is near the small end of the medium LOCA range, injection flow from the HHSI pumps is required to maintain coolant level above the core until RCS pressure decreases sufficiently to allow LHSI pump operation. For large LOCAs, HHSI flow is assumed unnecessary to prevent core damage. Nevertheless this event is asked to determine the extent of sump flow at the time of sump recirculation. For medium LOCAs, the ESD applies a simplified bounding model for HHSI response. Although the break may be small enough to require HHSI operation, the bounding flow rate is unlikely to exceed the makeup capacity from a single HHSI pump. Therefore, success of this event block requires just one train of the three HHSI pumps to supply injection during the blowdown phase of these events. The failure path from Event Block 9 in the ESD includes alternative operator responses to rapidly depressurize the RCS for injection from the LHSI pumps. However, we shall see later that these alternatives paths to avoid the need for HHSI are not modeled in the medium or large LOCA event trees.

- **Event 10 – LHSI.** All event scenarios modeled in the medium or large LOCA ESD eventually requires injection from the LHSI pumps. Three different types of scenarios reduce RCS pressure below the LHSI shutoff head (300 psig) and are as follows:

  - The initiating event may be for large LOCAs or at the large end of the medium LOCA size range. The RCS will rapidly depressurize, and LHSI flow is required to maintain coolant inventory throughout the event.

  - The initiating event may be at the small end of the medium LOCA size range, but insufficient HHSI flow is available to maintain coolant inventory above the core during the extended RCS blowdown. The operators respond to either overcool the RCS through the steam generators or to open additional RCS relief valves to reduce RCS pressure for LHSI injection.

  - The initiating event may be in the small-to-intermediate range of the medium LOCA sizes, and sufficient HHSI flow is available to maintain inventory during the blowdown phase of the event. A bounding model is used in the ESD for these intermediate medium LOCA events. Although HHSI flow is sufficient to keep the core flooded, RCS pressure continues to fall. The HHSI pumps eventually reach runout flow conditions at a discharge pressure of approximately 600 psig. The ESD model bounds plant response for these events by requiring subsequent flow from the LHSI pumps to stabilize coolant level at low RCS pressure.

Success of this event block indicates that flow is available from at least one LHSI pump train to its corresponding RCS cold leg. The success path continues to model actions for switchover to low pressure recirculation flow when the RWST is drained. Failure of this block occurs if no flow is available from the LHSI pumps. All failure paths are mapped to eventual core damage from loss of coolant inventory. The timing and containment conditions for each failure scenario depend on the specific preceding plant responses being modeled.

- **Event 11 – Automatic Low Pressure Recirculation Switchover.** This event represents automatic actions to initiate ECCS pump suction switchover to the emergency containment sumps upon low-low RWST level concurrent with a safety injection signal. Manual actions are not considered. Sump switchover initiates the recirculation phase of the medium or large LOCA with the HHSI, LHSI, and CS pumps taking suction from the emergency containment sumps. Success of this block implies that the automatic recirculation switchover signals are available. Subsequent blocks question the availability of the individual ECCS pump train recirculation suction valves. Since sump recirculation flow is the only available method to maintain RCS inventory and stable core cooling, failure of this block indicates that core damage will occur after the contents of the RWST are injected. The failure path is mapped to late core damage at low RCS pressure. The resulting plant damage states are designated as "wet" conditions, because RWST water is delivered to the containment sump before core damage occurs.

- **Event 12 – Recirculation Sump Valves.** Successful recirculation switchover will require success of the AC-powered recirculation sump valves to actuate open and the operators to close the RWST isolation valves. The LHSI pumps may also be required to be restarted if they were stopped earlier in the medium LOCA event. This event block models operation of the ECCS pump train suction valves from the containment sumps. Success indicates that at least one of these valves is open to provide recirculation flow from a running ECCS pump train. The failure path from this block occurs if all three sump suction paths remain closed or if the sump suction paths on those ECCS trains which are operating remain closed. The consequences from these valve failures are identical to those from failure of Event Block 11.

- **Event 13 – RWST Suction Isolation.** The operators are instructed to manually close all three RWST motor-operated suction valves after the recirculation sump suction valves open. If any one of the RWST suction valves remains open after switchover, and its associated check valve fails to close, a path from the containment sump to the RWST, the mechanical auxiliary building, and, subsequently, to the outside environment, is established. The success path from this event block indicates that all three RWST suction lines are closed. The failure path is mapped to late core damage at low RCS pressure. The resulting plant damage state is designated as a "wet" condition because the RWST water is injected into the containment sump before core damage occurs. Subsequent analysis indicates that failure to isolate the RWST suction valves does not affect sump recirculation (Updated Final Safety Analysis Report (UFSAR) Section 6.3.2.2). However, this failure mode is retained in Revision 7.1 and in the GSI-191 project model.

- **Event 32 – Secure all Containment Spray Pumps.** . This event represents a manual operator action to secure all trains of containment spray; per procedure 0POP05-EO-EO10, LOSS OF REACTOR OR SECONDARY COOLANT, Steps 16 and Step 16c when containment pressure falls below 6.5 psig and the TSC concurs. The same procedure notes that it may be necessary to run containment spray for up to

6.5 hours after sump recirculation switchover in order to reduce containment Iodine levels sufficiently before TSC concurrence would be obtained. This event is added because reducing the flow through the containment strainers reduces the potential for strainer clogging issues. For the current GSI-191 project, this action is always assumed successful. It is included in the model as a means for performing sensitivity analyses on the operator action failure probability. Note that by procedure, only those trains of containment spray operating during the injection phase are to be aligned for sump recirculation prior to this action.

- **Event 33 – No Sump Failure.** This event represents the GSI-191 sump clogging issues specifically related to the sump strainers; i.e., sump plugging resulting in insufficient flow, loss of NPSH, pump cavitation caused by air ingress, or strainer collapse by excessive loading. The sump failure probability is a function of many variables but mainly of the number of ECCS pumps drawing suction from each sump. The remaining GSI-191 issues are represented by later events.

- **Event 34 – Hot-leg Switchover.** This event block was included in the Revision 7.1 ESD for large LOCAs but not for medium LOCAs. It has been added here for the GSI-191 project and applied to both medium LOCAs and large LOCAs. This event requires the operators to align at least one low head safety injection train to the associated RCS hot leg in accordance with procedure 0POP05EOES14, TRANSFER TO HOT LEG RECIRCULATION. At least one low head recirculation train is to remain injecting to the associated cold leg; all other trains are aligned to their associated hot leg. Hot leg recirculation is required approximately 5.5 hours after a design basis large LOCA, in order to prevent boron precipitation in the reactor vessel which could impede or block the effectiveness of long term recirculation, thus leading to core degradation. Failure of this function is assumed to increase the probability of core damage owing to boron precipitation. Only cold leg breaks are assumed susceptible to a loss of core cooling caused by boron precipitation.

- **Event 35 – In-Vessel Flow Blockage.** This event represents the GSI-191 sump clogging issue associated with excessive plugging, within the reactor vessel, of the coolant flow path to the core fuel tubes. The failure probability is a function of the number of pumps trains operating from the sump during recirculation. Failure of this event is assumed to lead to core damage.

- **Event 36 – No Boron Plugging.** This event represents the recently added GSI-191 issue associated with boron precipitation sufficient to prevent extended core cooling. The failure probability is a function of the number of pumps trains operating from the sump during recirculation and on the success or failure of hot leg switchover. Failure of this event is assumed to lead to core damage. Only cold leg breaks are assumed susceptible to a loss of core cooling caused by boron precipitation.

Not shown on the ESD are a number of other actions directed by STP procedures that are not credited in the STP PRA, nor in the modified STP PRA models developed for evaluation of the GSI-191phenomena. These actions provide a source of defense in depth to the analysis performed. In the event of a loss of sump recirculation (i.e., failure of Events 11, 12, 13, 33, 35, or 36), the operators would be directed to procedure 0POP05-EO-EC11, "LOSS OF

EMERGENCY COOLANT RECIRCULATION". Step 6 of this procedure directs the operators to add borated makeup to the RWST via the CVCS blender. Step 30 also directs that alternate sources be used to provide makeup to the RWST; e.g., using a centrifugal charging pump. Step 39 directs the operators to check with the technical support center for potential other recovery actions. Further, Steps 24 and 36 direct the operators to place the RHR system in service if the Technical Support Center (TSC) concurs. We also note that as a planned response to any LOCA, procedure 0POP05-EO-ES13, "TRANSFER TO COLD LEG RECIRCULATION", Step 8 also directs the operators to begin makeup to the RWST. Each of these actions may prove effective in mitigating a loss of sump recirculation. However, none of the actions listed in this paragraph are credited in the current analysis.

- **Event 14 – RHR Heat Exchangers.** When using the LHSI pumps for sump recirculation cooling, the RHR heat exchangers are normally used to remove core decay heat. This event block models this heat removal function, and includes the individual component cooling water (CCW) supply and return valves for the RHR heat exchangers. Success occurs if the CCW supply and return valves are open, and core decay heat is transferred to the CCW system. Failure of this event block implies that flow is available from the operating LHSI pumps, but insufficient core decay heat is being removed through the RHR heat exchangers for long-term stable core cooling.

- **Event 15 – RCFCs.** Analyses have indicated that the RCFCs can provide an alternative method for removing core decay heat during sump recirculation cooling scenarios. The LHSI pumps are used to circulate water through the core and back to the containment sump through the LOCA flow path. The RCFCs remove heat from the saturated containment atmosphere, and thus remove heat from the containment sump water and the core. Success of this block implies that a sufficient number of RCFCs are operating with their cooling water aligned to the CCW system to provide long-term core cooling. If neither the RHR heat exchangers nor the RCFCs are available for recirculation cooling, it may be possible to use the steam generators.

  Analyses are not currently available to determine the effectiveness of heat transfer through the steam generators during MLOCA or large LOCA recirculation flow conditions. It is expected that coolant would remain at the level of the RCS loops, and the steam generator tubes would be at least partially drained. For effective heat transfer, the operators would have to maintain the secondary side of the steam generators at nearly atmospheric conditions by holding open the steam generator PORVs or by reopening the MSIVs and the steam dumps. Only the motor-driven AFW pumps and the startup feedwater pump could supply makeup flow under these conditions. Long-term makeup to the AFWST or the condenser hotwell would be required if an atmospheric steam relief path were kept open. To keep the medium or large LOCA ESD as simple as possible, these alternative steam generator cooling possibilities are not modeled. Therefore, failure of this event block is mapped directly to late core damage at low RCS pressure. The resulting plant damage states are designated as "wet" conditions, because RWST water is injected into the containment sump before core damage occurs. Not shown on the ESD but considered in both the Revision 7.1 and GSI-191 project models, is that the RCFCs are only effective for containment heat removal if the containment purge lines (i.e., Event 27 – Purge Isolation, described earlier) are closed. Also, core heat removal is only credited via the

RCFCs if the LHSI pumps are operating in the sump recirculation mode albeit without RHR heat exchanger cooling. No credit for core cooling is taken for sump recirculation using the HHSI pumps alone in the sump recirculation mode, even with RCFCs operating.

The next event refers back to page 1 of the ESD, when all injection fails because of a failure of ESFAS. Core damage is assumed to result but the question is whether the RWST is still injected automatically via the containment spray pumps. The other events on this portion of the ESD have been previously described.

- **Event 16 – SSPS/SEQ Common.** If the automatic and manual safeguards actuation signals have failed, this event block questions availability of the SSPS logic cabinets and the bus load sequencers to process separate input and output signals for automatic containment spray system startup. If both the logic cabinets and the load sequencer cabinets are available, the containment high-3 pressure condition that occurs at the time of core damage can provide automatic spray system start signals, even though other ECCS equipment has not been automatically or manually started. Success of this event block indicates that the automatic containment spray start signals are available. The failure path from this event block is mapped to early core damage at high RCS pressure. The resulting plant damage state is designated as a "dry" condition, because no RWST water is injected into the containment sump from the HHSI, LHSI, or CS systems. Originally this event was represented by Top Event SS. In Revision 7.1 and retained in the GSI-191 project model, the SSPS system is now modeled by top events SPR and SPS in the EPONSITE, support event tree.

The next event refers back to Page 1 of the ESD when all LHSI fails in the injection phase. Core damage is assumed but the question is whether at least one HHSI pump is available to inject the RWST.

- **Event 18 – One HHSI.** This event is similar to that for Event 9. The success criteria for large LOCAs and the bounding models used for medium LOCAs assign this failure path to eventual core damage, because the HHSI pumps cannot supply adequate coolant makeup flow at runout for these events. However, HHSI injection can deliver RWST water into the containment sump to determine whether the resulting plant damage state is designated as a "wet" or "dry" condition for core debris cooling. Success of this event block indicates that at least one HHSI pump delivers sufficient RWST injection flow. The event success path is mapped to a "wet" plant damage state. Failure of this block occurs if no HHSI pump delivers flow. The failure path continues to evaluate whether the containment spray pumps deliver water into the sump after core damage occurs.

The next event refers back to Page 1 of the ESD when the failure to close the MSIVs and turbine trip failure following a medium LOCA leads to a PTS challenge. The other events on this flow path have been previously described.

- **Event 19 – RPV Integrity.** If the reactor trips, but the main turbine fails to trip, and the MSIVs remain open, the plant will experience a rapid and severe overcooling condition. Subsequent injection from the HHSI pumps will partially restore RCS pressure following a medium LOCA. This failure mode is not modeled for large LOCAs. The effects from these conditions are bounded in the medium and large LOCA ESD by questioning whether the reactor vessel survives this potential pressurized thermal shock (PTS) challenge; i.e., via Top Event VI. If the RPV integrity is compromised to the point of failure, then core melt is likely resulting in an excessive LOCA scenario. Event Block 19 success implies that the reactor vessel remains intact during this transient. The success path continues to the transition cooldown and depressurization portion of the ESD corresponding to an extended medium LOCA blowdown at intermediate RCS pressure. Failure of this event block implies that reactor vessel integrity is compromised, and, subsequently, the reactor pressure vessel does not remain intact. The effects from this failure are also bounded in the ESD by mapping the failure path to an excessive LOCA condition that exceeds the makeup capacity of all injection systems. The failure sequence is mapped directly to early core damage at low RCS pressure. The resulting plant damage state is designated as a “wet” condition, because at least the HHSI system delivers RWST water into the containment sump.

The following discussion refers to Page 2 of the ESD when all HHSI fails.

Earlier versions of the medium LOCA ESD, included descriptions of additional operator actions to cooldown and depressurize the RCS to pressures less than the LHSI shutoff head; i.e., Events 20 through 26. These events included the status of the AFW system, the steam generator power operated relief valves, the actions to restore MFW including the status of the startup feedwater pump and condensate system, reopening of the MSIVs, the availability of the steam dumps and circulating water system, and, as a backup, the operator action to depressurize the RCS using the pressurizer PORVs and reactor vessel head vents.

These events were always excluded from the medium LOCA event trees and of course the large LOCA event trees. Consistent with these earlier models, the current model assumes that the medium LOCA break size is large enough to depressurize the RCS to allow LHSI injection without these additional events. However, the assumption that at least one HHSI pump must also inject into an intact loop, is also retained.

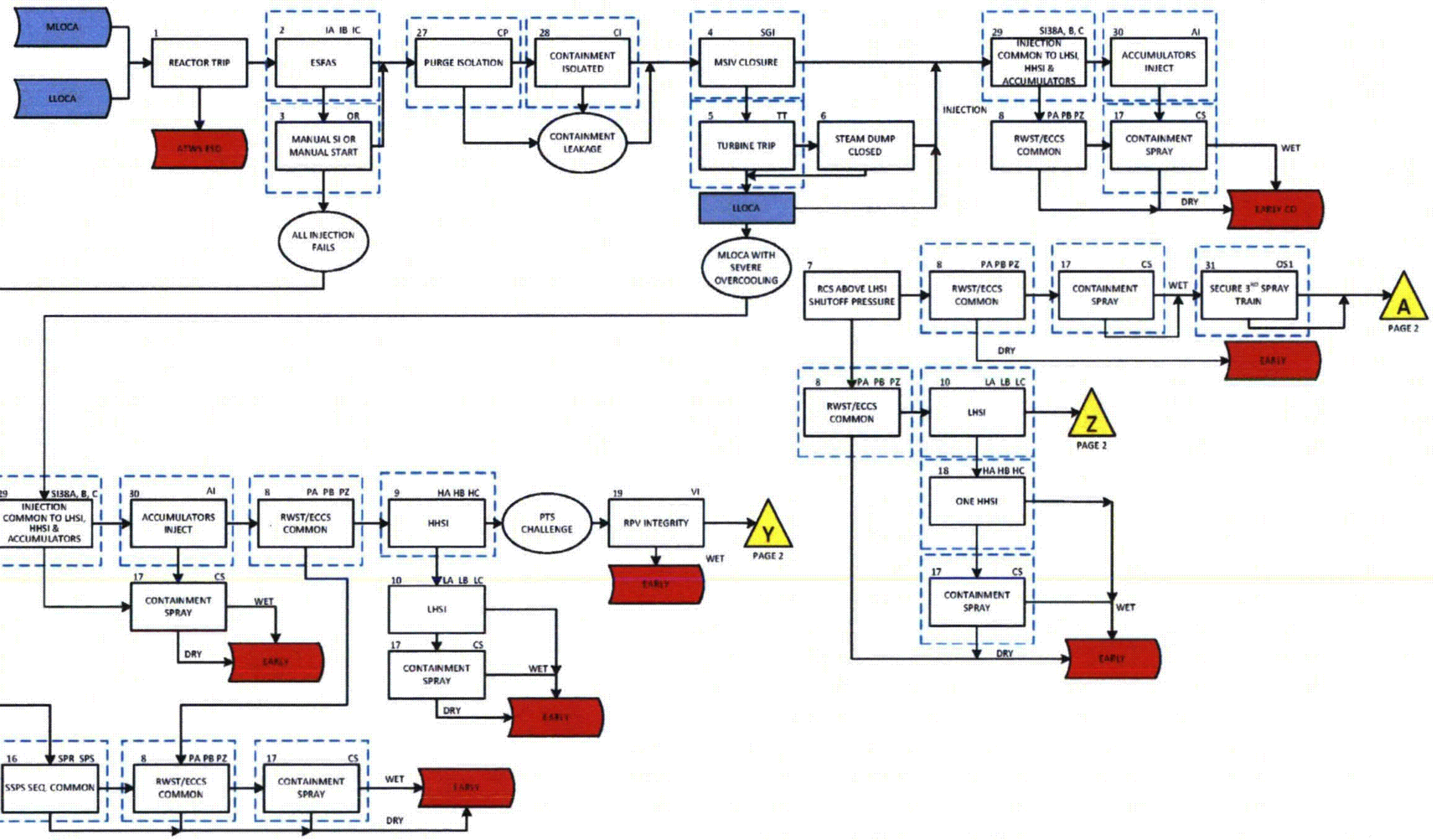


Figure A.3-1 South Texas Project Medium and Large Break LOCA Event Sequence Diagram (Page 1 of 2)

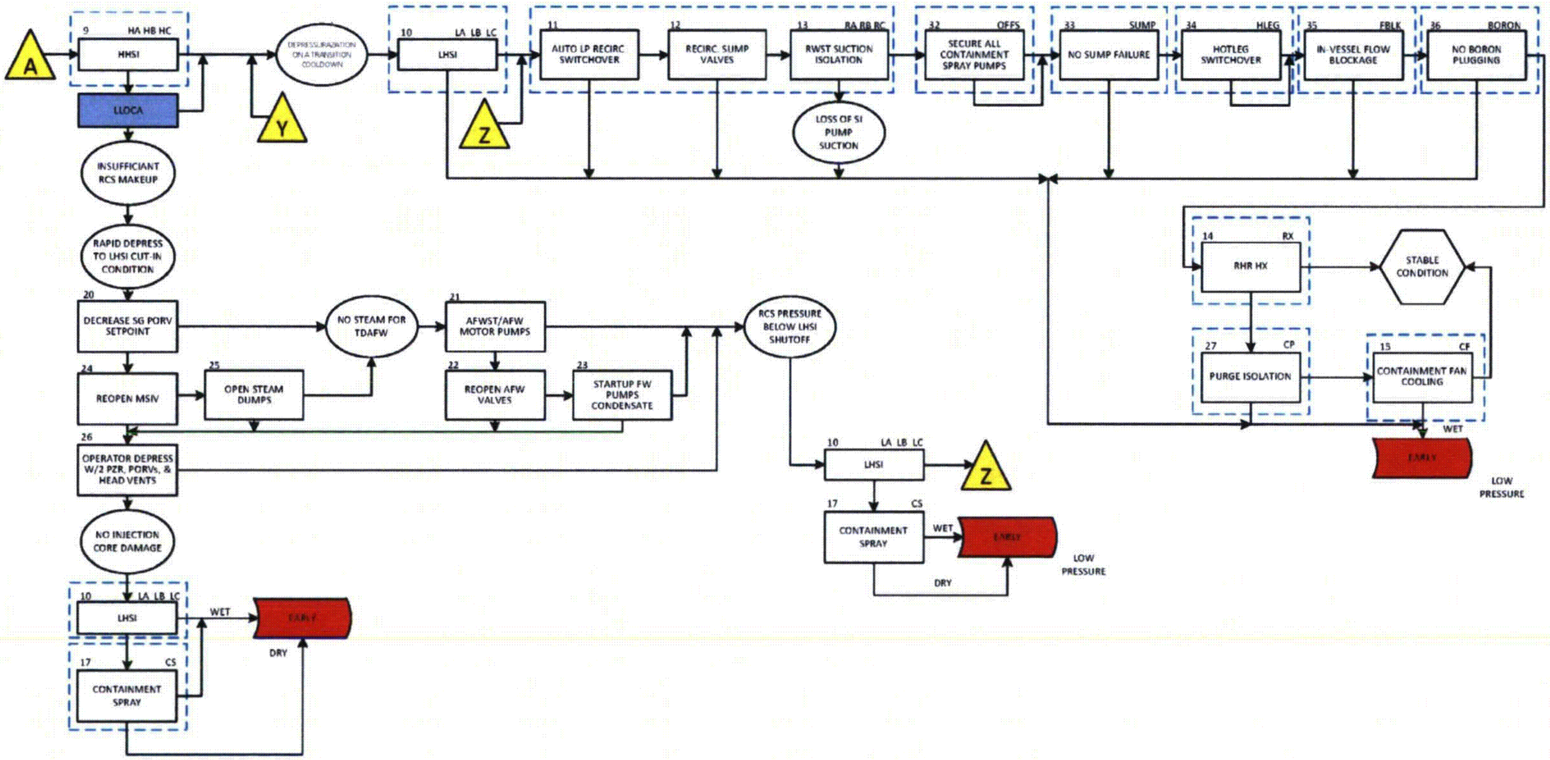


Figure A.3-1 South Texas Project Medium and Large Break LOCA Event Sequence Diagram (Page 2 of 2)

A.4 Medium or Large LOCA Event Trees

This section describes the LOCA event tree, which is derived from the medium or large LOCA ESD discussed in the previous section. The medium or large LOCA event model is also broken up into two stages when the ESD is converted into an event tree. The early response event tree (i.e., MLOCA) evaluates all the expected medium or large LOCA transient response sequences and accident sequences that lead to core damage within approximately 30 minutes to 1 hour after the occurrence of the event; i.e., during the RCS injection phase, and the containment protection functions before switchover to sump recirculation. The late response event tree (i.e., LTMLOCA) evaluates the progression of sequences during and after recirculation switchover, and the availability of core debris cooling after core damage has occurred. While many of the event blocks in the medium or large LOCA ESD are mapped into the MLOCA event tree, there are several event blocks in the medium LOCA ESD that are not included in the medium or large LOCA event tree as top events. Table A.4-1 provides the grouping of medium or large LOCA ESD event blocks into event tree top events. The rationale for excluding event blocks from the MLOCA event tree follows. These comments apply to both medium LOCAs and large LOCAs.

Table B.3-1 in Appendix B presents all the split fraction values used in quantification of the medium and large LOCA event model. The changes in split fractions made to incorporate outputs from CASA GRANDE to evaluate GSI-191 phenomena are highlighted in red text of that table and the basis for these changes are described with the top events presented below. For top events with no discussion of their corresponding split fractions, no changes were made for this evaluation; i.e., the split fractions are the same as in the reference PRA, Version 7.1, for STP.

The reactor trip event (MLOCA Event Block 1) is not included in the MLOCA event tree, because the requirement for injection insures sufficient boron is present in the RCS to guarantee reactor shutdown.

The ESFAS system, the SSPS logic cabinets, and the bus load sequencer cabinets (MLOCA Event Blocks 2 and 16) are modeled in the electric power tree; EPONSITE. These events model the generation of the necessary control signals to engineered safety feature (ESF) equipment and isolation of important containment penetrations. These signals start the HHSI and the LHSI pumps, and align the associated safety injection valves. These signals also affect startup and alignment of equipment in several of the plant support systems, such as ECW, component cooling water, essential chilled water, electrical equipment and heating, ventilation and air conditioning (HVAC). Therefore, the availability of these signals must be determined as an input to the mechanical support systems event tree model. The electric power event tree split fraction rules transmit the status of these signal availabilities to the mechanical support, MLOCA, and the LTMLOCA response event tree. The electric power event tree also includes a top event for operator actions to manually start equipment very early in the sequence if the automatic signals fail (medium or large LOCA ESD Event Block 3). These recovery actions are evaluated on a sequence-specific basis to account for effects from operator stress, event timing, procedures, etc. They are included in the electric power portion of the event tree model to ensure that the effects from both successful and failed recovery actions are correctly propagated through the remaining event trees.

Three sets of pumps are modeled in the MLOCA early tree; the HHSI pump trains (ESD Event Block 9), the LHSI pump trains (ESD Block 10) and the containment spray pump trains (ESD Event Block 17).

The medium LOCA early response tree also considers the containment isolation function, which occurs early in the sequences. Operation of the reactor containment fan coolers (RCFCs, ESD Event Block 15) is also considered in the MLOCA event tree, as their operation can affect containment sump temperatures.

Medium or large LOCA ESD Event Block 6 considers the successful reclosure (or remaining closed) of the steam dump valves in the context of a severe overcooling transient but is not modeled in the MLOCA event tree. The operation of the steam dump valves to assist in secondary heat removal (ESD Event Block 25) is not modeled in the MLOCA event tree. Secondary heat removal could be important in a medium LOCA scenario, if primary pressure remains above LHSI shutoff pressure and there is insufficient HHSI for primary makeup. The objective, given these conditions, is to rapidly depressurize the primary system to LHSI cut-in conditions. The MLOCA event tree does not take credit for rapid depressurization under these circumstances. For large LOCAs, the RCS depressurizes rapidly anyway and again these functions are not of concern. Thus, it is not necessary to model the following medium LOCA ESD event blocks related to rapid depressurization:

- Decreasing the Steam Generator PORV Setpoints (Medium LOCA ESD Event Block 20)
- The Availability of the AFWST and the Motor-Driven AFW Trains (Medium LOCA ESD Event Block 21)
- Reopening the MFW Isolation Valves (Medium LOCA ESD Event Block 22)
- Using the Motor-Driven Startup Feedwater Pump and the Condensate System (Medium LOCA ESD Event Block 23)
- Reopening the MSIVs (Medium LOCA ESD Block Event 24)
- The Opening of the Steam Dumps (Medium LOCA ESD Event Block 25)
- RCS Depressurization Using the Pressurizer PORVs and the Reactor Pressure Vessel Head Vents (Medium LOCA ESD Event Block 26)

This conservative approach substantially reduces the size of the MLOCA event tree without introducing significant conservatisms into the model.

The remainder of the medium and large LOCA ESD event blocks, which are excluded from the medium LOCA event tree, are included in the late response event tree. These event blocks include:

- Low Pressure Recirculation Switchover (Medium or Large LOCA ESD Event Block 11)
- The Availability of the Recirculation Sump Valves (Medium or Large LOCA ESD Event Block 12)
- The Availability of the RHR Heat Exchangers (Medium or Large LOCA ESD Event Block 14)
- The Availability of the RCFCs (Medium or Large LOCA ESD Event Block 15)
- RWST Suction Isolation (Medium or Large LOCA ESD Event Block 13)

A.4.1 MLOCA Early Event Tree

The remainder of this section discusses the top events of both the early and late frontline system response trees. Figure A.4-1 shows the MLOCA early response event tree, which has been generalized to make it applicable for both medium LOCAs and large LOCAs.

- **Top Event TT.** This top event includes medium or large LOCA ESD Event Block 5. Top Event TT determines whether full-rated steam flow is stopped after the reactor is shutdown. This is normally accomplished by tripping the main turbine (Medium LOCA ESD Event Block 5). Turbine trip is achieved by closing the turbine throttle or governor valves. In the event of main turbine trip failure (i.e., turbine throttle or governor valves remain open), automatic signals will be generated to close the MSIVs (Event Block 4). Success of Top Event TT occurs if the main turbine is tripped. The success branch indicates that there is no severe overcooling of the primary via the steam generators. Subsequent top events model operation of the HHSI and LHSI delivering flow to the vessel. Top Event TT fails if at least one pair of turbine throttle valves and governor valves remains open. The plant response to the failure of Top Event TT and Top Event SGI is conservatively bounded by treating the resulting cooldown as if full-rated steam flow continues after the reactor is shut down. Failure of the turbine to trip is not of interest for large LOCAs because the RCS cools down rapidly anyway.
- **Top Event SGI.** This top event includes medium or large LOCA ESD Event Block 4. If the main turbine throttle valves and governor valves remain open, failure of Top Event TT, automatic signals will be generated to close the MSIVs. Success of Top Event MSIV occurs if at least three of four MSIVs close automatically following turbine trip failure. Failure may also occur if in response to a turbine trip failure, an MSIV fails to close and there is a coincident failure to isolate the feedwater regulating valves on the same loop. The success branch indicates that there is no severe steam generator overcooling. Failure of Top Event SGI occurs if at least two MSIVs fail to close. To avoid the need to model multiple top events and to perform separate cooldown analyses for a variety of steam flow conditions, plant response to the failure branch from Top Event SGI is conservatively bounded by treating the resulting cooldown as if full-rated steam flow continues to the turbine after the reactor is shut down. The failure branch thus subsequently evaluates the effect of pressurized thermal shock to the reactor vessel.

- **Top Event VI.** The MLOCA early response event tree applies a conservative bounding model for the effects from potential reactor vessel PTS challenges represented by the medium or large LOCA ESD Event Block 19. Top Event VI evaluates the likelihood that the reactor vessel remains intact during a severe overcooling transient caused by failure of Top Event TT and Top Event SGI. Vessel integrity is evaluated assuming both HHSI and LHSI pumps will be available for injection. The model also contains the following two principal sources of conservatism.

  - The assigned temperature and pressure conditions for which Top Event VI is evaluated.

  - The subsequent effects following failure of Top Event VI.

  The rate and amount of RCS overcooling are bounded by assigning failure of top events TT and SGI to a condition with full-rated steam flow remaining after the reactor is tripped. Automatic safeguards actuation signals from high pressure rate and low pressurizer pressure (success of Medium LOCA ESD Event Block 2) will cause full injection flow from the HHSI pumps (success of Medium LOCA ESD Event Block 9). Failure of the operators to quickly stop all HHSI flow will partially restore RCS pressure. No detailed analyses have been performed to compare the rate of volumetric shrinkage during the cooldown with the rate of RCS repressurization. However, the estimate is that the lack of credit in the model for this operator action to terminate HHSI introduces only slight conservatism. Full HHSI flow will begin to refill the RCS when the steam generators boil dry and the cooldown subsides. Emergency procedures and operator training programs strongly advise against rapid intervention to reverse automatic system response until a comprehensive plant status review is completed. Based on these observations, the results from detailed analyses of RCS thermal and hydraulic response and a time-integrated model for operator interaction are expected to provide only slight changes from the bounding repressurization model used for Top Event VI. The model also does not account for possible extensions to the repressurization time that could result from partial or total HHSI system failure.

  The effects from failure of Top Event VI during medium LOCAs are conservatively bounded by assigning the failure branch of Top Event VI to an excessive LOCA condition beyond the combined makeup capacity from the HHSI and LHSI systems. This condition is equivalent to catastrophic failure of the reactor vessel. For large LOCAs, the RCS is already open and depressurized so that top event is assumed successful regardless of the status of top events TT and SGI. The failure branch of Top Event VI continues to question the common equipment that affects RWST injection flow to the ECCS trains. All of those branches are then directly mapped to the long-term response tree.

  The success of Top Event VI implies that the integrity of the reactor vessel is intact. The tasks at hand are to cooldown and depressurize the RCS in order to achieve long-term cooling. Since this requires LHSI and HHSI, the success branch of Top Event VI also models top events representing the common equipment that affects RWST injection flow to the ECCS trains.

- **Top Event SI38A.** This top event models the common cold leg injection check valve to RCS loop A, SI0038A. HHSI, LHSI, and the RCS Loop A accumulator share this common check valve. Failure of this top event disables Train A injection to the RCS. However, failure of this top event does not necessarily fail pump operation. Therefore, for the GSI-191 project, failure of this top event was assumed to have no impact on the two pumps and the accumulator to Train A themselves. Rather, the requirement for this common check valve is considered later in a macro that describes successful HHSI and LHSI RCS injection and in a macro describing avoidance of core damage.

- **Top Event SI38B.** This top event models the common cold leg injection check valve to RCS Loop B, SI0038B. This top event is similar to Top Event SI38A

- **Top Event SI38C.** This top event models the common cold leg injection check valve to RCS Loop C, SI0038C. This top event is similar to Top Event SI38A

- **Top Event AI.** This top event models the three accumulators in the emergency core cooling systems. The accumulators each discharge into one of the RCS cold legs in Loop A, B, or C. For medium LOCAs, success of this top event requires at least one of three accumulators to successfully inject. It's possible that the break may be in one of the three Loops A, B, C, or to Loop D to which no accumulators are connected. The specific RCS loop in which the break is said to occur is assigned an equal probability for all loops and is tracked by top event BRKS. Top Event BRKS is placed in the common SEISET event tree. Failure of this top event indicates no accumulator successfully injects into the RCS. For large LOCAs, the success criterion is that two accumulators must successfully inject. Failure of Top Event AI is assumed to lead to core damage and is defined in Macro "SUCC" in the MLOCA Plant Damage State Tree, PDSML.

Top Event CP. Top Event CP models the automatic isolation of all normally open "large" containment penetrations (≥ 3-inch diameter) before or at the time of vessel failure. The containment penetrations of particular concern are the large containment supplementary purge lines. Success of this top event requires that at least one containment isolation valve in each purge line be automatically closed. Success implies that there is no immediate venting of fission products, and that the RCFCs are capable of removing heat and radioactivity from the containment atmosphere through the condensation process, while also preserving water inventory in the containment. Thus, the success branch of Top Event CP questions the availability of RCFCs under Top Event CF. The success branch for Top Event CP does ask small containment line isolation in addition to questions relating to fission product removal.

Failure of Top Event CP occurs if at least one of the containment purge lines remains unisolated. This immediate venting of the fission products renders the RCFCs ineffective for filtering the releases. The only effective method for fission product removal occurs if the containment sprays operate at the time of vessel failure. Thus, the failure branch from Top Event CP does not question the status of the RCFCs, but focuses on the containment sprays modeled by Top Event CS. Since containment integrity is lost, small containment line isolation is no longer significant, and is therefore not asked. With at least one of the containment purge lines unisolated, the containment remains atmospheric limiting some of the margin for NPSH.

- **Top Event CI.** This top event models the automatic isolation of the containment penetrations that connect the containment atmosphere to the outside atmosphere, are open before or at the time of reactor vessel failure, and have a flow area less than an equivalent 3-inch diameter hole. The top event includes long-term response core melt ESD Event Block 28. Top Event CI is questioned except in those sequences in which the supplementary purge lines are unisolated (failure of Top Event CP). The penetrations considered in the analysis of this top event include:

  - Containment Radiation Monitor Sampling Lines
  - Pressurizer Relief Tank (PRT) Vent Line
  - PRT Post-Accident Sampling
  - Reactor Coolant Drain Tank (RCDT) Vent Line
  - RCDT to Liquid Waste Penetration Space (LWPS) Holdup Tank Flow Path
  - Containment Normal Sump Drain Line
  - Seal Return and Letdown Line

- **Top Event CF.** Top Event CF includes the MLOCA ESD Block 15 and models the availability of at least two RCFCs with cooling water flow supplied by the CCW system. Success of Top Event CF indicates that long-term containment heat removal and fission product removal are being provided. If LHSI pump flow is later established from the containment sump in the recirculation mode to the RCS is also available, regardless of whether the RHR heat exchangers is cooled, then core decay heat removal is also available.

- **Top Event PA.** This top event models all common equipment that affects RWST injection flow from ECCS Train A; i.e., HHSI Pump A, LHSI Pump A, and Containment Spray Pumps A. This is the Train A portion of MLOCA ESD Event Block 8. Success of Top Event PA indicates that the RWST is available, that Train A Motor-Operated Suction Valve XSI-0001A is open, that Check Valve XSI-0002A opens on demand, and that room cooling is available. The success branch of Top Event PA continues in the early response tree to question the availability of flow from the Train A LHSI pump and HHSI pump. Failure of Top Event PA implies that the Train A ECCS pumps are not available to inject RWST water into the RCS or containment. If the pumps receive automatic signals to start during the early phase of event response, the failure branch from Top Event PA is assigned to an end state that also disables all three ECCS Train A pumps (i.e., HHSI, LHSI, and containment spray on Train A) for later containment sump recirculation flow.

- **Top Event PB.** This top event is similar to Top Event PA. It models the common equipment that affects RWST injection from ECCS train B.

- **Top Event PZ.** This top event is similar to Top Event PA. It models the common equipment that affects RWST injection from ECCS Train C.

  The RWST is shared by all three ECCS pump trains. The event tree logic structure has been simplified by not including a separate top event for model failures of this common borated water supply. Failure of the RWST disables Top Events PA, PB, and PZ. This single contribution is propagated through the conditional split fraction models. Thus, RWST failure leads directly to event sequences with all three Top Events PA, PB, and PZ failed.

- **Top Event HA.** Top Event HA models the availability of HHSI Train A to deliver water from the common ECCS suction header to the RCS. It includes the Train A portion of Medium LOCA ESD Block 9. Success of Top Event HA requires the train A HHSI pump to start and to continue operation for at least 24 hours, delivering injection flow to the RCS. Success of this top event requires success of Top Event PA. Success of the HHSI function during a medium or large break LOCA requires at least one pump train to inject into an intact RCS loop. The location of the broken loop is set in the seismic event tree, SEISET, in Top Event BRKS. However, for the GSI-191 project, success of Top Event HA is instead considered even if the break is located in Loop A. For the GSI-191 model, we are interested in whether the HHSI pumps operate and eventually take suction from the containment sump regardless if their injection flow is injected to the RCS. Rather, the requirement for RCS injection, that loop A not be the break location, is considered later in a macro that describes successful RCS injection and in a macro describing avoidance of core damage. Total pump flow taking suction from the containment sumps is an important parameter in determining the potential for sump strainer blockage and strainer failures, air ingress, and whether excessive debris collects in the fuel.

- **Top Event HB.** This top event is similar to Top Event HA. It models startup and operation of HHSI Train B.

- **Top Event HC.** This top event is similar to Top Event HA. It models startup and operation of HHSI Train C.

- **Top Event LA. LHSI pump train A delivers flow to the RCS**. For the GSI-191 model, we are also interested in whether the LHSI pumps operate and eventually take suction form the containment sump regardless if their injection flow is injected to the RCS. Total pump flow taking suction from the containment sumps is an important parameter in determining the potential for sump strainer blockage and strainer failures, air ingress, and whether excessive debris collects in the fuel. The status of the LHSI pump trains is initially assumed not affected by the location of the break since the LHSI pumps may still eventually take suction from the containment sumps even if the injection loop for that train is the same as the break location and flow never enters the RCS. Rather, the requirement for RCS injection, that Loop A not be the break location, is considered later in a macro that describes successful RCS injection and in a macro describing avoidance of core damage.

- **Top Event LB.** Same as LA with respect to Train B

- **Top Event LC.** Same as LA with respect to Train C

- **Top Event CS.** This top event has been modified from the CSR and WI top events originally used to represent containment spray in the medium LOCA late tree in Revision 7.1. Those top events represented the operation of containment during the recirculation mode (i.e., CSR) or for water injection into the containment after core damage (i.e., WI), if the RWST had not been injected earlier. For Revision 7.1, containment spray during the injection phase was not modeled since containment spray is not required to realistically limit containment pressure to acceptable levels, even for the largest of the large LOCAs.

For the GSI-191 project, the availability of containment spray pumps during sump recirculation can affect the potential for strainer clogging issues. Therefore, both the spray injection and spray recirculation functions are of interest. Top Event CS tracks the availability of the containment spray pumps to start and operate in response to the containment pressure increase during RCS blowdown, and for the pumps to operate for 24 hours. The status of all three spray pump trains are tracked by the eight state top event; i.e., CS. The associated containment spray pump trains are later assumed failed if the common RWST suction valves for that train (i.e., PA, PB, or PZ) are failed. However, the status of the spray trains is not affected by the location of the break, nor by the failure of the common SI injection check valves since the spray pumps do not inject to the RCS. A total of 66 split fractions are developed for Top Event CS. Two of these split fractions are used as defaults; i.e., for guaranteed success (i.e., 0 failure probability) or failed (1.0 failure probability) boundary conditions. The remaining 64 correspond to the evaluation of the eight states of this top event for eight different boundary conditions. The eight different boundary conditions correspond to the conditions when supporting systems (e.g., AC power) are successful or failed for each of the three pump trains; i.e., eight conditions in all. The actual fault tree for containment spray is not logically different than that developed for Version 7.1 in that the failure modes considered are the same. The fault tree logic has only been restructured to allow for the evaluation of all 66 split fractions.

Top Event OSI. This new top event represents a manual operator action to secure one train of containment spray, if all three are running, to conserve RWST water; i.e., per Procedure 0POP05-EO-EO10, LOSS OF REACTOR OR SECONDARY COOLANT. This event was not modeled in Revision 7.1. It is added because reducing the flow through the containment strainers reduces the potential for strainer clogging issues. This top event is only branched at in MLOCA event tree after the one Top Event CS state in which all three trains of containment spray are successfully running since that is the only condition in which the action is directed.

For the current GSI-191 project, this action is always assumed failed within the PRA model; i.e., split fraction OSIZ=1.0 is always used. However, within CASA GRANDE, this action is always assumed successful when determining the failure probabilities introduced by the GSI-191 phenomena. This top event is included in the PRA model only as a means for performing sensitivity analyses of the pump state combination frequencies on the operator action failure probability.

Detailed quantification of the success or failure for each top event is accomplished by defining one or more split fractions that depend on the specific event sequence conditions when the top event is questioned. These split fractions account for important dependencies that affect system success criteria, equipment response, or operator actions. The models for each split fraction are presented in more detail in the system analysis notebooks.

Table A.4-1 Grouping of Medium LOCA ESD Event Blocks into Event Tree

ESD Event Blocks	Event Tree Top Event	Top Event Definition	Notes*
1	RT	At least 55 out 56 control rods inserted to shut down the reactor in response to an automatic reactor trip signal – not modeled in MLOCA event tree.	1
2	IA	Automatic safety injection and isolation signal available from ESFAS train A. Included in electric power model of support systems which precede the frontline Medium LOCA trees	1
2	IB	Automatic safety injection and isolation signal available from ESFAS train B. Included in electric power model of support systems which precede the frontline Medium LOCA trees	1
2	IC	Automatic safety injection and isolation signal available from ESFAS train C. Included in electric power model of support systems which precede the frontline Medium LOCA trees	1
3	OR	Operators manually start and align equipment that does not receive automatic actuation signals of support systems which precede the frontline Medium LOCA trees	3
4	SGI	At least 3 of 4 MSIVs close automatically to isolate steam flow from the steam generators and either the MSIV closes or the feed water regulating valves close in each loop	2

Table A.4-1 Grouping of Medium LOCA ESD Event Blocks into Event Tree (Continued)

ESD Event Blocks	Event Tree Top Event	Top Event Definition	Notes*
5	TT	Turbine throttle or governor valves close automatically to stop steam flow through main turbine.	2
6	--	Steam Dumps Closed - Not modeled in event trees.	4, 8
7		Reactor Pressure Vessel (RPV) Pressure Above LHSI Shutoff	7, 8
8	PA	RWST suction path available for HHSI, LHSI, and containment spray train A.	2
8	PB	RWST suction path available for HHSI, LHSI, and containment spray train B.	2
8	PZ	RWST suction path available for HHSI, LHSI, and containment spray train C.	2
9	HA	HHSI pump train A delivers flow to the RCS.	2
9	HB	HHSI pump train B delivers flow to the RCS.	2
9	HC	HHSI pump train C delivers flow to the RCS.	2
10	LA	LHSI pump train A delivers flow to the RCS.	2
10	LB	LHSI pump train B delivers flow to the RCS,	2
10	LC	LHSI pump train C delivers flow to the RCS.	2
11, 12, 13	RA	Containment sump suction path available and RWST isolated for HHSI, LHSI, and containment spray train A.	6
11, 12, 13	RB	Containment sump suction path available and RWST isolated for HHSI, LHSI, and containment spray train B.	6
11, 12, 13	RC	Containment sump suction path available and RWST isolated for HHSI, LHSI, and containment spray train C.	6
14	RX	Coolant flow path open and CCW valves aligned for RHR heat exchanger in at least one operating LHSI train.	6
15	CF	At least two RCFC fan units running with cooling water flow path aligned to CCW system.	2
16	SS	Solid state protection system processes automatic reactor trip signals and safeguards actuation signals of support systems which precede the frontline Medium LOCA trees	1

Table A.4-1 Grouping of Medium LOCA ESD Event Blocks into Event Tree (Continued)

ESD Event Blocks	Event Tree Top Event	Top Event Definition	Notes*
17	CS	At least one containment spray train delivers flow to the spray ring headers, automatically.	2, 9
18	HA	HHSI pump train A delivers flow to the RCS. 1 of 3 trains needed for success	2
18	HB	HHSI pump train B delivers flow to the RCS. 1 of 3 trains needed for success	2
18	HC	HHSI pump train C delivers flow to the RCS. 1 of 3 trains needed for success	2
19	VI	Reactor vessel remains intact during severe overcooling PTS challenge. HHSI pump train C delivers flow to the RCS.	2
20-26		Not modeled in event trees	8
27	CP	Automatic isolation of 1 of 2 valves in each supplementary purge line if open at the time of the accident.	2
28	CI	Automatic isolation of 1 of 2 valves in all other (less than 3 inch diameter) containment penetrations that connect the containment atmosphere to the outside atmosphere and are open before at the time of reactor vessel failure.	2
29	SI38A,	Cold leg injection check valve XSI0038A, opens on demand	2
29	SI38B	Cold leg injection check valve XSI0038B opens on demand	2
29	SI38C	Cold leg injection check valve XSI0038C., opens on demand	2
30	AI	Sufficient accumulators (2 of 3 for Large and 1 of 3 for Medium) provide injection through motor operated valves XSI0039 and check valves XSI0046 via an intact RCS loop.	2
31	OS1--	Operators secure 3rd running containment spray prior to sump recirculation switchover	2
32	OFFS	Operators secure all containment spray pumps operating during sump recirculation	6
33	SUMP	Absence of sump plugging issues during recirculation; i.e., loss of NPSH, pump cavitation caused air ingress, or strainer collapse	6
34	HLEG	Transfer of at least one LHSI pump train from cold leg to an intact loop for hot leg injection at 5.5 hours after a Medium or Large LOCA.	6

Table A.4-1 Grouping of Medium LOCA ESD Event Blocks into Event Tree (Continued)

ESD Event Blocks	Event Tree Top Event	Top Event Definition	Notes*
35	FBLK	Absence of in-vessel flow blockage during sump recirculation	6
36	BORON	Absence of boron precipitation following a Medium or Large LOCA cold leg break.	6

Notes:

1.To facilitate tracking support system dependencies, this top event is modeled in the electric power event tree.

2.This top event is modeled in the MLOCA event tree.

3.To facilitate tracking support system dependencies, this recovery action is modeled in the electric power event tree. Recovery actions are evaluated on a sequence-specific basis to account for the timing of failures, stress, control room alarms, procedures, etc., that affect operator response.

4.No credit is taken for secondary systems decay heat removal capability.

5.The Medium LOCA event tree does not model the rapid depressurization of the RCS to LHSI cut-in conditions on loss of HHSI, and it is assumed to lead to core damage.

6.This top event is modeled in the long-term response event tree· (LTMLOCA).

7.Since the Medium LOCA initiating event category covers a range of RCS breaks (flow rates from piping ruptures from 2 inches to 6 inches in diameter), this event block is used as "flag" to note the differences in plant response for this range of break sizes. Although this event block is not modeled explicitly in the event trees, the Medium LOCA event tree structure and success criteria for HHSI and LHSI apply a simplified bounding model and reflects the case where the Medium LOCA requires one HHSI pump and one LHSI pump injecting into an intact RCS loop.

8. This event is not modeled in any event tree

9. All three containment spray system trains represented by one multi-state top event, CS.

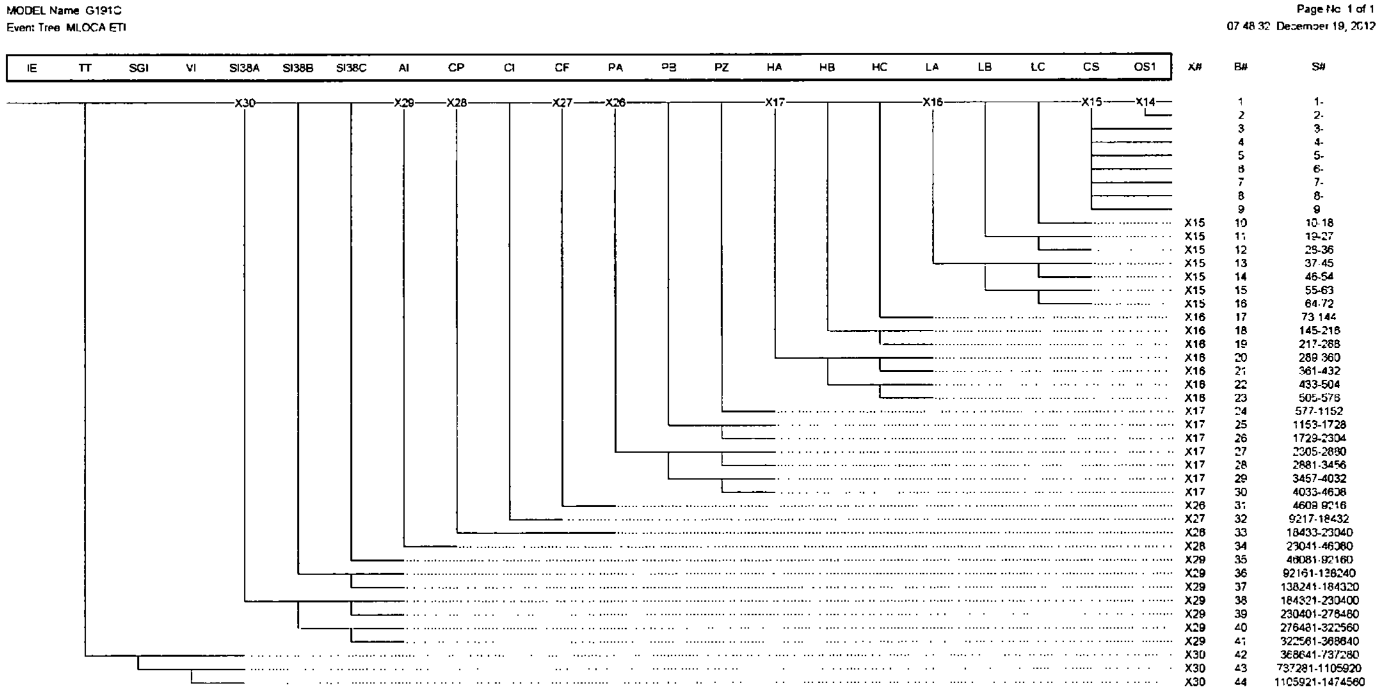


Figure A.4-1 Generalized MLOCA Early Event Tree

A.4.2 Late Medium LOCA Event Tree

The MLOCA event tree branches to the late response tree, LTMLOCA shown in Figure A.4-2. The LTMLOCA event tree questions coolant injection into the RCS and to the containment spray headers. Top Event N2 at the beginning of the late Medium LOCA event tree segregates sequences requiring emergency containment recirculation cooling from those sequences resulting in or tending towards core damage as a result of the sequence path through the early Medium LOCA event tree. LTMLOCA also evaluates the status of emergency containment sump recirculation function (Top Events RA, RB, and RC), sump clogging issues (i.e., Top Events OFFS, HLEG, FBLK, and BORON) and RHR cooling (Top Event RX).

The MLOCA and LTMLOCA event trees were used for the Medium LOCA initiating event only in Revision 7.1. For the GSI-191 project, the revised set of early and late event trees for Medium LOCA have been generalized to also make them applicable to large LOCAs. The Revision 7.1 large LOCA event tree is not used.

Top events in the LTMLOCA event tree are described below.

- **Top Event N2.** Identifies the sequence paths through the MLOCA tree resulting in early core damage. Early core damage may result from a PTS condition leading to vessel failure, from inadequate accumulator injection, from failure of HHSI, or from failure of LHSI. For large LOCAs, only inadequate accumulator injection or failure of LHSI core damage mechanisms apply. The status of containment spray injection is established in the early MLOCA event tree but is not used in the evaluating the status of Top Event N2.

- **Top Event RA.** Containment sump suction path for Train A available and RWST isolated for HHSI, LHSI, and containment spray Train A. Failure of Top Event RA prevents sump recirculation involving the HHSI, LHSI, or containment spray pump on Train A.

- **Top Event RB.** Same as RA with respect to Train B

- **Top Event RC.** Same as RA with respect to Train C

- **Top Event OFFS**. This new top event for the GSI-191 project represents a manual operator action to secure all trains of containment spray; per Procedure 0POP05-EO-EO10, LOSS OF REACTOR OR SECONDARY COOLANT, Step 16 and Step 16c when containment pressure falls below 6.5 psig and the TSC concurs. The same procedure notes that it may be necessary to run containment spray for up to 6.5 hours after sump recirculation switchover in order to reduce containment Iodine levels sufficiently before TSC concurrence would be obtained. This event is added because reducing the flow through the containment strainers reduces the potential for strainer clogging issues. . It is included in the model as a means for performing sensitivity analyses of the pump state combination frequencies on the operator action failure probability. Note that by procedure, only those trains of containment spray operating during the injection phase are to be aligned for sump recirculation prior to this action.

For the current GSI-191 project, this action is always assumed failed within the PRA model; i.e., split fraction OFFSZ=1.0 is always used. However, within CASA GRANDE, this action is always assumed successful when determining the failure probabilities introduced by the GSI-191 phenomena.

- **Top Event SUMP**. This new top event for the GSI-191 project represents the GSI-191 sump clogging issues specifically related to the sump strainers; i.e., sump plugging resulting in insufficient flow, loss of NPSH, pump cavitation caused by air ingress, or strainer collapse by excessive loading. The remaining GSI-191 issues are represented by later top events.

  At STP, there are three separate sump strainers; one for each of the three pump trains A, B, and C. The sump failure probabilities are provided by CASA GRANDE as a function of the specific sequence paths through the MLOCA and LTMLOCA event trees. For the GSI-191 project model of 2012, these failure probabilities are evaluated as a function of the number of HHSI, HLSI and containment spray pumps operating for sump recirculation. CASA GRANDE looks at the sump failure probabilities for each of the three trains separately and reports the highest of the three for each sequence condition. The RISKMAN PRA model then conservatively assumes that if one sump strainer fails they all do. If Top Event SUMP fails, this implies that all three trains of sump recirculation fail and that core damage results.

  Since the most likely condition is that all three pump trains are available on each strainer for sump recirculation, this assumption is not believed overly conservative.

  The failure probabilities for this top event are provided directly from the CASA GRANDE output in Volume 3. The uncertainty in these failure probabilities are reported as discrete probability distributions with 5 points each. A data variable is developed for each pump state failure probability distribution. Then these data variables are assigned directly as the split fraction values for each pump state analyzed. The mean values from the CASA GRANDE output distributions are used for the mean values of the SUMP split fractions. The full data variable 5 bin distributions are instead used when uncertainty analysis is performed. Effectively these split fractions can be thought of as single basic event fault tree where the basic event probability is the same as the split fraction value.

  There are 10 split fractions assigned to this top event; i.e., five each for medium LOCA and for large LOCA. It is coincidental that the number of split fractions analyzed is the same number as the number of discrete points in the data variable uncertainty distributions for sump failure probability noted above. Since there are three ECCS pump systems of interest and each can be in a state of zero, one, two, or three pumps running, there are theoretically a total of 64 pump state combinations. Actually there are fewer combinations because only those sequences in which sufficient pumps are available to prevent core damage are of interest for Top Event SUMP. The CASA GRANDE results have been evaluated for just five of these possible pump state combinations for both medium LOCAs and large LOCAs. An additional 11 pump state combinations are assigned to the least conservative pump state combination split fractions from among the five states that are evaluated by CASA GRANDE for each LOCA size. For these 11 combinations a new split fraction is not developed but rather the relevant sequences are assigned to use one of the five that are developed for each LOCA size. The remaining 48 pump state combinations are relatively low in occurrence frequency and are therefore conservatively assumed to always fail Top Event SUMP; i.e., we conservatively assume sump plugging occurs for these unanalyzed pump state combinations.

- **Top Event HLEG.** This top event is not included in the LTMLOCA event tree of Revision 7.1. It has been added here for the GSI-191 project and applied to both medium LOCAs and large LOCAs. The fault tree for Top Event HLEG models the operator action and equipment necessary to align at least one low head safety injection train to the associated RCS hot leg in accordance with Procedure 0POP05EOES14 – TRANSFER TO HOT LEG RECIRCULATION. This procedure directs that both HHSI and LHSI trains be aligned for hot leg recirculation. At least one low head recirculation train is to remain injecting to the associated cold leg; all other LHSI trains are aligned to their associated hot leg. Hot leg recirculation is required approximately 5.5 hours after a design basis large LOCA, in order to prevent boron precipitation in the reactor vessel which could impede or block the effectiveness of long term recirculation, thus leading to core degradation. Success of the hot leg recirculation function requires an operator action to align at least one recirculation flow path to discharge to the reactor coolant system hot leg. Failure of this function may lead to core damage if boron precipitation is excessive.

  For the GSI-191 project in 2012, the probability of excessive boron precipitation considered later in top event BORON is assumed dependent on whether the break is in the cold leg, on the extent of core flow blockage prior to hot leg switchover, and by whether a LHSI train is realigned for hot leg recirculation; i.e., no dependence on the number of HHSI trains aligned is assumed. It's possible that aligning the flow from just a single HHSI pump for hot leg recirculation would also be successful, but this is not credited.

  There are three trains of LHSI which may be aligned for hot leg recirculation but by procedure, one must remain aligned for cold leg recirculation. The procedures are not explicit as to the trains to align so we assume that either Train A, Train B, or both Trains A and B are aligned for hot leg recirculation depending on the number of LHSI pump trains operating during sump recirculation. Separate split fractions are evaluated for cases when only Train A is available for swapover to hot leg, when only B is available or when both A and B are available, the latter case because all three LHSI pump trains are operating in the sump recirculation mode. Sequence conditions in which at least two LHSI pump trains are not operating are instead assigned to a guaranteed failure probability for Top Event HLEG when quantifying the event tree; i.e., Split Fraction HLEGZ=1.0 is used.

  Recall that if only two trains of LHSI are operating, that the train realigned to the hot leg may inadvertently be directed to the loop where the break is located. This event combination is counted as a failure of the LHSI pump train which would be aligned to the broken RCS loop for hot leg recirculation. Since the second train of LHSI must be maintained on cold leg injection such a situation is also assumed to fail hot leg recirculation represented by top event HLEG due to diversion of flow out the broken loop.

- **Top Event FBLK.** This new top event for the GSI-191 project represents the GSI-191 sump clogging issue associated with excessive plugging within the reactor vessel of the coolant flow path to the core fuel tubes. The probability of failure is provided as an input from CASA GRANDE. The failure probability is a function of the number of pumps trains operating from the sump during recirculation. Failure of this event is assumed to lead to core damage.

  The failure probabilities for this top event are provided directly from the CASA GRANDE output in Volume 3. The uncertainty in these failure probabilities are reported as discrete probability distributions with 5 points each. A data variable is developed for each pump state failure probability distribution. Then these data variables are assigned directly as the split fraction values for each pump state analyzed. The mean values from the CASA GRANDE output distributions are used for the mean values of the FBLK split fractions. The full data variable 5 bin distributions are instead used when uncertainty analysis is performed. Effectively these split fractions can be thought of as single basic event fault tree where the basic event probability is the same as the split fraction value.

  There are 10 split fractions assigned to this top event; i.e., five each for medium LOCA and for large LOCA. It is coincidental that the number of split fractions analyzed is the same number as the number of discrete points in the data variable uncertainty distributions for sump failure probability noted above. Since there are three ECCS pump systems of interest and each can be in a state of zero, one, two, or three pumps running, there are theoretically a total of 64 pump state combinations. Actually there are fewer combinations because only those sequences in which sufficient pumps are available to prevent core damage are of interest for Top Event FBLK. The CASA GRANDE results have been evaluated for just five of these possible states for both medium LOCAs and large LOCAs. An additional 11 pump state combinations are assigned to the least conservative split fractions from among the five pump state results that are evaluated by CASA GRANDE for each LOCA size. For these 11 combinations a new split fraction is not developed but rather they are assigned to use one of the five that are developed for each LOCA size. The remaining 48 pump state combinations are relatively low in occurrence frequency and are therefore conservatively assumed to always fail Top Event FBLK; i.e., we conservatively assume flow blockage within the reactor core or entrance to the core occurs for these unanalyzed pump state combinations.

  The above describes how the PRA model was changed to accept the CASA GRANDE results before they were made available. The CASA GRANDE results later showed that there was zero probability of flow blockage failure for any of the conditions analyzed. Nevertheless, for all the other 48 pump state combinations a failure probability of 1.0 was assumed. However, this conservative assumption has no effect on the GSI-191 results because all those same sequences are already assigned to failure of sump plugging via top event SUMP.

- **Top Event BORON**. This new top event for the GSI-191 project represents the recently added GSI-191 issue associated with boron precipitation sufficient to prevent extended core cooling. The failure probability is a function of the number of pumps trains operating from the sump during recirculation and on the success or failure of hot leg switchover. Failure of this event is assumed to lead to core damage.

CASA GRANDE provides the probabilities of boron precipitation prior to the alignment for hot leg recirculation at 5.5 hours. The split of break locations in the hot leg versus the cold leg is considered in CASA GRANDE for each break size. If the break is in the hot leg, the potential for boron precipitation is judged to be zero. If the break is in the cold leg, CASA GRANDE provides the probability of boron precipitation in the first 5.5 hours as a function of the ECCS pump state combinations operating; i.e., prior to hot leg recirculation switchover. If boron precipitation in the first 5.5 hours does not occur, then Top Event BORON further considers whether the alignment for hot leg recirculation is successful; i.e., whether Top Event HLEG is successful. If HLEG is successful, then no boron precipitation after 5.5 hours is assumed. If HLEG fails, then the fraction of breaks which are in the cold leg are considered when evaluating the probability of excessive boron precipitation. Only if the break is in the cold leg and HLEG fails is boron precipitation after 5.5 hours assumed. Since failure of hot leg switchover is assumed to guarantee boron precipitation failure for cold leg breaks in the long term, there is no need to distinguish failures earlier than the required time of switchover from later times. Top Event HLEG is therefore asked first and the split fractions for Top Event BORON account for this observation.

The excessive boron precipitation failure probabilities for this top event are provided from the CASA GRANDE output in Volume 3 for the period of time prior to hot leg recirculation switchover. The uncertainty in these failure probabilities are reported as discrete probability distributions with 5 points each. A data variable is developed for each pump state failure probability distribution. Then these data variables are considered in the development of the split fraction values for each pump state analyzed.

The CASA GRANDE failure probabilities are used directly for split fraction conditions in which the switchover to hot leg recirculation is successful; i.e. when HLEG=S there is no contribution to boron precipitation failure after switchover. For split fraction conditions involving failure of switchover to hot leg recirculation, the early probability of excessive boron precipitation is added to the fraction of breaks which occur in the cold legs to account for excessive boron precipitation after the time of required hot leg switchover. The overlap of the two failure probabilities is subtracted out to avoid double counting the overlap in the total split fraction probability. Effectively these split fractions can be thought of as one or two basic event fault trees. In practice, the split fraction equation creation method of RISKMAN was again used to avoid the need to create such fault trees which while simple are also numerous.

The mean values from the CASA GRANDE output distributions are used for the point estimate mean values of the SUMP split fractions. The full data variable 5 bin distributions are instead used when uncertainty analysis is performed.

There are 26 split fractions assigned to this top event which consider both boron precipitation in the first 5.5 hours and afterwards if hot leg recirculation is not successful; i.e., 13 each for medium LOCA and for large LOCA. The 13 split fractions for each apply to the five different pump state cases, with and without HLEG success, plus three additional, default split fractions that are independent of the specific pump state. Since there are three ECCS pump systems of interest and each can be in a state of zero, one, two, or three pumps running, there are theoretically a total of 64 pump state combinations. Actually there are fewer combinations because only those sequences in which sufficient pumps are available to prevent core damage are of interest for Top Event BORON. The CASA GRANDE results have been evaluated for just five of these possible states for both medium LOCAs and large LOCAs. An additional 11 pump state combinations are assigned to the least conservative pump state combination split fractions from among the five pump state results that are evaluated by CASA GRANDE for each LOCA size. For these 11 combinations a new split fraction is not developed but rather the relevant sequences are assigned to use one of the five that are developed for each LOCA size. The remaining 48 pump state combinations are each individually relatively low in occurrence frequency and are therefore conservatively assumed to always fail Top Event BORON; i.e., we conservatively assume that excessive boron precipitation results for these unanalyzed pump state combinations.

- **Top Event RX.** Top Event RX models the availability of the RHR heat exchangers to remove core decay heat. It includes the medium LOCA ESD Event Block 14. The top event is questioned whenever at least one LHSI pump train is available to provide low pressure recirculation flow through the RHR heat exchangers. Success implies that the associated component cooling water (CCW) supply and return valves are open for the RHR heat exchangers, and that core decay heat is being removed through the CCW system. The success for Top Event RX is that the RHR heat exchanger be available for decay heat removal for at least one of the associated and available LHSI pump trains operating in the recirculation mode. In scenarios in which only one LHSI pump train is available (only Top Event LA, LB, or LC is successful), success of Top Event RX requires the RHR heat exchanger associated with that LHSI pump train to be available. The success path indicates that long-term core decay and containment heat removal is established in at least one functioning safety injection train. Failure of Top Event RX indicates that no core decay heat removal is available through the RHR heat exchanger. An alternate heat removal mechanism via the RCFCs may be established, but still at least one LHSI pump train must be operating in the sump recirculation mode. .

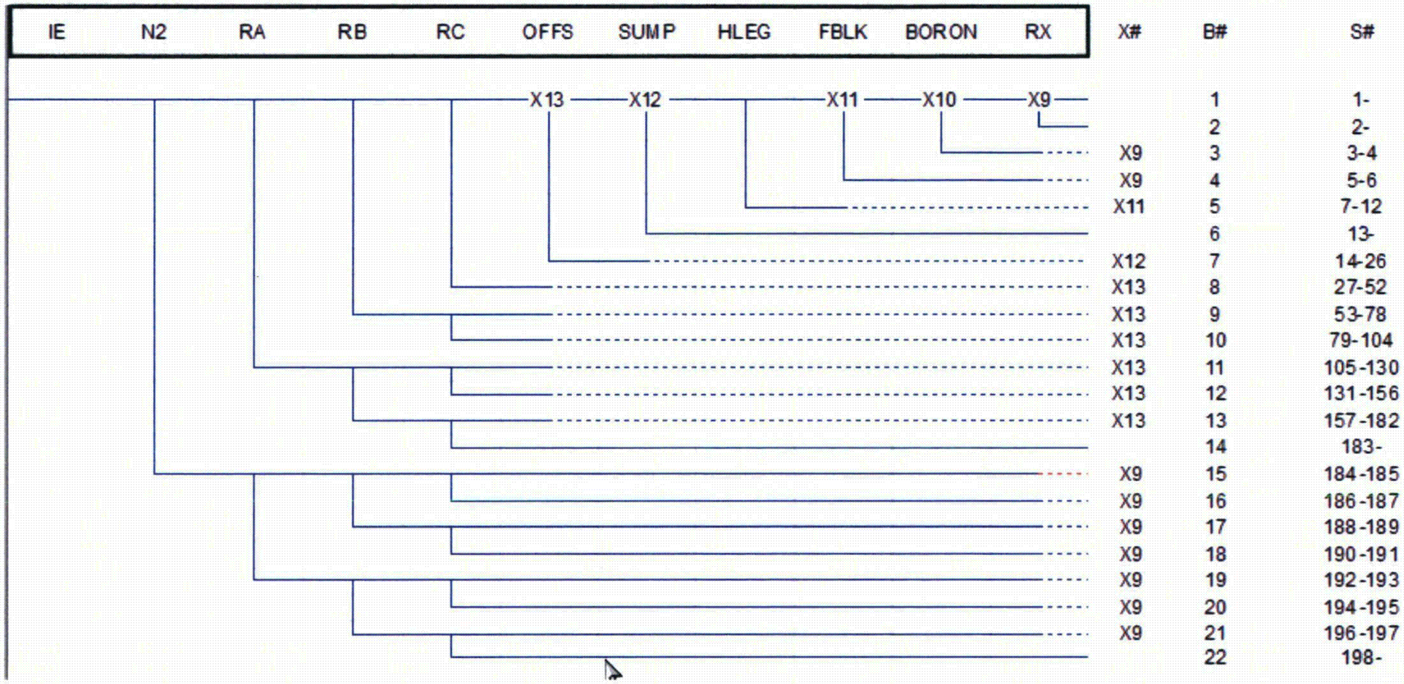


Figure A.4-2 Generalized LTMLOCA Late Event Tree

A.4.3 Plant Damage States for Medium LOCA Events

The final linked event tree in the Level 1 linked set for medium and large LOCAs is the same as that developed in Revision 7.1 for Medium LOCAs; i.e., PDSML. This is a single top event tree that is used simply to supply the plant damage state binning logic for each path through the Level 1 models; i.e., the single Top Event BI is set to guaranteed success.

The binning logic for PDSML is developed in terms of macros defining the conditions for physical parameters that are used in both the PDSML binning rules and in the CET Level 2 split fraction assignment and release category binning logic. This macro logic is shown in Table A.4.3-1. The key macro, SUCC, defines the conditions in which a sequence avoids core damage.

The contributors to core damage are distinguished by the failure mechanisms. Four different bins are defined; i.e., MELT, MELTSUMP, MELTFBLK, and MELTBORON. Bin MELT represents the conditions that lead to core damage that are not related to any of the GSI-191 issues. The other three bins correspond to the GSI-191 failure mechanisms; i.e., sump strainer failures, fuel flow blockage, and boron precipitation. IF there are sequences in which multiple GSI-191 failure mechanisms are present, the failures are grouped in the order in which the bins appear in the rules; i.e., MELT, MELTSUMP, MELTFBLK, and then MELTBORON. The Level 1 sequence group PDS is then defined as the sum of these four bins.

Table A.4.3-2 shows the Plant Damage State Assignment Rules for Medium/Large LOCAs in terms of the macros presented in Table A.4.3-1.

Table A.4.3-1 PDSML Macro Logic for Plant Damage State Assignment

RCSPHI	BI=S*BI=F	RCS at high pressure at UTAF. Guaranteed false because pressure is assumed to be < 600 psi in a Medium LOCA (BDW)
RCSPSY	BI=S*BI=F	RCS at system pressure. Guaranteed false because pressure assumed to be < 600 psi in a MLOCA (BDW)
SGCOOL	BI=S*BI=F	Steam Generator cooling. Assumed to be false because MLOCA empties steam generators (BDW)
RCSPLO	VI=F*IMLOCA +ILLOCA	RCS at low pressure at UTAF. Pressure assumed to be > 200 psi unless vessel fails (BDW) **FOR MLOCAS, YET ALWAYS TRUE FOR LLOCAS**
RCSPMD	-RCSPLO	RCS at Medium pressure at UTAF. Default for MLOCA. Pressure not low added to rule to remove conflict (BDW), **NEVER TRUE FOR LLOCA**
SEALCOOL	-(BI=S*BI=F)	Dummy rule because pump seal cooling not important in MLOCA. Renamed from LK12F (BDW)
PORVFL	BI=S*BI=F	Stuck open PZR PORV not important in MLOCA so guaranteed false. LK13F renamed to PORVFL. LK15F deleted (BDW)
RECOOL	((LA=S*RA=S*SI38A=S*-SLBRKA +LB=S*RB=S*SI38B=S*-SLBRKB +LC=S*RC=S*SI38A=S*-SLBRKC)*RX=S)*SUMP=S*FBLK=S*BORON=S	Recirculation cooling using LHSI and RHR HX (BDW); **1/3 FOR SUCCESS, ADDED CL INJECTION VALVE AND BREAK LOCATION DEPENDENCIES; AND LOGIC FOR GSI191 FAILURE MODES**
CSI	SPRYAS+SPRYBS+SPRYCS	Containment spray injection success (BDW), **CHANGED TO NEW SPRAY SUCCESS MACROS**
CSR	LATESPRYA+LATESPRYB+LATESPRYC	Containment spray recirculation success (BDW), **CHANGED TO NEW LATE SPRAY RECIRCULATION MACROS FOR GSI-191**

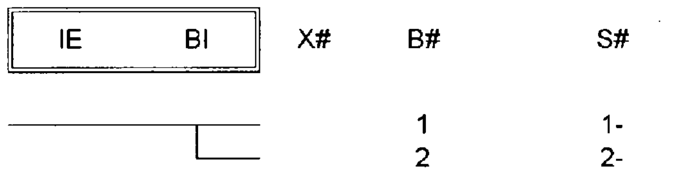
Table A.4.3-1 PDSML Macro Logic for Plant Damage State Assignment (Continued)

ISOFAILS	CI=F	Small containment isolation failure (BDW); **LARGE ISOLATION FAILURES ARE MODELED IN CET VIA SF L1B WHICH ENTERS INTO MACRO:= ELARGE**
CNTINTB	BI=S*BI=F	Containment bypass not applicable for MLOCA sequences (BDW)
SIANY	SI38A=S*PA=S*-SLBRKA*(HA=S+LA=S) +SI38B=S*PA=S*-SLBRKB*(HB=S+LB=S) + SI38C=S*PA=S*-SLBRKC*(HC=S+LC=S)	SI success using any pump (BDW); **CHANGED TO INCLUDE LOGIC FOR CL INJECTION VALVES, RWST SUCTION LINES, AND FOR BREAK LOCATION AS WELL AS HPI AND LHSI PUMPS, SPRAY INJECTION REPRESENTED SEPARATELY BY CSI MACRO**
SUCC	**AI=S*-VI=F*(SUCCHHSI+ILLOCA)*SUCCLHSIR * N2=S * (RX=S + RX=F*CP=S*CF=S)*-SUMP=F*-FBLK=F*-HLEG=F**	**No core damage FOR MLOCA; Success of ACCUMULATORS, PTS,HPI, & LHSI VIA N2, AND THEN LHSI RECIRCULATION WITH COOLING BY RX OR VIA FC ;AND NO GSI191 FAILURE MECHANISMS**
SUCCHHSI	**((HA=S*SI38A=S*PA=S*-SLBRKA*-HHSIA*-SICOMA)+(HB=S*SI38B=S*PB=S*-SLBRKB*-HHSIB*-SICOMB)+(HC=S*SI38C=S*PZ=S*-SLBRKC*-HHSIC*-SICOMC))**	**SUCCESSFUL HHSI 1/3 INJECTION TO UNBROKEN LOOP, NOT NEEDED FOR RECIRCULATION**
SUCCLHSIR	**((LA=S*SI38A=S*PA=S*-SLBRKA*-LHSIA*-SICOMA*RA=S)+(LB=S*SI38B=S*PB=S*-SLBRKB*-LHSIB*-SICOMB*RB=S)+(LC=S*SI38C=S*PZ=S*-SLBRKC*-LHSIC*-SICOMC*RC=S))**	**SUCCESFUL LHSI 1/3 TO UNBROKEN LOOP, ALSO NEEDED FOR RECIRCULATION**

Table A.4.3-2 Plant Damage State Assignment Rules for Medium and Large LOCAs

MELT	(-SUCC*-SUMP=F*-FBLK=F*-(HLEG=S*BORON=F))	MELT SEQUENCES WITHOUT G191 EFFECTS
MELTSUMP	SUMP=F*-SUCC	ADDED MELT SEQUENCES DUE TO SUMP STRAINER ISSUES
MELTFBLK	FBLK=F*-SUCC	ADDED MELT SEQUENCES DUE TO FUEL FLOW BLOCKAGE
MELTBORON	BORON=F*HLEG=S*-SUCC	ADDED MELT SEQUENCES DUE TO BORON PRECIPITATION BUT WITH HLEG=S
SUCCESS	**1**	**SUCCESS SEQUENCES (NOT CORE DAMAGE)**

Event Tree: PDSML.ETI 09:45:45 June 19



A.4.4 Level 2 Containment Event Tree for Medium and Large LOCA events

The Level 2 containment event tree developed for Revision 7.1 of the STP PRA (Reference 2) is used as is for the GSI-191 project. This includes the definition of release categories and the grouping of release categories into four release category groups; i.e., RELI, RELII, RELIII, and RELIV. One difference is in the logic defining the macros used in the CET. These macros are those defined in Table A.4.3-1. Because the containment spray top events CSR and WI were removed and the new Top Event CS added, the macro logic was changed to reflect these differences; i.e., macros for containment spray injection (CSI), containment spray recirculation (CSR) and for any means of injecting RWST water into the containment (SIANY) were changed. Also, the macro for recirculation cooling (RECOOL) was changed to explicitly add the dependencies for cold leg injection check valves and break location to the recirculation cooling macro. For convenience, the four release category groups are defined in Table A.4.4-1.

Table A.4.4-1 Definition of Release Category Groups

Release Category Group description	GROUP
Total CDF	PDS
Early large containment failure: before or at vessel breach (CP=F), early H2 burn	RELI
Early small containment failure: before or at vessel breach, early H2 burn	RELII
Late: overpressure, burn, or large late failure	RELIII
No release, intact containment	RELIV

A.5 References

1. STPEGS Level 2 PSA and Individual Plant Examination, August 1992.

2. "Medium Loss of Coolant Accident (LOCA) Event Tree (MLOCA,LTMLOCA,PDSML)," Revision 7, prepared by Mary Anne Billings and Chase Gilmore for South Texas Project Electric Generating Station, Probabilistic Risk Assessment, June 18, 2012.

Appendix B. RISKMAN Modeling Changes for Medium and Large LOCA Event Trees

B.1 Introduction

For the GSI-191 project, the STP_REV7.1 RISKMAN model was changed to reflect the GSI-191 sequence model changes and to incorporate the associated phenomena. The changes to the frontline event tree structures and top events are presented in Appendix A, i.e., for event trees MLOCA and LTMLOCA. This appendix presents the split fraction rules, macros, and binning logic for the event trees that have changed for this project. Further, the master frequency file used for the GSI-191 quantification, both for the revised base case and for the quantification with GSI-191 phenomena included is also provided; i.e., the same master frequency file is used for both quantifications, but the ones representing GSI-191 phenomena are not used in the base case quantification.

B.2 Event Tree Rule Changes

As described in Appendix A, a single set of linked event trees is used to quantify both the medium LOCA and large LOCA initiating events. The event tree names linked are the same as for the medium LOCA initiating event in model STP_REV7.1. This linked set is as follows:

SEISET
PMET
OFFGRID
EPONSITE
MECHSUP
MLOCA
LTMLOCA
PDSML
CET (for Level 2 release categories only)

The only event trees in this linked set that required split fraction rule changes are for MLOCA (Table B.2-1) and LTMLOCA (Table B.2-2). The event trees that required macro logic changes are: PMET (Table B.2-3), EPONSITE (Table B.2-4), MLOCA (Table B.2-5), and PDSML (Table B.2-6). Only event tree PDSML required bin assignment rule changes (Table B.2-7) because it is at the end of the linked event trees for the Level 1 quantification. No changes were made to the Level 2 binning rules. The full set of event tree rules is presented in each table with the changed rules shown in red. The bin assignment rules shown in Table B.2-7 were reordered depending on the analysis outcomes being evaluated. Recall that the first binning rule satisfied when evaluating top to bottom is assigned to a given sequence.

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree

Split Fraction	Rule	Comment
TTZ	(IA=F+SPR=F)*(IB=F+SPS=F)	
TTC	IB=F+SPS=F	
TTB	IA=F+SPR=F	
TTA	1	
SGIY	ILLOCA	**ELIMINATED SG ISOLATION FAILURES FOR LLOCA SINCE RCS ALREADY DEPRESSURIZES VERY FAST**
SGIZ	SGIF	Modified to reflect changes in REV61 Feedwater Isolation Modeling
SGIC	IB=F*OR=F+DB=F+SGISB	Modified to reflect changes in REV61 Feedwater Isolation Modeling
SGIB	IA=F*OR=F+DA=F+SGISA	Modified to reflect changes in REV61 Feedwater Isolation Modeling
SGIA	OR=S+IA=S*IB=S+DA=S*DB= S	Modified to reflect changes in REV61 Feedwater Isolation Modeling
VIA	1	
SI38AZ	SLBRKA*-SLBRKA	**REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT**
SI38AA	1	
SI38BZ	SLBRKB*-SLBRKB	**REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT**
SI38BC	SLBRKA*-SLBRKA	**REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT**
SI38BB	SI38A=F	POTENTIAL CCF THOUGH NOT MODELED
SI38BA	1	
SI38CZ	SLBRKC*-SLBRKC	**REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT**

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
SI38CH	SLBRKB*-SLBRKB*SI38A=F	REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT
SI38CG	SLBRKB*-SLBRKB	REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT
SI38CF	SLBRKA*-SLBRKA*SI38B=F	REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT
SI38CE	SLBRKA*-SLBRKA	REMOVED DEPENDENCE ON SLBRKA,B,C, AND ADDED IT TO ACCUMULATOR RULES SEPARATELY FOR BOTH MLOCA AND LLOCA; FLOW DIVERSION HAS DIFFERENT IMPACT
SI38CD	SI38A=F*SI38B=F	POTENTIAL CCF THOUGH NOT MODELED
SI38CC	SI38A=F	POTENTIAL CCF THOUGH NOT MODELED
SI38CB	SI38B=F	POTENTIAL CCF THOUGH NOT MODELED
SI38CA	1	
AIMLZ	((SI38A=F+ACCA+SLBRKA)*(SI38B=F+ACCB+SLBRKB)*(SI38C=F+ACCC+SLBRKC)+VI=F)*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIMLA	((SI38B=F+ACCB+SLBRKB)*(SI38C=F+ACCC+SLBRKC))*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIMLB	((SI38A=F+ACCA+SLBRKA)*(SI38C=F+ACCC+SLBRKC))*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIMLC	((SI38A=F+ACCA+SLBRKA)*(SI38B=F+ACCB+SLBRKB))*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIMLBC	(SI38A=F+ACCA+SLBRKA)*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
AIMLAC	(SI38B=F+ACCB+SLBRKB)*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIMLAB	(SI38C=F+ACCC+SLBRKC)*IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AIML	IMLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AILLZ	((SI38A=F+ACCA+SLBRKA)*(SI38B=F+ACCB+SI38C=F+ACCC+SLBRKB+SLBRKC)+(SI38B=F+ACCB+SLBRKB)*(SI38C=F+ACCC+SLBRKC))*ILLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AILLBC	(SI38A=F+ACCA+SLBRKA)*ILLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AILLAC	(SI38B=F+ACCB+SLBRKB)*ILLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AILLAB	(SI38C=F+ACCC+SLBRKC)*ILLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
AILL	ILLOCA	RV51 RMTS macro added.; ADDED DEPENDENCE ON SLBRK LOCATION; AND ADDED RESTRICTION TO MLOCA OR LLOCA IES
CPG	PGOPEN*CNTPGA*CNTPGB	NO CHANGES REQUIRED FOR GSI-191
CPF	PGOPEN*CNTPGB	
CPH	PGOPEN*CNTPGA	
CPE	PGOPEN	
CPC	CNTPGA*CNTPGB	
CPB	CNTPGB	
CPD	CNTPGA	
CPA	1	
CIZ	CNTIB*(CNTIA+CNTIC)	NO CHANGES REQUIRED FOR GSI-191
CIC	CNTIB	
CIE	CNTIA*CNTIC	
CIB	CNTIA	

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
CID	CNTIC	
CIA	1	
CFZ	FNCLRA*FNCLRB*FNCLRC	NO CHANGES REQUIRED FOR GSI-191
CFU	ACRUN*FNCLRB*FNCLRC	
CFT	BCRUN*FNCLRB*FNCLRC	
CFS	ABRUN*FNCLRB*FNCLRC	
CFR	ACRUN*FNCLRA*FNCLRC	
CFQ	BCRUN*FNCLRA*FNCLRC	
CFP	ABRUN*FNCLRA*FNCLRC	
CFO	ACRUN*FNCLRA*FNCLRB	
CFN	BCRUN*FNCLRA*FNCLRB	
CFM	ABRUN*FNCLRA*FNCLRB	
CFL	ACRUN*FNCLRC	
CFK	BCRUN*FNCLRC	
CFJ	ABRUN*FNCLRC	
CFI	ACRUN*FNCLRB	
CFH	BCRUN*FNCLRB	
CFG	ABRUN*FNCLRB	
CFF	ACRUN*FNCLRA	
CFE	BCRUN*FNCLRA	
CFD	ABRUN*FNCLRA	
CFC	ACRUN	
CFB	BCRUN	
CFA	ABRUN	
PAZ	ECCSA	NOTE: ECCSA,B,C DOES NOT INCLUDE DEPENDENCE ON SLBRKA NOR SI38A (B,C), **LATER MUST INCLUDE IN N2 RULES AND SUCCESS MACRO FOR INJECTION**
PAA	1	
PBZ	ECCSB	NOTE: ECCSA,B,C DOES NOT INCLUDE DEPENDENCE ON SLBRKA NOR SI38A (B,C), **LATER MUST INCLUDE IN N2 RULES AND SUCCESS MACRO FOR INJECTION**
PBC	ECCSA	
PBB	PA=F	
PBA	1	
PZZ	ECCSC	NOTE: ECCSA,B,C DOES NOT INCLUDE DEPENDENCE ON SLBRKA NOR SI38A (B,C), **LATER MUST INCLUDE IN N2 RULES AND SUCCESS MACRO FOR INJECTION**

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
PZI	ECCSA*ECCSB	
PZH	ECCSB*PA=F	
PZG	ECCSB	
PZF	ECCSA*PB=F	
PZE	ECCSA	
PZD	PA=F*PB=F	
PZC	PA=F	
PZB	PB=F	
PZA	1	
HAZ	HHSIA+SI38A=F*-SLBRKA	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HAA	1	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HBZ	HHSIB+ SI38B=F*-SLBRKB	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HBC	HHSIA+SI38A=F*-SLBRKA	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HBB	HA=F	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
HBA	1	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCZ	HHSIC+SI38C=F*-SLBRKC	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCI	(HHSIA+SI38A=F*-SLBRKA)*(HHSIB+SI38B=F*-SLBRKA)	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCH	(HHSIB+SI38B=F*-SLBRKB)*HA=F	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCG	HHSIB+SI38B=F*-SLBRKB	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCF	(HHSIA+SI38A=F*-SLBRKA)*HB=F	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO
HCE	HHSIA+SI38A=F*-SLBRKA	REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
HCD	HA=F*HB=F	**REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO**
HCC	HA=F	**REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO**
HCB	HB=F	**REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO**
HCA	1	**REMOVED DEPENDENCE ON VI, ADDED SI38A,B,C DEPENDENCE SINCE PUMPS FAIL ONLY IF NOT THE BROKEN LOOP WHEN CL VALVE FTO, LATER ASSUME CL INJECTION PATH IS NEEDED FOR SUCCESSFUL RCS INJECTION IN N2 RULE AND SUCC MACRO**
LAZ	LHSIA+SI38A=F*-SLBRKA	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LAA	1	
LBZ	LHSIB+SI38B=F*-SLBRKB	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LBC	LHSIA+SI38A=F*-SLBRKA	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
LBB	LA=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LBA	1	
LCZ	LHSIC+SI38C=F*-SLBRKC	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCI	(LHSIA+SI38A=F*-SLBRKA)*(LHSIB+SI38B=F*-SLBRKB)	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCH	(LHSIB+SI38B=F*-SLBRKB)*LA=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCG	LHSIB+SI38B=F*-SLBRKB	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCF	(LHSIA+SI38A=F*-SLBRKA)*LB=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCE	LHSIA+SI38A=F*-SLBRKA	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
LCD	LA=F*LB=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCC	LA=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCB	LB=F	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
LCA	1	LHSIA,B,C INCLUDES RWST SUCTION ON PA AND BREAK LOCATION VIA SLBRKA, BUT ONLY FOR LLOCAS, NOT MLOCAS, DELETED BREAK LOCATION DEPENDENCE FOR LLOCAS EXCEPT AS SAVING PUMP WHEN CL VALVE FAILS TO OPEN
CS1AA	**CS = CSABC * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)**	**CS = CSABC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C**
CS1AB	**CS = CSABC * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)**	**CS = CSABC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C**
CS1AC	**CS = CSABC * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)**	**CS = CSABC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C**
CS1AD	**CS = CSABC * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)**	**CS = CSABC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C**
CS1AE	**CS = CSABC * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)**	**CS = CSABC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C**
CS1AF	**CS = CSABC * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)**	**CS = CSABC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C**

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
CS1AG	CS = CSABC * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSABC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS1AH	CS = CSABC * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSABC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS2AA	CS = CSAB * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAB and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS2AB	CS = CSAB * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAB and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS2AC	CS = CSAB * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAB and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS2AD	CS = CSAB * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAB and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS2AE	CS = CSAB * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSAB and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS2AF	CS = CSAB * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSAB and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS2AG	CS = CSAB * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSAB and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS2AH	CS = CSAB * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSAB and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS3AA	CS = CSAC * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS3AB	CS = CSAC * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS3AC	CS = CSAC * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS3AD	CS = CSAC * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSAC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS3AE	CS = CSAC * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSAC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS3AF	CS = CSAC * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSAC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
CS3AG	CS = CSAC * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSAC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS3AH	CS = CSAC * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSAC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS4AA	CS = CSBC * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSBC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS4AB	CS = CSBC * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSBC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS4AC	CS = CSBC * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSBC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS4AD	CS = CSBC * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSBC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS4AE	CS = CSBC * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSBC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS4AF	CS = CSBC * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSBC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS4AG	CS = CSBC * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSBC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS4AH	CS = CSBC * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSBC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS5AA	CS = CSA * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSA and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS5AB	CS = CSA * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSA and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS5AC	CS = CSA * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSA and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS5AD	CS = CSA * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSA and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS5AE	CS = CSA * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSA and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS5AF	CS = CSA * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSA and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
CS5AG	CS = CSA * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSA and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS5AH	CS = CSA * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSA and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS6AA	CS = CSB * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSB and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS6AB	CS = CSB * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSB and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS6AC	CS = CSB * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSB and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS6AD	CS = CSB * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSB and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS6AE	CS = CSB * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSB and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS6AF	CS = CSB * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSB and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS6AG	CS = CSB * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSB and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS6AH	CS = CSB * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSB and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS7AA	CS = CSC * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS7AB	CS = CSC * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS7AC	CS = CSC * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS7AD	CS = CSC * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS7AE	CS = CSC * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSC and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS7AF	CS = CSC * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSC and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C

Table B.2-1 Split Fraction Rule Changes for MLOCA Event Tree (Continued)

Split Fraction	Rule	Comment
CS7AG	CS = CSC * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSC and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS7AH	CS = CSC * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSC and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS8AA	CS = CSNO * (-CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSNO and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS8AB	CS = CSNO * (CS_CSPRYAF * -CS_CSPRYBF * -CS_CSPRYCF)	CS = CSNO and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Success: CSS SUPPORT C
CS8AC	CS = CSNO * (-CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSNO and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS8AD	CS = CSNO * (CS_CSPRYAF * CS_CSPRYBF * -CS_CSPRYCF)	CS = CSNO and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Success: CSS SUPPORT C
CS8AE	CS = CSNO * (-CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSNO and Success: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS8AF	CS = CSNO * (CS_CSPRYAF * -CS_CSPRYBF * CS_CSPRYCF)	CS = CSNO and Failed: CSS SUPPORT A and Success: CSS SUPPORT B and Failed: CSS SUPPORT C
CS8AG	CS = CSNO * (-CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSNO and Success: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
CS8AH	CS = CSNO * (CS_CSPRYAF * CS_CSPRYBF * CS_CSPRYCF)	CS = CSNO and Failed: CSS SUPPORT A and Failed: CSS SUPPORT B and Failed: CSS SUPPORT C
OS1Z	CS=CSABC	OPERATOR ACTION ONLY CREDITED FOR STATE WITH ALL THREE SPRAY TRAINS INJECTING, STATE CSABC
OS1Y	1	ADDED FOR COMPLETENESS BUT OPERATOR ACTION IS NOT ASKED FOR STATES OTHER THAN WITH ALL 3 TRAINS OF SPRAY INJECTING

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA

Split Fraction	Rule	Comment
N2Z	(SI38A=F+PA=F+HA=F+SLBRKA+HHSIA)*(SI38B=F+PB=F+HB=F+SLBRKB+HHSIB)*(SI38C=F+PZ=F+HC=F+SLBRKC+HHSIC)*IMLOCA+VI=F+AI=F+(SI38A=F+PA=F+LA=F+SLBRKA+LHSIA)*(SI38B=F+PB=F+LB=F+SLBRKB+LHSIB)*(SI38C=F+PZ=F+LC=F+SLBRKC+LHSIC)	**"Modified for Hot Leg and Accumulator changes"; FOR GSI191,ADDED LOGIC FOR BREAK TRAIN LOCATION SINCE NOW EXCLUDED FROM MACROS SI38A,B,C; ALSO ADDED LOGIC FOR LHSI SINCE MOVED UP TO EARLY TREE ,LHSI AND HHSI CONSIDERED SEPARATELY**
N2Y	1	**AND ADDED DEPENDENCE ON HHSI ONLY FOR MLOCA SINCE THIS TREE NOW SHARED WITH LLOCA; ALSO ADDED ACCUMULATOR DEPENDENCE SINCE MISSING FROM REV 6 AND REV 7.1 (THOUGH INCLUDED IN MACRO SUCCESS)**
RAZ	SWA+ECCSA	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RAA	1	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RBZ	SWB+ECCSB	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RBC	SWA+ECCSA	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RBB	RA=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
RBA	1	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCZ	SWC+ECCSC	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCJ	(SWA+ECCSA)*(SWB+ECCSB)	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCH	(SWB+ECCSB)*RA=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCG	SWB+ECCSB	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCF	(SWA+ECCSA)*RB=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCE	SWA+ECCSA	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCD	RA=F*RB=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
RCC	RA=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCB	RB=F	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
RCA	1	SWA,B,C MACROS ALSO INCLUDES PA,B,C=F; THAT'S OK BUT; **DROPPING SI38A,B,C=F DEPENDENCE WHICH IS NOT REQUIRED FOR CONTAINMENT SPRAY, ECCSA,B,C CONSIDERS SICOMA,B,C AND SUPPORTS**
OFFSZ	1	DUMMY AWAITING REAL VALUES FROM CASA GRANDE
SUMPY	INIT=MLBASE+INIT=ML2BAS+ INIT=LLBASE+INIT=LL2BAS	**NO SUMP FAILURES IF EXCLUDE GSI-191 PHENOMENA**
SUML1	(INIT=MLOCA+INIT=MLOCA2) *STRNRID1	**MLOCA WITH GSI-191 SUMP PLUGGING**
SUML9	(INIT=MLOCA+INIT=MLOCA2) *STRNRID9	**MLOCA WITH GSI-191 SUMP PLUGGING**
SUML22	(INIT=MLOCA+INIT=MLOCA2) *STRNRID22	**MLOCA WITH GSI-191 SUMP PLUGGING**
SUML26	(INIT=MLOCA+INIT=MLOCA2) *STRNRID26	**MLOCA WITH GSI-191 SUMP PLUGGING**
SUML43	(INIT=MLOCA+INIT=MLOCA2) *STRNRID43	**MLOCA WITH GSI-191 SUMP PLUGGING**
SULL1	(INIT=LLOCA+INIT=LLOCA2)* STRNRID1	**LLOCA WITH GSI-191 SUMP PLUGGING**
SULL9	(INIT=LLOCA+INIT=LLOCA2)* STRNRID9	**LLOCA WITH GSI-191 SUMP PLUGGING**
SULL22	(INIT=LLOCA+INIT=LLOCA2)* STRNRID22	**LLOCA WITH GSI-191 SUMP PLUGGING**
SULL26	(INIT=LLOCA+INIT=LLOCA2)* STRNRID26	**LLOCA WITH GSI-191 SUMP PLUGGING**
SULL43	(INIT=LLOCA+INIT=LLOCA2)* STRNRID43	**LLOCA WITH GSI-191 SUMP PLUGGING**
SUMPZ	1	**DEFAULT FOR REMAINING 64-16=48 PUMP COMBINATION CASE IDS**
HLEGY	IMLOCA *-IMLOCA	**NOW ASKING HLEG SWITCHOVER FOR BOTH LLOCA AND MLOCA; STPREV7.1 ASSUMPTION DID NOT REQUIRE FOR MLOCA**

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
HLEGZ	HLEGA*HLEGB*HLEGC	REWRITTEN FROM LLOCA RULES TO REFLECT HL SWITCHOVER GUIDANCE, IF NO TRAINS AVAILABLE THEN FAIL
HLEGZ	HLEGA*HLEGB +HLEGA*HLEGC +HLEGB*HLEGC	FAIL IF ONLY 1 TRAIN AVAILABLE SINCE 2 REQUIRED BY PROCEDURE
HLEGAB	(-HLEGA*-HLEGB*-HLEGC*-SLBRKA*-SLBRKB)	3 TRAINS AVAILABLE AND SWITCH 2 BY PROCEDURE, NEITHER IS BROKEN LOOP, A&B PREFRRED TO SWITCH
HLEGA	(-HLEGA*HLEGB*-HLEGC*-SLBRKA)+ (-HLEGA*-HLEGB*HLEGC*-SLBRKA) +(-HLEGA*-HLEGB*-HLEGC*-SLBRKA*SLBRKB)	A AND ONE OTHER TRAIN AVAILABLE AND TRAIN A NOT BROKEN OR ALL 3 AVAILABLE BUT B TRAIN BROKEN
HLEGB	(HLEGA*-HLEGB*-HLEGC*-SLBRKB) + (-HLEGA*-HLEGB*-HLEGC*SLBRKA*-SLBRKB)	B AND C TRAINS AVAILABLE AND B NOT BROKEN, B PREFERRED IF A UNAVAILABLE OR ALL 3 AVAILABLE BUT BUT A BROKEN
HLEGZ	1	ALL OTHER CASES NOT SUCCESS, MUST HAVE TWO AVAILABLE AND ASSUME BROKEN LOOP NOT KNOWN
FWY	INIT=MLBASE+INIT=ML2BAS+ INIT=LLBASE+INIT=LL2BAS	NO CORE FLOW BLOCKAGE FAILURES IF EXCLUDE GSI-191 PHENOMENA; I.E. BAS OR BASE IES
FML1	(INIT=MLOCA+INIT=MLOCA2) *VESSELID1	MLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FML9	(INIT=MLOCA+INIT=MLOCA2) *VESSELID9	MLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FML22	(INIT=MLOCA+INIT=MLOCA2) *VESSELID22	MLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FML26	(INIT=MLOCA+INIT=MLOCA2) *VESSELID26	MLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FML43	(INIT=MLOCA+INIT=MLOCA2) *VESSELID43	MLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FLL1	(INIT=LLOCA+INIT=LLOCA2)* VESSELID1	LLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FLL9	(INIT=LLOCA+INIT=LLOCA2)* VESSELID9	LLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FLL22	(INIT=LLOCA+INIT=LLOCA2)* VESSELID22	LLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FLL26	(INIT=LLOCA+INIT=LLOCA2)* VESSELID26	LLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FLL43	(INIT=LLOCA+INIT=LLOCA2)* VESSELID43	LLOCA WITH GSI-191 CORE FLOW BLOCKAGE
FWZ	1	DEFAULT FOR REMAINING 64-16=48 PUMP COMBINATION CASE IDS
BORON Y	(INIT=MLBASE+INIT=ML2BAS +INIT=LLBASE+INIT=LL2BAS) *HLEG=S	IF GSI-191 PHENOMENA EXCLUDED, AND HLEG=S THEN NO CHANCE OF BORON PRECIPITATION.

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
BORML	(INIT=MLBASE+INIT=ML2BAS) *HLEG=F	IF GSI-191 PHENOMENA EXCLUDED, AND HLEG=F THEN CHANCE OF BORON PRECIPITATION DETERMINED BY COLD LEG FRACTION FOR MLOCAS.
BORLL	(INIT=LLBASE+INIT=LL2BAS)* HLEG=F	IF GSI-191 PHENOMENA EXCLUDED, AND HLEG=F THEN CHANCE OF BORON PRECIPITATION DETERMINED BY COLD LEG FRACTION FOR LLOCAS.
BORML	(INIT=MLOCA+INIT=MLOCA2) *HLEG=F	IF GSI-191 PHENOMENA INCLUDED, AND HLEG=F THEN CHANCE OF BORON PRECIPITATION LIMITED BY COLD LEG FRACTION FOR MLOCAS.
BORLL	(INIT=LLOCA+INIT=LLOCA2)* HLEG=F	IF GSI-191 PHENOMENA INCLUDED, AND HLEG=F THEN CHANCE OF BORON PRECIPITATION LIMITED BY COLD LEG FRACTION FOR LLOCAS.
BML1S	(INIT=MLOCA+INIT=MLOCA2) *VESSELID1*HLEG=S	MLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BML9S	(INIT=MLOCA+INIT=MLOCA2) *VESSELID9*HLEG=S	MLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BML22S	(INIT=MLOCA+INIT=MLOCA2) *VESSELID22*HLEG=S	MLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BML26S	(INIT=MLOCA+INIT=MLOCA2) *VESSELID26*HLEG=S	MLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BML43S	(INIT=MLOCA+INIT=MLOCA2) *VESSELID43*HLEG=S	MLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BLL1S	(INIT=LLOCA+INIT=LLOCA2)* VESSELID1*HLEG=S	LLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BLL9S	(INIT=LLOCA+INIT=LLOCA2)* VESSELID9*HLEG=S	LLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER
BLL22S	(INIT=LLOCA+INIT=LLOCA2)* VESSELID22*HLEG=S	LLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
BLL26S	(INIT=LLOCA+INIT=LLOCA2)* VESSELID26*HLEG=S	**LLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER**
BLL43S	(INIT=LLOCA+INIT=LLOCA2)* VESSELID43*HLEG=S	**LLOCA WITH GSI-191 PHENOMENA INCLUDED, AND HLEG=S ,ONLY EARLY CHANCE OF BORON PRECIPITATION INCLUDED, BEFORE HLEG SWITCHOVER**
BMLGF	(INIT=MLOCA+INIT=MLOCA2)	**MLOCA WITH GSI-191 PHENOMENA INCLUDED, PUMP COMBINATION STATE DEFAULT FOR EARLY CHANCE OF BORON PRECIPITATION = CL FRACTION FOR MLOCAS, INDEPENDENT OF HLEG SWITCHOVER**
BLLGF	(INIT=LLOCA+INIT=LLOCA2)	**LLOCA WITH GSI-191 PHENOMENA INCLUDED, PUMP COMBINATION STATE DEFAULT FOR EARLY CHANCE OF BORON PRECIPITATION = CL FRACTION FOR LLOCAS, INDEPENDENT OF HLEG SWITCHOVER**
RXZ	(PA=F+HXA+LA=F+RA=F +SI38A=F +SLBRKA+LHSIA)*(PB=F+HX B+LB=F+RB=F+SI38B=F +SLBRKB+LHSIB)*(PZ=F+HX C+LC=F+RC=F+SI38C=F +SLBRKC+LHSIC) + SUMP=F	**ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C**
RX1A	(PA=F+HXA+LA=F+RA=F+SI3 8A=F+SLBRKA+LHSIA)*(PB=F +HXB+LB=F+RB=F+SI38B=F+ SLBRKB+LHSIB)	**ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C**
RX1B	(PA=F+HXA+LA=F+RA=F+SI3 8A=F+SLBRKA+LHSIA)*(PZ=F +HXC+LC=F+RC=F+SI38C=F+ SLBRKC+LHSIC)	**ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C**

Table B.2-2 Split Fraction Rule Changes for Event Tree LTMLOCA (Continued)

Split Fraction	Rule	Comment
RX1A	(PB=F+HXB+LB=F+RB=F+SI38B=F+SLBRKB+LHSIB)*(PZ=F+HXC+LC=F+RC=F+SI38C=F+SLBRKC+LHSIC)	ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C
RX2BC	PA=F+HXA+LA=F+RA=F+SI38A=F+SLBRKA+LHSIA	ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C
RX2AC	PB=F+HXB+LB=F+RB=F+SI38B=F+SLBRKB+LHSIB	ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C
RX2AB	PZ=F+HXC+LC=F+RC=F+SI38C=F+SLBRKC+LHSIC	ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C
RX3	1	ADDED IN CL INJECTION VALVES SI38A,B,C FOR LHSI, PA,B,C=F; AND POTENTIAL FOR SLBRKA,B,C SINCE INTERESTED IN AVOIDING CORE DAMAGE HERE, ALSO ADDED SUMP=F FROM GSI191 BUT LEFT OUT FUEL BLOCKAGE OR BORON PRECIPITATION, ADDED PMET GENST MACROS: LHSIA,B,C
	see comment	DELETED ALL WI AND CSR SFS SINCE NO LONGER NEEDED, SPRAY IS NOW ALWAYS ASKED IN THE EARLY MLOCA TREE, AND RECIRC IS DETERMINED BY MACROS AFTER RECIRCULATION QUESTIONS ASKED

Table B.2-3 Changes to Macro Rules for Event Tree PMET

Event Tree	Macro	Rule	Comment
PMET	ABRUN	-(TYPE=F+TYPE=S)+GENST=CFCORR+GENST=MSNPM1+GENST=GENS3+GENST=GENS6+GENST=GENS9+GENST=GENS12	Macro ABRUN sets initial plant support configuration. In this configuration trains A&B of EW, EABHVAC, CRHVAC, and ECH running, Train A CCW and Train B CVCS are running
PMET	BCRUN	-(TYPE=F+TYPE=S)+GENST=MSNPM2+GENST=GENS1+GENST=GENS4+GENST=GENS7+GENST=GENS10+GENST=GENS13	Macro BCRUN sets initial plant support configuration. In this configuration trains B&C of EW, EABHVAC, CRHVAC, and ECH running, Train B CCW and Train B CVCS are running
PMET	ACRUN	-(TYPE=F+TYPE=S)+GENST=MSNPM3+GENST=GENS2+GENST=GENS5+GENST=GENS8+GENST=GENS11	Macro ACRUN sets initial plant support configuration. In this configuration trains A&C of EW, EABHVAC, CRHVAC, and ECH running, Train C CCW and Train A CVCS are running
PMET	PGOPEN	-(TYPE=F + TYPE=S)	Allows a quantification to be performed assuming the Supplemental Purge Line is open 100% of the time, and is used for quantifying individual maintenance states
PMET	BUSF	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 13.8kV Standby Bus F supply to E1A
PMET	BUSG	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 13.8kV Standby Bus G supply to E1B
PMET	BUSH	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 13.8kV Standby Bus H supply to E1C
PMET	E1AM	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 4.16kV Bus E1A
PMET	E1BM	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 4.16kV Bus E1B
PMET	E1CM	-(TYPE=F + TYPE=S)	RV51 RMTS macro, 4.16kV Bus E1C
PMET	MLOEW1	INIT=LOECW1 + INIT=LEW1L2 + INIT=LOECW4 + INIT=LEW4L2 + INIT=LOECW7 + INIT=LEW7L2	Tracks the status of support system initiators, one train of ECW
PMET	MLOEW2	INIT=LOECW2 + INIT=LEW2L2 + INIT=LOECW5 + INIT=LEW5L2 + INIT=LOECW8 + INIT=LEW8L2	Tracks the status of support system initiators, two trains of ECW

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	MLOEW3	INIT=LOECW3 + INIT=LEW3L2 + INIT=LOECW6 + INIT=LEW6L2 + INIT=LOECW9 + INIT=LEW9L2	Tracks the status of support system initiators, three trains of ECW
PMET	MLOCW1	INIT=LOCCW1 + INIT=LCC1L2 + INIT=LOCCW4 + INIT=LCC4L2 + INIT=LOCCW7 + INIT=LCC7L2	Tracks the status of support system initiators, one train of CCW
PMET	MLOCW2	INIT=LOCCW2 + INIT=LCC2L2 + INIT=LOCCW5 + INIT=LCC5L2 + INIT=LOCCW8 + INIT=LCC8L2	Tracks the status of support system initiators, two trains of CCW
PMET	MLOCW3	INIT=LOCCW3 + INIT=LCC3L2 + INIT=LOCCW6 + INIT=LCC6L2 + INIT=LOCCW9 + INIT=LCC9L2	Tracks the status of support system initiators, three trains of CCW
PMET	MLOCR1	INIT=LOCR1 + INIT=LCR1L2 + INIT=LOCR4 + INIT=LCR4L2 + INIT=LOCR7 + INIT=LCR7L2	Tracks the status of support system initiators, one train of CR HVAC
PMET	MLOCR2	INIT=LOCR2 + INIT=LCR2L2 + INIT=LOCR5 + INIT=LCR5L2 + INIT=LOCR8 + INIT=LCR8L2	Tracks the status of support system initiators, two trains of CR HVAC
PMET	MLOCR3	INIT=LOCR3 + INIT=LCR3L2 + INIT=LOCR6 + INIT=LCR6L2 + INIT=LOCR9 + INIT=LCR9L2	Tracks the status of support system initiators, three trains of CR HVAC
PMET	MLOEB1	INIT=LOEAB1 + INIT=LEB1L2 + INIT=LOEAB4 + INIT=LEB4L2 + INIT=LOEAB7 + INIT=LEB7L2	Tracks the status of support system initiators, one train of EAB HVAC
PMET	MLOEB2	INIT=LOEAB2 + INIT=LEB2L2 + INIT=LOEAB5 + INIT=LEB5L2 + INIT=LOEAB8 + INIT=LEB8L2	Tracks the status of support system initiators, two trains of EAB HVAC
PMET	MLOEB3	INIT=LOEAB3 + INIT=LEB3L2 + INIT=LOEAB6 + INIT=LEB6L2 + INIT=LOEAB9 + INIT=LEB9L2	Tracks the status of support system initiators, three trains of EAB HVAC
PMET	SSPSR	-(TYPE=F+TYPE=S)	Logic Train R maintenance
PMET	SSPSS	-(TYPE=F+TYPE=S)	Logic Train S maintenance
PMET	ESFA	-(TYPE=F+TYPE=S)	ESF Actuation Train A maintenance

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	ESFB	-(TYPE=F+TYPE=S)	ESF Actuation Train B maintenance
PMET	ESFC	-(TYPE=F+TYPE=S)	ESF Actuation Train C maintenance
PMET	SEQA	-(TYPE=F+TYPE=S)	Load Sequencer Train A maintenance
PMET	SEQB	-(TYPE=F+TYPE=S)	Load Sequencer Train B maintenance
PMET	SEQC	-(TYPE=F+TYPE=S)	Load Sequencer Train C maintenance
PMET	CFCA	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. Used for planned maintenance of RCFC Train A
PMET	CFCA1	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenance of RCFC Fan Unit 11A
PMET	CFCA2	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenance of RCFC Fan Unit 12A
PMET	CFCB	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. Used for planned maintenance of RCFC Train B
PMET	CFCB1	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenance of RCFC Fan Unit 11B
PMET	CFCB2	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenance of RCFC Fan Unit 12B
PMET	CFCC	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. Used for planned maintenance of RCFC Train C
PMET	CFCC1	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenance of RCFC Fan Unit 11C
PMET	CFCC2	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. This macro is not yet assigned. It models the planned maintenanceof RCFC Fan Unit 12C
PMET	HEA	-(TYPE=F+TYPE=S) + GENST=GENS4	Applies to maintenance on EAB HVAC Train A

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	HEB	-(TYPE=F+TYPE=S) + GENST=GENS5	Applies to maintenance on EAB HVAC train B
PMET	HEC	-(TYPE=F+TYPE=S) + GENST=GENS6	Applies to maintenance on EAB HVAC train C
PMET	EWA	-(TYPE=F+TYPE=S) + GENST=GENS1 + CCA * CHA300 * DGA	Applies to maintenance on ECW train A. Added CCA, CHA300 and DGA to eliminate feedback during planned maintenance
PMET	EWB	-(TYPE=F+TYPE=S) + GENST=GENS2 + CCB * CHB300 * DGB	Applies to maintenance on ECW train B Added CCB, CHB300 and DGB to eliminate feedback during planned maintenance
PMET	EWC	-(TYPE=F+TYPE=S) + GENST=GENS3 + CCC * CHC300 * DGC	Applies to maintenance on ECW train C Added CCC, CHC300 and DGC to eliminate feedback during planned maintenance
PMET	CCA	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. Applies to maintenance on CCW train A
PMET	CCB	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. Applies to maintenance on CCW train B
PMET	CCC	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. Applies to maintenance on CCW train C
PMET	CHA300	-(TYPE=F+TYPE=S) + GENST=GENS1 + GENST=GENS4	RV6-modified GENST assignment. Applies to maintenance on ECH Train A or 300 ton chiller
PMET	CHB300	-(TYPE=F+TYPE=S) + GENST=GENS2 + GENST=GENS5	RV6-modified GENST assignment. Applies to maintenance on ECH Train B or 300 ton chiller
PMET	CHC300	-(TYPE=F+TYPE=S) + GENST=GENS3 + GENST=GENS6	RV6-modified GENST assignment. Applies to maintenance on ECH Train C or 300 ton chiller
PMET	DGA	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. Applies to maintenance on emergency diesel generator train A
PMET	DGB	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. Applies to maintenance on emergency diesel generator train B

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	DGC	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. Applies to maintenance on emergency diesel generator train C
PMET	TSCDG	-(TYPE=F+TYPE=S)	Applies to maintenance on TSC diesel generator
PMET	BOPDG	-(TYPE=F+TYPE=S)	Applies to maintenance on BOP diesel generator
PMET	IA11	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument air compressor 11(21)
PMET	IA12	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument air compressor 12(22)
PMET	IA13	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument air compressor 13(23)
PMET	IA14	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument air compressor 14(24), diesel backed
PMET	PDP	-(TYPE=F+TYPE=S)	Applies to maintenance on PD Pump
PMET	SICOMA	-(TYPE=F+TYPE=S) + GENST=GENS7	Applies to maintenance on SI Common Train A
PMET	SICOMB	-(TYPE=F+TYPE=S) + GENST=GENS8	Applies to maintenance on SI Common Train B
PMET	SICOMC	-(TYPE=F+TYPE=S) + GENST=GENS9	Applies to maintenance on SI Common Train C
PMET	HHA	-(TYPE=F+TYPE=S) + GENST=GENS7	Applies to maintenance on HHSI train A
PMET	HHB	-(TYPE=F+TYPE=S) + GENST=GENS8	Applies to maintenance on HHSI train B
PMET	HHC	-(TYPE=F+TYPE=S) + GENST=GENS9	Applies to maintenance on HHSI train C
PMET	LHA	-(TYPE=F+TYPE=S) + GENST=GENS7	RV6-modified GENST assignment. Applies to maintenance on LHSI train A
PMET	LHB	-(TYPE=F+TYPE=S) + GENST=GENS8	RV6-modified GENST assignment. Applies to maintenance on LHSI train B
PMET	LHC	-(TYPE=F+TYPE=S) + GENST=GENS9	RV6-modified GENST assignment. Applies to maintenance on LHSI train C
PMET	ACCA	-(TYPE=F+TYPE=S)	RV51 RMTS macro, SI Accumulator A
PMET	ACCB	-(TYPE=F+TYPE=S)	RV51 RMTS macro, SI Accumulator B

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	ACCC	-(TYPE=F+TYPE=S)	RV51 RMTS macro, SI Accumulator C
PMET	CSA	-(TYPE=F+TYPE=S) + GENST=GENS7	Applies to maintenance on CS train A
PMET	CSB	-(TYPE=F+TYPE=S) + GENST=GENS8	Applies to maintenance on CS train B
PMET	CSC	-(TYPE=F+TYPE=S) + GENST=GENS9	Applies to maintenance on CS train C
PMET	CVA	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. Applies to maintenance on charging pump A (C elect. power)
PMET	CVB	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. Applies to maintenance on charging pump B (A elect power)
PMET	RHRA	-(TYPE=F+TYPE=S) + GENST=GENS1	RV6-modified GENST assignment. Applies to maintenance on RHR train A
PMET	RHRB	-(TYPE=F+TYPE=S) + GENST=GENS2	RV6-modified GENST assignment. Applies to maintenance on RHR train B
PMET	RHRC	-(TYPE=F+TYPE=S) + GENST=GENS3	RV6-modified GENST assignment. Applies to maintenance on RHR train C
PMET	PZPRVA	-(TYPE=F+TYPE=S)	Applies to maintenance on pressurizer PORV A
PMET	PZPRVB	-(TYPE=F+TYPE=S)	Applies to maintenance on pressurizer PORV B
PMET	MSISA	-(TYPE=F+TYPE=S)	RV51 RMTS macro, MS Isolation signal train A
PMET	MSISB	-(TYPE=F+TYPE=S)	RV51 RMTS macro, MS Isolation signal train B
PMET	SGISA	-(TYPE=F+TYPE=S)	REV61 macro, FW/MS Isolation signal train A
PMET	SGISB	-(TYPE=F+TYPE=S)	REV61 macro, FW/MS Isolation signal train B
PMET	SGPRVA	-(TYPE=F+TYPE=S) + GENST=GENS10	Applies to maintenance on SG A PORV
PMET	SGPRVB	-(TYPE=F+TYPE=S) + GENST=GENS11	Applies to maintenance on SG B PORV
PMET	SGPRVC	-(TYPE=F+TYPE=S) + GENST=GENS12	Applies to maintenance on SG C PORV
PMET	SGPRVD	-(TYPE=F+TYPE=S) + GENST=GENS13	Applies to maintenance on SG D PORV
PMET	AFWA	-(TYPE=F+TYPE=S) + GENST=GENS10	Applies to maintenance on AFW Train A
PMET	AFWB	-(TYPE=F+TYPE=S) + GENST=GENS11	Applies to maintenance on AFW Train B

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	AFWC	-(TYPE=F+TYPE=S) + GENST=GENS12	Applies to maintenance on AFW Train C
PMET	AFWD	-(TYPE=F+TYPE=S) + GENST=GENS13	Applies to maintenance on AFW Train D
PMET	QDAM	-(TYPE=F+TYPE=S)	Applies to maintenance on QDPS Train A
PMET	QDBM	-(TYPE=F+TYPE=S)	Applies to maintenance on QDPS Train B
PMET	QDCM	-(TYPE=F+TYPE=S)	Applies to maintenance on QDPS Train C
PMET	QDDM	-(TYPE=F+TYPE=S)	Applies to maintenance on QDPS Train D
PMET	INST1M	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument inverter Channel 1
PMET	INST2M	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument inverter Channel 2
PMET	INST3M	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument inverter Channel 3
PMET	INST4M	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument inverter Channel 4
PMET	INSTA	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument bus Channel 1
PMET	INSTB	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument bus Channel 2
PMET	INSTC	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument bus Channel 3
PMET	INSTD	-(TYPE=F+TYPE=S)	Applies to maintenance on instrument bus Channel 4
PMET	DCTA	-(TYPE=F+TYPE=S)	Planned maintenance on DC Battery E1A11
PMET	DCTB	-(TYPE=F+TYPE=S)	Planned maintenance on DC Battery E1B11
PMET	DCTC	-(TYPE=F+TYPE=S)	Planned maintenance on DC Battery E1C11
PMET	DCTD	-(TYPE=F+TYPE=S)	Planned maintenance on DC Battery E1D11
PMET	SXAM	-(TYPE=F+TYPE=S)	Planned Maintenance on Station Auxiliary Transformer A
PMET	SXBM	-(TYPE=F+TYPE=S)	Planned Maintenance on Station Auxiliary Transformer B
PMET	ETRANS	-(TYPE=F+TYPE=S)	Applies to maintenance on emergency transformer
PMET	CRA	-(TYPE=F+TYPE=S)	Applies to maintenance on Control Room HVAC train A
PMET	CRB	-(TYPE=F+TYPE=S)	Applies to maintenance on Control Room HVAC train B

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	CRC	-(TYPE=F+TYPE=S)	Applies to maintenance on Control Room HVAC train C
PMET	EW1TRN	EWA*EWB + EWA*EWC + EWB*EWC	This macro is used to imply 2 ECW trains out of service due to maintenance
PMET	EW2TRN	EWA*-(EWB+EWC) + EWB*-(EWA+EWC) + EWC*-(EWA+EWB)	This macro is used to imply 1 ECW train out of service due to maintenance
PMET	EW3TRN	-(EWA+EWB+EWC)	This macro represents all ECW trains available
PMET	CC1TRN	CCA*CCB + CCA*CCC + CCB*CCC + EWA*EWB + EWA*EWC + EWB*EWC	This macro is used to imply 2 CCW trains out of service due to maintenance
PMET	CC2TRN	CCA*-(CCB+CCC) + CCB*-(CCA+CCC) + CCC*-(CCA+CCB) + EWA*-(EWB+EWC) + EWB*-(EWA+EWC) + EWC*-(EWA+EWB)	This macro is used to imply 1 CCW train out of service due to maintenance
PMET	CC3TRN	-(CCA+CCB+CCC+EWA+EWB+EWC)	This macro represents all CCW trains available
PMET	CR1TRN	CRA*CRB + CRA*CRC + CRB*CRC	This macro is used to imply 2 CR HVAC trains out of service due to maintenance
PMET	CR2TRN	CRA*-(CRB+CRC) + CRB*-(CRA+CRC) + CRC*-(CRA+CRB)	This macro is used to imply 1 CR HVAC train out of service due to maintenance
PMET	CR3TRN	-(CRA+CRB+CRC)	This macro represents all CR HAVC trains available
PMET	HE1TRN	HEA*HEB + HEA*HEC + HEB*HEC	This macro is used to imply 2 EAB HVAC trains out of service due to maintenance
PMET	HE2TRN	HEA*-(HEB+HEC) + HEB*-(HEA+HEC) + HEC*-(HEA+HEB)	This macro is used to imply 1 EAB HVAC train out of service due to maintenance
PMET	HE3TRN	-(HEA+HEB+HEC)	This macro represents all EAB HVAC trains available
PMET	AMSAC	-(TYPE=F+TYPE=S)	AMSAC not available
PMET	RTRIPR	-(TYPE=F+TYPE=S)	RV51 RMTS macro, Reactor Trip actuation signal train R
PMET	RTRIPS	-(TYPE=F+TYPE=S)	RV51 RMTS macro, Reactor Trip actuation signal train S

Table B.2-3 Changes to Macro Rules for Event Tree PMET (Continued)

Event Tree	Macro	Rule	Comment
PMET	CIPHAA	-(TYPE=F+TYPE=S)	RV51 RMTS macro, Containment Isolation Phase A signal train A
PMET	CIPHAB	-(TYPE=F+TYPE=S)	RV51 RMTS macro, Containment Isolation Phase A signal train B
PMET	CIPHAC	-(TYPE=F+TYPE=S)	RV51 RMTS macro, Containment Isolation Phase A signal train C
PMET	BLOCKA	-(TYPE=F+TYPE=S)	Pressurizer PORV 655A Train A blocked, only applicable when TYPE=F (CRMP or MAS models)
PMET	BLOCKB	-(TYPE=F+TYPE=S)	Pressurizer PORV 656A Train B blocked, only applicable when TYPE=F (CRMP or MAS models)
PMET	BLKAOPEN	-(TYPE=F+TYPE=S)	Pressurizer PORV 655A block valve stuck open - added for CRMP
PMET	BLKBOPEN	-(TYPE=F+TYPE=S)	ressurizer PORV 656A block valve stuck open - added for CRMP
PMET	SGMSSV	-(TYPE=F+TYPE=S)	RV51 RMTS macro, SG Safety Relieve Valve(s)
PMET	DCBUSA	-(TYPE=F+TYPE=S)	RV6 RMTS macro, DC BUS E1A11
PMET	DCBUSB	-(TYPE=F+TYPE=S)	RV6 RMTS macro, DC BUS E1B11
PMET	DCBUSC	-(TYPE=F+TYPE=S)	RV6 RMTS macro, DC BUS E1C11
PMET	DCBUSD	-(TYPE=F+TYPE=S)	RV6 RMTS macro, DC BUS E1D11
PMET	SMKPGALL	-(TYPE=F+TYPE=S)	RV6 macro, EAB HVAC Smoke Purge function - all trains (impact on DMZ split fraction)

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE

Event Tree	Macro	Rule	Comment
EPONSITE	PZRLP	ISLOCA+IILOCA+ISGTR+IRCRV+IRCPL	Macro identifies initiators assumed to initiate SI only as a result of Low Pressurizer Pressure. For SSPS split fractions
EPONSITE	LOCA	IMLOCA+ILLOCA+IELOCA+IRCR2	Other LOCA Initiators
EPONSITE	SINJ	PZRLP+ISLBD+ISLBI+LOCA	SI Initiating Events
EPONSITE	ACTRNA	EA=F*-(GA=F)+BF=F*-(GA=S+OM=S)*-EMXFA+IZ071X	Train A Essential AC Power fails if the bus is failed or offsite power is not available and EDG A is not available and the emergency transformer is not available for Train A
EPONSITE	ACTRNB	EB=F*-(GB=F)+BG=F*-(GB=S+OM=S)*-EMXFB+IZ071X+IZ047X+IZ047B+IZ47BC	Defines failure for Train B Essential AC Power. Same conditions as for Train A applied to Train B
EPONSITE	ACTRNC	EC=F*-(GC=F)+BH=F*-(GC=S+OM=S)*-EMXFC+IZ071X+IZ047X+IZ47BC	Defines failure for Train A Essential AC Power. Same conditions as for Train A applied to Train C
EPONSITE	INST1	EA=F*DA=F+SIV=F+INST1M*(EA=F+OG=F+BF=F+UA=F)+INSTA	Instrument Channel I Support. Power to QDPS Train A. Added maintenance macros INST1M and INSTA.
EPONSITE	INST2	EA=F*DD=F+SIV=F+INST2M*(EA=F+OG=F+BF=F+UA=F)+INSTB	Instrument Channel II Support. Power to QDPS Train D. Added maintenance macros INST2M and INSTB.
EPONSITE	INST3	EB=F*DB=F+SIV=F+INST3M*(EB=F+OG=F+BG=F+SXA=F*SXB=F)+INSTC	Instrument Channel III Support. Power to QDPS Train B. Added maintenance macros INST3M and INSTC.
EPONSITE	INST4	EC=F*DC=F+SIV=F+INST4M*(EC=F+OG=F+BH=F+UA=F)+INSTD	Instrument Channel IV Support. Power to QDPS Train C. Added maintenance macros INST4M and INSTD.

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	DGAGF	IFL26+IFLECW+ILOECW+SDG=F+DGA+EWA+IHWIND+DCTA+DCBUSA+DA=F+IZ071X	DGA failure due to support. Rev 5. RV6 RMTS macro added
EPONSITE	DGBGF	IFL26+IFLECW+ILOECW+SDG=F+DGB+EWB+IHWIND+DCTB+DCBUSB+DB=F+IZ047X+IZ071X+IZ47BC+IZ047B	DGB failure due to support. IZ047X fails associated 4.16kV bus. Rev 5. RV6 RMTS macro added
EPONSITE	DGCGF	IFL26+IFLECW+ILOECW+SDG=F+DGC+EWC+IHWIND+DCTC+DCBUSC+DC=F+IZ047X+IZ071X+IZ47BC	DGC failure due to support. IZ047X fails associated 4.16kV bus. Rev 5. RV6 RMTS macro added
EPONSITE	DGALL	GA=F*GB=F*GC=F	Failure of all three EDGs (any cause)
EPONSITE	DG2	GA=F*(GB=F+GC=F)+GB=F*GC=F	Failure of any two EDGs (any cause)
EPONSITE	DG1	GA=F+GB=F+GC=F	Failure of any EDG (any cause)
EPONSITE	DGMAINT	DGA+DCTA+DCBUSA+EWA+DGB+DCTB+DCBUSB+EWB+DGC+DCTC+DCBUSC+EWC	Maintenance on any EDG or ECW Train, RV6 added DC
EPONSITE	DGMNT2	(DGA+DCTA+DCBUSA+EWA)*(DGB+DCTB+DCBUSB+EWB+DGC+DCTC+DCBUSC+EWC)+(DGB+DCTB+DCBUSB+EWB)*(DGC+DCTC+DCBUSC+EWC)	Maintenance on combinations of 2 EDG/ECW Trains, RV6 added DC
EPONSITE	EMXFA	BF=F*-EMXFC*GA=F*OX=S	Emergency Transformer status for Train A. Bus F fails, EDG A isunavailable, and operator action to load the Emergency Transformer on Train A. Train C is assumed to have power. Macro is True if Transformer is available and aligned to Train A.
EPONSITE	EMXFB	BG=F*-(EMXFA+EMXFC)*GB=F*OX=S	Emergency Transformer status for Train B. Bus G fails, EDG B is unavailable, and operator action to load the Emergency Transformer on Train B. Trains A and C are assumed to have power. Macro isTrue if Transformer is available and aligned to Train

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	EMXFC	BH=F*GC=F*OX=S	Emergency Transformer status for Train C. Bus H fails, EDG C isunavailable, and operator action to load the Emergency Transformer on Train C. Train C is assumed to have the highest priority, then A then B. Macro is True if Transformer is available
EPONSITE	ECWA	ACTRNA+(BF=F+BCRUN)*(DA=F+IA=F*OR=F)+EWA	Defines failure for Train A ECW
EPONSITE	ECWB	ACTRNB+(BG=F+ACRUN)*(DB=F+IB=F*OR=F)+EWB	Defines failure for Train B ECW
EPONSITE	ECWC	ACTRNC+(BH=F+ABRUN)*(DC=F+IC=F*OR=F)+EWC	Defines failure for Train C ECW
EPONSITE	FANFA	ACTRNA+(BF=F+BCRUN)*(DA=F+IA=F*OR=F)+RESA+HEA	Defines failure for Train A EAB HVAC
EPONSITE	FANFB	ACTRNB+(BG=F+ACRUN)*(DB=F+IB=F*OR=F)+RESB+HEB	Defines failure for Train B EAB HVAC
EPONSITE	FANFC	ACTRNC+(BH=F+ABRUN)*(DC=F+IC=F*OR=F)+RESC+HEC	Defines failure for Train C EAB HVAC
EPONSITE	CCWA	ACTRNA+(BF=F+BCRUN+ACRUN)*(DA=F+IA=F*OR=F)+WA=F+EBHVAC+CCA+ILOCCW+IZ147O	Defines failure for Train A CCW
EPONSITE	CCWB	ACTRNB+(BG=F+ACRUN+ABRUN)*(DB=F+IB=F*OR=F)+WB=F+EBHVAC+CCB+ILOCCW+IZ147O	Defines failure for Train B CCW
EPONSITE	CCWC	ACTRNC+(BH=F+ABRUN+BCRUN)*(DC=F+IC=F*OR=F)+WC=F+EBHVAC+CCC+ILOCCW+IZ147O	Defines failure for Train C CCW
EPONSITE	INEA	ACTRNA+IA=F*OR=F+RESA	Defines failure for Train A Non-essential CCW
EPONSITE	INEB	ACTRNB+IB=F*OR=F+RESB	Defines failure for Train B Non-essential CCW
EPONSITE	INEC	ACTRNC+IC=F*OR=F+RESC+IZ147O	Defines failure for Train C Non-essential CCW
EPONSITE	MSIF	IZ047X+(DA=F+IA=F*OR=F+MSISA)*(DB=F+IB=F*OR=F+MSISB)*-ILOIA	MSIV Isolation signal failure or failure of MSIV support. RV51 added RMTS macro

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	SGIF	IZ047X+(DA=F+IA=F*OR=F+MSISA)*(DB=F+IB=F*OR=F+MSISB)*-ILOIA	Added in REV61. Copied from REV6 Macro MSIF. FW/MSIV Isolation signal failure or failure of FW/MSIV support. RV51 added RMTS macro
EPONSITE	SGPVA	AFAS+SGPRVA+QA=F+AC1=F	Defines failure for Train A SG PORV. Modified to reflect failure of QDPS Train A
EPONSITE	SGPVB	AFBS+SGPRVB+QB=F+AC3=F	Defines failure for Train B SG PORV. Modified to reflect failure of QDPS Train B
EPONSITE	SGPVC	AFCS+SGPRVC+QC=F+AC4=F	Defines failure for Train C SG PORV. Modified to reflect failure of QDPS Train C
EPONSITE	SGPVD	AFDS+ACTRNA+RESA+EBHVAC+SGPRVD+QD=F+AC2=F	Defines failure for Train D SG PORV. Modified to reflect failure of QDPS Train D
EPONSITE	AFAS	ACTRNA+DA=F+IA=F*AM=F*OR=F+RESA+EBHVAC+AFWA+IFR23+ILOCR*OR=F+SAF=F+IFR10+SLBRKA	Defines failure for Train A AFW Pump.
EPONSITE	AFBS	ACTRNB+DB=F+IB=F*AM=F*OR=F+RESB+EBHVAC+AFWB+IFR23+ILOCR*OR=F+SAF=F+IFR10+SLBRKB	Defines failure for Train B AFW Pump.
EPONSITE	AFCS	ACTRNC+DC=F+IC=F*AM=F*OR=F+RESC+EBHVAC+AFWC+IFR23+ILOCR*OR=F+SAF=F+IFR10+SLBRKC	Defines failure for Train C AFW Pump.
EPONSITE	AFDS	DD=F+IA=F*AM=F*OR=F+AFWD+IFR23+ILOCR*OR=F+SAF=F+SGI=F+SLBRKD+IZ071X	Defines failure for Train D AFW Pump.
EPONSITE	AFWS	AFA=F*AFB=F*AFC=F*AFD=F	AFW System Failure
EPONSITE	PORVA	DA=F+EBHVAC+PZPRVA	Defines failure for Train A Pressurizer PORV
EPONSITE	PORVB	DB=F+EBHVAC+PZPRVB+IZ047B+IZ47BC+IZ047X	Defines failure for Train B Pressurizer PORV
EPONSITE	LTDNCA	IC=F*OR=F	

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	ECCSA	ACTRNA+DA=F+IA=F*OR=F+RESA+EBHVAC+SICOMA+(ECA=F*-ECHA)*(ECB=F*-ECHB)*(ECC=S+BCRUN*(ECC=F*-ECHC))	Failure of ECCS common train A
EPONSITE	ECCSB	ACTRNB+DB=F+IB=F*OR=F+RESB+EBHVAC+SICOMB+(ECA=F*-ECHA)*(ECB=F*-ECHB)*(ECC=F*-ECHC)*PA=S	Failure of ECCS common train B
EPONSITE	ECCSC	ACTRNC+DC=F+IC=F*OR=F+RESC+EBHVAC+SICOMC+((ECA=F*-ECHA)*((ECB=F*-ECHB)+(ECC=F*-ECHC))+(ECB=F*-ECHB)*(ECC=F*-ECHC))*PA=S*PB=S+(ECA=F*-ECHA)*(ECB=F*-ECHB)*(ECC=F*-ECHC)*(PA=S+PB=S)	Failure of ECCS common train C
EPONSITE	**LHSIA**	**ECCSA+PA=F+LHA+IZ071X+IZ147O**	**Failure of HHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR LLOCA. (WAS NEVER THERE FOR MLOCAS)**
EPONSITE	**LHSIB**	**ECCSB+PB=F+LHB+IZ071X**	**Failure of LHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR LLOCA. (WAS NEVER THERE FOR MLOCAS)**
EPONSITE	**LHSIC**	**ECCSC+PZ=F+LHC+IZ071X**	**Failure of LHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR LLOCA. (WAS NEVER THERE FOR MLOCAS)**
EPONSITE	HHSIA	ECCSA+PA=F+HHA+IZ147O	**Failure of HHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR MLOCA.**
EPONSITE	HHSIB	ECCSB+PB=F+HHB	**Failure of HHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR MLOCA.**
EPONSITE	HHSIC	ECCSC+PZ=F+HHC	**Failure of HHSI Train , REMOVED DEPENDENCE ON SLBRKA,B,C FOR MLOCA.**

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	CSPRYA	ECCSA+PA=F+CSA+IZ147O	Failure of CSS Train A, TO BE USED IN TOP EVENT CS BOUNDARY CONDITION LOGIC
EPONSITE	CSPRYB	ECCSB+PB=F+CSB	Failure of CSS Train B, TO BE USED IN TOP EVENT CS BOUNDARY CONDITION LOGIC
EPONSITE	CSPRYC	ECCSC+PZ=F+CSC	Failure of CSS Train C, TO BE USED IN TOP EVENT CS BOUNDARY CONDITION LOGIC
EPONSITE	LATESPRYA	RA=S*SPRYAS*PA=S*-SICOMA*-OS1=S*-OFFS=S	TRAIN A SPRAY AVAILABLE FOR RECIRCULATION, ASSUME TRAIN A IS TURNED OFF EARLY WHEN PROCEDURES FOLLOWED
EPONSITE	LATESPRYB	RB=S*SPRYBS*PB=S*-SICOMB*-OFFS=S	TRAIN B SPRAY AVAILABLE FOR RECIRCULATION
EPONSITE	LATESPRYC	RC=S*SPRYCS*PZ=S*-SICOMC*-OFFS=S	TRAIN C SPRAY AVAILABLE FOR RECIRCULATION
EPONSITE	LATESPRY0	(-LATESPRYA*-LATESPRYB*-LATESPRYC)	0 TRAINS OF SPRAY RUNNING
EPONSITE	LATESPRY1	(LATESPRYA*-LATESPRYB*-LATESPRYC+ LATESPRYB*-LATESPRYA*-LATESPRYC+ LATESPRYC*-LATESPRYB*-LATESPRYA)	1 TRAY OF SPRAY RUNNING FOR RECIRCULATION
EPONSITE	LATESPRY2	(LATESPRYA*LATESPRYB*-LATESPRYC+ LATESPRYB*-LATESPRYA*LATESPRYC+ LATESPRYC*-LATESPRYB*LATESPRYA)	2 TRAINS WOF SPRAY RUNNING FOR RECIRCULATION
EPONSITE	LATESPRY3	LATESPRYA*LATESPRYB*LATESPRYC	3 TRAINS OF SPRAY RUNNING FOR RECIRCULATION
EPONSITE	NOSPRYA	CS=CSBC+CS=CSB+CS=CSC+CS=CSNO	MACROS FOR WHEN SPRAY TRAINS ARE NOT OPERATING FOR INJECTION IN TOP EVENT CS, A TRAIN ASSUMED SECURED BY OS1=S
EPONSITE	NOSPRYB	CS=CSAC+CS=CSA+CS=CSC+CS=CSNO	MACROS FOR WHEN SPRAY TRAINS ARE NOT OPERATING FOR INJECTION IN TOP EVENT CS

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	NOSPRYC	CS=CSAB+CS=CSA+CS=CSB+CS=CSNO	MACROS FOR WHEN SPRAY TRAINS ARE NOT OPERATING FOR INJECTION IN TOP EVENT CS
EPONSITE	SPRYAS	CS=CSABC+CS=CSAB+CS=CSAC+CS=CSA	MACROS FOR WHEN SPRAY TRAINS ARE OPERATING FOR INJECTION IN TOP EVENT CS
EPONSITE	SPRYBS	CS=CSABC+CS=CSAB+CS=CSBC+CS=CSB	MACROS FOR WHEN SPRAY TRAINS ARE OPERATING FOR INJECTION IN TOP EVENT CS
EPONSITE	SPRYCS	CS=CSABC+CS=CSAC+CS=CSBC+CS=CSC	MACROS FOR WHEN SPRAY TRAINS ARE OPERATING FOR INJECTION IN TOP EVENT CS
EPONSITE	LATEHSIAS	RA=S*-HHSIA*PA=S*HA=S*-SICOMA	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATEHSIBS	RB=S*-HHSIB*PB=S*HB=S*-SICOMB	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATEHSICS	RC=S*-HHSIC*PZ=S*HC=S*-SICOMC	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATEHHSI0	(-LATEHSIAS*-LATEHSIBS*-LATEHSICS)	0 TRAINS OF HHSI RUNNING IN RECIRCULATION
EPONSITE	LATEHHSI1	(LATEHSIAS*-LATEHSIBS*-LATEHSICS+ LATEHSIBS*-LATEHSIAS*-LATEHSICS+ LATEHSICS*-LATEHSIBS*-LATEHSIAS)	1 TRAY OF HHSI RUNNING FOR RECIRCULATION
EPONSITE	LATEHHSI2	(LATEHSIAS*LATEHSIBS*-LATEHSICS+ LATEHSIBS*-LATEHSIAS*LATEHSICS+ LATEHSICS*-LATEHSIBS*LATEHSIAS)	2 TRAINS OF HHSI RUNNING FOR RECIRCULATION
EPONSITE	LATEHHSI3	LATEHSIAS*LATEHSIBS*LATEHSICS	3 TRAINS OF HHSI RUNNING FOR RECIRCULATION

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	LATELSIAS	RA=S*-LHSIA*PA=S*LA=S*-SICOMA	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATELSIBS	RB=S*-LHSIB*PB=S*LB=S*-SICOMB	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATELSICS	RC=S*-LHSIC*PZ=S*LC=S*-SICOMC	ASSUME SUMP VALVES AND HHSI PUMPS REQUIRED BUT NOT CL INJECTION VALVES NOR INTACT LOOP
EPONSITE	LATELHSI0	(-LATELSIAS*-LATELSIBS*-LATELSICS)	0 TRAINS OF HHSI RUNNING IN RECIRCULATION
EPONSITE	LATELHSI1	(LATELSIAS*-LATELSIBS*-LATELSICS+ LATELSIBS*-LATELSIAS*-LATELSICS+ LATELSICS*-LATELSIBS*-LATELSIAS)	1 TRAY OF LHSI RUNNING FOR RECIRCULATION
EPONSITE	LATELHSI2	(LATELSIAS*LATELSIBS*-LATELSICS+ LATELSIBS*-LATELSIAS*LATELSICS+ LATELSICS*-LATELSIBS*LATELSIAS)	2 TRAINS OF LHSI RUNNING FOR RECIRCULATION
EPONSITE	LATELHSI3	LATELSIAS*LATELSIBS*LATELSICS	3 TRAINS OF LHSI RUNNING FOR RECIRCULATION
EPONSITE	PUMPID1	LATEHHSI3*LATELHSI3*LATESPRY3	PUMP COMBINATION STATE:=H3L3S3SUCC
EPONSITE	PUMPID22	LATEHHSI2*LATELHSI2*LATESPRY2	PUMP COMBINATION STATE:=H2L2S2SUCC
EPONSITE	PUMPID5	LATEHHSI3*LATELHSI2*LATESPRY3	PUMP COMBINATION STATE:=H3L2S3SUCC
EPONSITE	PUMPID2	LATEHHSI3*LATELHSI3*LATESPRY2	PUMP COMBINATION STATE:=H3L3S2SUCC
EPONSITE	PUMPID17	LATEHHSI2*LATELHSI3*LATESPRY3	PUMP COMBINATION STATE:=H2L3S3SUCC
EPONSITE	PUMPID21	LATEHHSI2*LATELHSI2*LATESPRY3	PUMP COMBINATION STATE:=H2L2S3SUCC
EPONSITE	PUMPID23	LATEHHSI2*LATELHSI2*LATESPRY1	PUMP COMBINATION STATE:=H2L2S1SUCC
EPONSITE	PUMPID3	LATEHHSI3*LATELHSI3*LATESPRY1	PUMP COMBINATION STATE:=H3L3S1SUCC
EPONSITE	PUMPID26	LATEHHSI2*LATELHSI1*LATESPRY2	PUMP COMBINATION STATE:=H2L1S2SUCC
EPONSITE	PUMPID6	LATEHHSI3*LATELHSI2*LATESPRY2	PUMP COMBINATION STATE:=H3L2S2SUCC

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	PUMPID43	LATEHHSI1*LATELHSI1*LATESPRY1	PUMP COMBINATION STATE:=H1L1S1SUCC
EPONSITE	PUMPID38	LATEHHSI1*LATELHSI2*LATESPRY2	PUMP COMBINATION STATE:=H1L2S2SUCC
EPONSITE	PUMPID9	LATEHHSI3*LATELHSI1*LATESPRY3	PUMP COMBINATION STATE:=H3L1S3SUCC
EPONSITE	PUMPID33	LATEHHSI1*LATELHSI3*LATESPRY3	PUMP COMBINATION STATE:=H1L3S3SUCC
EPONSITE	PUMPID18	LATEHHSI2*LATELHSI3*LATESPRY2	PUMP COMBINATION STATE:=H2L3S2SUCC
EPONSITE	PUMPID4	LATEHHSI3*LATELHSI3*LATESPRY0	PUMP COMBINATION STATE:=H3L3S0SUCC
EPONSITE	STRNRID1	PUMPID1+PUMPID2+PUMPID4	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR STRAINER FAILURE
EPONSITE	STRNRID9	PUMPID9	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR STRAINER FAILURE
EPONSITE	STRNRID22	PUMPID22+PUMPID5+PUMPID17+PUMPID21+PUMPID3+PUMPID6+PUMPID18+PUMPID33	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR STRAINER FAILURE
EPONSITE	STRNRID26	PUMPID26+PUMPID23+PUMPID38	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR STRAINER FAILURE
EPONSITE	STRNRID43	PUMPID43	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR STRAINER FAILURE
EPONSITE	VESSELID1	PUMPID1+PUMPID2	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR IN-VESSEL FAILURE
EPONSITE	VESSELID9	PUMPID9+PUMPID5+PUMPID17+PUMPID3+PUMPID6+PUMPID33+PUMPID18+PUMPID4	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR IN-VESSEL FAILURE
EPONSITE	VESSELID22	PUMPID22+PUMPID21	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR IN-VESSEL FAILURE
EPONSITE	VESSELID26	PUMPID26+PUMPID23+PUMPID38	PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR IN-VESSEL FAILURE

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	**VESSELID43**	**PUMPID43**	**PUMP COMBINATIONS MAPPED TO CASA GRANDE CASES FOR IN-VESSEL FAILURE**
EPONSITE	CNTPGA	IA=F*OR=F+CIPHAA	Defines failure for Train A Containment Purge, RV51 added RMTS macro
EPONSITE	CNTPGB	ACTRNB+IB=F*OR=F+RESB+EBHVAC+CIPHAB	Defines failure for Train B Containment Purge, RV51 added RMTS macro
EPONSITE	CNTIA	ACTRNA+IA=F*OR=F+RESA+EBHVAC+IZ071X+IZ147O+CIPHAA	Defines failure for Train A Containment Isolation, RV51 added RMTS macro
EPONSITE	CNTIB	ACTRNB+IB=F*OR=F+RESB+EBHVAC+CIPHAB	Defines failure for Train B Containment Isolation, RV51 added RMTS macro
EPONSITE	CNTIC	ACTRNC+IC=F*OR=F+RESC+EBHVAC+IZ071X+CIPHAC	Defines failure for Train C Containment Isolation, RV51 added RMTS macro
EPONSITE	SWA	ACTRNA+IA=F*OR=F+RESA+EBHVAC+PA=F+IZ147O	Defines failure for Train A SI Recirculation
EPONSITE	SWB	ACTRNB+IB=F*OR=F+RESB+EBHVAC+PB=F	Defines failure for Train B SI Recirculation
EPONSITE	SWC	ACTRNC+IC=F*OR=F+RESC+EBHVAC+PZ=F	Defines failure for Train C SI Recirculation
EPONSITE	LOOPGNR	IELOOPG*OGR=F*OM=F	Grid Related LOOP not recovered REV. 7
EPONSITE	LOOPPNR	IELOOPP*OGR=F*OM=F	Plant Centered LOOP not recovered REV. 7
EPONSITE	LOOPSNR	IELOOPS*OGR=F*OM=F	Switchyard Centered LOOP not recovered REV. 7
EPONSITE	LOOPWNR	IELOOPW*OGR=F*OM=F	Weather Related LOOP not recovered REV. 7
EPONSITE	**HLEGA**	**LA=F+RA=F+PA=F+SI38A=F+LHSIA**	**AVAILABILITY OF LHSI TRAIN A,B, OR C FOR HOT LEG, ASUME CL INJECTION PATH MUST HAVE WORKED; BREAK LOCATION UNKNOWN TO OPERATORS**

Table B.2-4 Changes to Macro Rules for Event Tree EPONSITE (Continued)

Event Tree	Macro	Rule	Comment
EPONSITE	HLEGB	LB=F+RB=F+PB=F+SI38B=F+LHSIB	AVAILABILITY OF LHSI TRAIN A,B, OR C FOR HOT LEG, ASUME CL INJECTION PATH MUST HAVE WORKED; BREAK LOCATION UNKNOWN TO OPERATORS
EPONSITE	HLEGC	LC=F+RC=F+PZ=F+SI38C=F+LHSIC	AVAILABILITY OF LHSI TRAIN A,B, OR C FOR HOT LEG, ASUME CL INJECTION PATH MUST HAVE WORKED; BREAK LOCATION UNKNOWN TO OPERATORS

Table B.2-5 Changes to Macro Rules for Event Tree MLOCA

Event Tree	Macro	Rule	Comment
MLOCA	CS_CSPRYAF	CSPRYA	CSS SUPPORT A
MLOCA	CS_CSPRYBF	CSPRYB	CSS SUPPORT B
MLOCA	CS_CSPRYCF	CSPRYC	CSS SUPPORT C

Table B.2-6 Changes to Macro Rules for Event Tree PDSML

Event Tree	Macro	Rule	Comment
PDSML	RCSPHI	BI=S*BI=F	RCS at high pressure at UTAF. Guaranteed false because pressure is assumed to be < 600 psi in a medium LOCA (BDW)
PDSML	RCSPSY	BI=S*BI=F	RCS at system pressure. Guaranteed false because pressure assumed to be < 600 psi in a MLOCA (BDW)
PDSML	SGCOOL	BI=S*BI=F	Steam Generator cooling. Assumed to be false because MLOCA empties steam generators (BDW)
PDSML	RCSPLO	VI=F*IMLOCA +ILLOCA	RCS at low pressure at UTAF. Pressure assumed to be > 200 psi unless vessel fails (BDW) **FOR MLOCAS, YET ALWAYS TRUE FOR LLOCAS**
PDSML	RCSPMD	-RCSPLO	RCS at medium pressure at UTAF. Default for MLOCA. Pressure not low added to rule to remove conflict (BDW), **NEVER TRUE FOR LLOCA**
PDSML	SEALCOOL	-(BI=S*BI=F)	Dummy rule because pump seal cooling not important in MLOCA. Renamed from LK12F (BDW)
PDSML	PORVFL	BI=S*BI=F	Stuck open PZR PORV not important in MLOCA so guaranteed false. LK13F renamed to PORVFL. LK15F deleted (BDW)
PDSML	RECOOL	((LA=S*RA=S*SI38A=S*-SLBRKA +LB=S*RB=S*SI38B=S*-SLBRKB +LC=S*RC=S*SI38A=S*-SLBRKC)*RX=S)*SUMP=S*FBLK=S*BORON=S	Recirculation cooling using LHSI and RHR HX (BDW); **1/3 FOR SUCCESS, ADDED CL INJECTION VALVE AND BREAK LOCATION DEPENDENCIES; AND LOGIC FOR GSI191 FAILURE MODES**
PDSML	CSI	SPRYAS+SPRYBS+SPRYCS	Containment spray injection success (BDW), **CHANGED TO NEW SPRAY SUCCESS MACROS**

Table B.2-6 Changes to Macro Rules for Event Tree PDSML (Continued)

Event Tree	Macro	Rule	Comment
PDSML	CSR	LATESPRYA+LATESPRYB+LATESPRYC	Containment spray recirculation success (BDW), **CHANGED TO NEW LATE SPRAY RECIRCULATION MACROS FOR GSI 191**
PDSML	ISOFAILS	CI=F	Small containment isolation failure (BDW); **LARGE ISOLATION FAILURES ARE MODELED IN CET VIA SF L1B WHICH ENTERS INTO MACRO:= ELARGE**
PDSML	CNTINTB	BI=S*BI=F	Containment bypass not applicable for MLOCA sequences (BDW)
PDSML	SIANY	SI38A=S*PA=S*-SLBRKA*(HA=S+LA=S) +SI38B=S*PA=S*-SLBRKB*(HB=S+LB=S) + SI38C=S*PA=S*-SLBRKC*(HC=S+LC=S)	SI success using any pump (BDW); **CHANGED TO INCLUDE LOGIC FOR CL INJECTION VALVES, RWST SUCTION LINES, AND FOR BREAK LOCATION AS WELL AS HPI AND LHSI PUMPS, SPRAY INJECTION REPRESENTED SEPARATELY BY CSI MACRO**
PDSML	SUCC	**AI=S*-VI=F*(SUCCHHSI+ILLOCA)*SUCCLHSIR * N2=S * (RX=S + RX=F*CP=S*CF=S)*-SUMP=F*-FBLK=F*-BORON=F**	**No core damage REQUIRES SUCCESS OF ACCUMULATORS, PTS,HPI, & LHSI VIA N2, AND THEN LHSI RECIRCULATION WITH COOLING BY RX OR VIA FC ;AND NO GSI191 FAILURE MECHANISMS**
PDSML	SUCCHHSI	**((HA=S*SI38A=S*PA=S*-SLBRKA*-HHSIA*-SICOMA)+(HB=S*SI38B=S*PB=S*-SLBRKB*-HHSIB*-SICOMB)+(HC=S*SI38C=S*PZ=S*-SLBRKC*-HHSIC*-SICOMC))**	**SUCCESSFUL HHSI 1/3 INJECTION TO UNBROKEN LOOP, NOT NEEDED FOR RECIRCULATION**
PDSML	SUCCLHSIR	**((LA=S*SI38A=S*PA=S*-SLBRKA*-LHSIA*-SICOMA*RA=S)+(LB=S*SI38B=S*PB=S*-SLBRKB*-LHSIB*-SICOMB*RB=S)+(LC=S*SI38C=S*PZ=S*-SLBRKC*-LHSIC*-SICOMC*RC=S))**	**SUCCESFUL LHSI 1/3 TO UNBROKEN LOOP, ALSO NEEDED FOR RECIRCULATION**

Table B.2-7 Changes to Binning Rules for Event Tree PDSML

Bin	Rule	Sequence Save Cutoff	Comment
MELT	(-SUCC*-SUMP=F*-FBLK=F*-(BORON=F))	1.00E-10	MELT SEQUENCES WITHOUT G191 EFFECTS
MELTSUMP	SUMP=F*-SUCC	1.00E-10	ADDED MELT SEQUENCES DUE TO SUMP STRAINER ISSUES
MELTFBLK	FBLK=F*-SUCC	1.00E-10	ADDED MELT SEQUENCES DUE TO FUEL FLOW BLOCKAGE
MELTBORON	BORON=F*-SUCC	1.00E-10	ADDED MELT SEQ. DUE TO BORON PRECIP. BUT WITH HLEG=S
H3L3S3SUCC	LATEHHSI3*LATELHSI3*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L3S2SUCC	LATEHHSI3*LATELHSI3*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L3S1SUCC	LATEHHSI3*LATELHSI3*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L3S0SUCC	LATEHHSI3*LATELHSI3*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L2S3SUCC	LATEHHSI3*LATELHSI2*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L2S2SUCC	LATEHHSI3*LATELHSI2*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L2S1SUCC	LATEHHSI3*LATELHSI2*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L2S0SUCC	LATEHHSI3*LATELHSI2*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L1S3SUCC	LATEHHSI3*LATELHSI1*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L1S2SUCC	LATEHHSI3*LATELHSI1*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L1S1SUCC	LATEHHSI3*LATELHSI1*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L1S0SUCC	LATEHHSI3*LATELHSI1*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S

Table B.2-7 Changes to Binning Rules for Event Tree PDSML (Continued)

Bin	Rule	Sequence Save Cutoff	Comment
H3L0S3SUCC	LATEHHSI3*LATELHSI0*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L0S2SUCC	LATEHHSI3*LATELHSI0*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L0S1SUCC	LATEHHSI3*LATELHSI0*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H3L0S0SUCC	LATEHHSI3*LATELHSI0*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L3S3SUCC	LATEHHSI2*LATELHSI3*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L3S2SUCC	LATEHHSI2*LATELHSI3*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L3S1SUCC	LATEHHSI2*LATELHSI3*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L3S0SUCC	LATEHHSI2*LATELHSI3*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L2S3SUCC	LATEHHSI2*LATELHSI2*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L2S2SUCC	LATEHHSI2*LATELHSI2*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L2S1SUCC	LATEHHSI2*LATELHSI2*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L2S0SUCC	LATEHHSI2*LATELHSI2*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L1S3SUCC	LATEHHSI2*LATELHSI1*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L1S2SUCC	LATEHHSI2*LATELHSI1*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L1S1SUCC	LATEHHSI2*LATELHSI1*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S

Table B.2-7 Changes to Binning Rules for Event Tree PDSML (Continued)

Bin	Rule	Sequence Save Cutoff	Comment
H2L1S0SUCC	LATEHHSI2*LATELHSI1*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L0S3SUCC	LATEHHSI2*LATELHSI0*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L0S2SUCC	LATEHHSI2*LATELHSI0*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L0S1SUCC	LATEHHSI2*LATELHSI0*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H2L0S0SUCC	LATEHHSI2*LATELHSI0*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L3S3SUCC	LATEHHSI1*LATELHSI3*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L3S2SUCC	LATEHHSI1*LATELHSI3*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L3S1SUCC	LATEHHSI1*LATELHSI3*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L3S0SUCC	LATEHHSI1*LATELHSI3*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L2S3SUCC	LATEHHSI1*LATELHSI2*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L2S2SUCC	LATEHHSI1*LATELHSI2*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L2S1SUCC	LATEHHSI1*LATELHSI2*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L2S0SUCC	LATEHHSI1*LATELHSI2*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L1S3SUCC	LATEHHSI1*LATELHSI1*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L1S2SUCC	LATEHHSI1*LATELHSI1*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S

Table B.2-7 Changes to Binning Rules for Event Tree PDSML (Continued)

Bin	Rule	Sequence Save Cutoff	Comment
H1L1S1SUCC	LATEHHSI1*LATELHSI1*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L1S0SUCC	LATEHHSI1*LATELHSI1*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L0S3SUCC	LATEHHSI1*LATELHSI0*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L0S2SUCC	LATEHHSI1*LATELHSI0*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L0S1SUCC	LATEHHSI1*LATELHSI0*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H1L0S0SUCC	LATEHHSI1*LATELHSI0*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L3S3SUCC	LATEHHSI0*LATELHSI3*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L3S2SUCC	LATEHHSI0*LATELHSI3*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L3S1SUCC	LATEHHSI0*LATELHSI3*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L3S0SUCC	LATEHHSI0*LATELHSI3*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L2S3SUCC	LATEHHSI0*LATELHSI2*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L2S2SUCC	LATEHHSI0*LATELHSI2*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L2S1SUCC	LATEHHSI0*LATELHSI2*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L2S0SUCC	LATEHHSI0*LATELHSI2*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L1S3SUCC	LATEHHSI0*LATELHSI1*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S

Table B.2-7 Changes to Binning Rules for Event Tree PDSML (Continued)

Bin	Rule	Sequence Save Cutoff	Comment
H0L1S2SUCC	LATEHHSI0*LATELHSI1*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L1S1SUCC	LATEHHSI0*LATELHSI1*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L1S0SUCC	LATEHHSI0*LATELHSI1*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L0S3SUCC	LATEHHSI0*LATELHSI0*LATESPRY3*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L0S2SUCC	LATEHHSI0*LATELHSI0*LATESPRY2*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L0S1SUCC	LATEHHSI0*LATELHSI0*LATESPRY1*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
H0L0S0SUCC	LATEHHSI0*LATELHSI0*LATESPRY0*SUCC	1.00E-07	HiLjSk = i HHSI TRAINS S*j LHSI TRAINS S*k SPRAY TRAINS S
SUCCESS	SUCC	5.00E+00	MISPLACED SUCCESS SEQUENCES
SCPSCISCFS	SUCC*CP=S*CI=S*CF=S	1.00E-07	TEST OF CP,CI,CF FAILURE FREQUENCIES
SCPSCISCFF	SUCC*CP=S*CI=S*CF=F	1.00E-07	TEST OF CP,CI,CF FAILURE FREQUENCIES
SCPSCIFCFS	SUCC*CP=S*CI=F*CF=S	1.00E-07	TEST OF CP,CI,CF FAILURE FREQUENCIES
SCPSCIFCFF	SUCC*CP=S*CI=F*CF=F	1.00E-07	TEST OF CP,CI,CF FAILURE FREQUENCIES
SCPF	SUCC*CP=F	1.00E-07	TEST OF CP,CI,CF FAILURE FREQUENCIES

B.3 Split Fraction Changes

Table B.3-1 lists the split fraction names and values used for the event tree quantification. Only the split fractions from top events BORON, FBLK, and SUMP are new. All others are unchanged.

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC1A	AC1	1.35E-04	CH 1 - ALL SUPPORT	INSTO
AC1AM	AC1	2.66E-05	SINGLE TRAIN, CH 1 INV MAINT	IV1234
AC1Y	AC1	0.00E+00	GS	
AC1Z	AC1	1.00E+00	GF	
AC2A	AC2	1.37E-04	CH 2 - ALL SUPPORT	INSTN
AC2AM1	AC2	1.37E-04	AC1=S, CH1 INV MAINT	INSTN
AC2AM2	AC2	2.57E-05	AC1=S, CH2 INV MAINT	IV2134
AC2B	AC2	5.01E-04	AC1=F	INSTK
AC2BM1	AC2	1.36E-04	AC1=F, CH1 INV MAINT	IV134
AC2BM2	AC2	2.65E-05	AC1=F, CH2 INV MAINT	IV234
AC2C	AC2	1.37E-04	SINGLE TRAIN	INSTN
AC2CM	AC2	2.57E-05	SINGLE TRAIN, CH2 INV MAINT	IV2134
AC2Y	AC2	0.00E+00	GS	
AC2Z	AC2	1.00E+00	GF	
AC3A	AC3	1.35E-04	CH 3 - ALL SUPPORT	INSTM
AC3AM1	AC3	1.35E-04	AC1=S, AC2=S, CH1 INV MAINT	INSTM
AC3AM2	AC3	1.35E-04	AC1=S, AC2=S, CH2 INV MAINT	INSTM
AC3AM3	AC3	1.35E-04	AC1=S, AC2=S, CH3 INV MAINT	IV3124
AC3B	AC3	4.66E-04	AC1=S, AC2=F	INSTH
AC3BM1	AC3	4.94E-04	AC1=S, AC2=F, CH1 INV MAINT	INSTH
AC3BM2	AC3	1.37E-04	AC1=S, AC2=F, CH2 INV MAINT	IV214
AC3BM3	AC3	2.62E-05	AC1=S, AC2=F, CH3 INV MAINT	IV314

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC3C	AC3	4.77E-04	AC1=F, AC2=S	INSTJ
AC3CM1	AC3	1.33E-04	AC1=F, AC2=S, CH1 INV MAINT	IV124
AC3CM2	AC3	5.05E-04	AC1=F, AC2=S, CH2 INV MAINT	INSTJ
AC3CM3	AC3	2.57E-05	AC1=F, AC2=S, CH3 INV MAINT	IV324
AC3D	AC3	5.74E-02	AC1=F, AC2=F	INSTE
AC3DM1	AC3	4.72E-04	AC1=F, AC2=F, CH1 INV MAINT	IV14
AC3DM2	AC3	5.05E-04	AC1=F, AC2=F, CH2 INV MAINT	IV24
AC3DM3	AC3	2.65E-05	AC1=F, AC2=F, CH3 INV MAINT	IV34
AC3E	AC3	1.35E-04	AC1=B, AC2=S	INSTM
AC3EM2	AC3	1.35E-04	AC1=B, AC2=S, CH2 INV MAINT	INSTM
AC3EM3	AC3	2.68E-05	AC1=B, AC2=S, CH3 INV MAINT	IV3124
AC3F	AC3	4.94E-04	AC1=B, AC2=F	INSTH
AC3FM2	AC3	1.37E-04	AC1=B, AC2=F, CH2 INV MAINT	IV214
AC3FM3	AC3	2.62E-05	AC1=B, AC2=F, CH3 INV MAINT	IV314
AC3G	AC3	1.35E-04	AC1=S, AC2=B	INSTM
AC3GM1	AC3	1.35E-04	AC1=S, AC2=B, CH1 INV MAINT	INSTM
AC3GM3	AC3	2.68E-05	AC1=S, AC2=B, CH3 INV MAINT	IV3124
AC3H	AC3	5.05E-04	AC1=F, AC2=B	INSTJ
AC3HM1	AC3	1.33E-04	AC1=F, AC2=B, CH1 INV MAINT	IV124
AC3HM3	AC3	2.57E-05	AC1=F, AC2=B, CH3 INV MAINT	IV324
AC3I	AC3	1.35E-04	SINGLE TRAIN	INSTM
AC3IM	AC3	2.68E-05	SINGLE TRAIN, CH3 INV MAINT	IV3124
AC3Y	AC3	0.00E+00	GS	
AC3Z	AC3	1.00E+00	GF	
AC4A	AC4	1.35E-04	CH 4 - ALL SUPPORT	INSTL
AC4AA	AC4	1.35E-04	AC1=S, AC2=B, AC3=B	INSTL
AC4AA1	AC4	1.35E-04	AC1=S, AC2=B, AC3=B, CH1 INV MAINT	INSTL

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC4AA4	AC4	2.57E-05	AC1=S, AC2=B, AC3=B, CH4 INV MAINT	IV4123
AC4AB	AC4	5.03E-04	AC1=F, AC2=B, AC3=B	INSTI
AC4AB1	AC4	1.33E-04	AC1=F, AC2=B, AC3=B, CH1 INV MAINT	IV123
AC4AB4	AC4	2.62E-05	AC1=F, AC2=B, AC3=B, CH4 INV MAINT	IV423
AC4AC	AC4	1.35E-04	SINGLE TRAIN	INSTL
AC4AC4	AC4	2.57E-05	SINGLE TRAIN, CH4 INV MAINT	IV4123
AC4AM1	AC4	1.35E-04	AC1=S, AC2=S, AC3=S, CH1 INV MAINT	INSTL
AC4AM2	AC4	1.35E-04	AC1=S, AC2=S, AC3=S, CH2 INV MAINT	INSTL
AC4AM3	AC4	1.35E-04	AC1=S, AC2=S, AC3=S, CH3 INV MAINT	INSTL
AC4AM4	AC4	2.57E-05	AC1=S, AC2=S, AC3=S, CH4 INV MAINT	IV4123
AC4B	AC4	4.52E-04	AC1=S, AC2=S, AC3=F	INSTF
AC4BM1	AC4	4.69E-04	AC1=S, AC2=S, AC3=F, CH1 INV MAINT	INSTF
AC4BM2	AC4	4.68E-04	AC1=S, AC2=S, AC3=F, CH2 INV MAINT	INSTF
AC4BM3	AC4	1.33E-04	AC1=S, AC2=S, AC3=F, CH3 INV MAINT	IV312
AC4BM4	AC4	2.63E-05	AC1=S, AC2=S, AC3=F, CH4 INV MAINT	IV412
AC4C	AC4	4.54E-04	AC1=S, AC2=F, AC3=S	INSTG
AC4CM1	AC4	4.70E-04	AC1=S, AC2=F, AC3=S, CH1 INV MAINT	INSTG
AC4CM2	AC4	1.38E-04	AC1=S, AC2=F, AC3=S, CH2 INV MAINT	IV213
AC4CM3	AC4	4.70E-04	AC1=S, AC2=F, AC3=S, CH3 INV MAINT	INSTG
AC4CM4	AC4	2.61E-05	AC1=S, AC2=F, AC3=S, CH4 INV MAINT	IV413
AC4D	AC4	4.58E-04	AC1=F, AC2=S, AC3=S	INSTI
AC4DM1	AC4	1.33E-04	AC1=F, AC2=S, AC3=S, CH1 INV MAINT	IV123
AC4DM2	AC4	4.74E-04	AC1=F, AC2=S, AC3=S, CH2 INV MAINT	INSTI
AC4DM3	AC4	4.76E-04	AC1=F, AC2=S, AC3=S, CH3 INV MAINT	INSTI
AC4DM4	AC4	2.62E-05	AC1=F, AC2=S, AC3=S, CH4 INV MAINT	IV423
AC4E	AC4	3.38E-02	AC1=S, AC2=F, AC3=F	INSTB
AC4EM1	AC4	5.48E-02	AC1=S, AC2=F, AC3=F, CH1 INV MAINT	INSTB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC4EM2	AC4	4.72E-04	AC1=S, AC2=F, AC3=F, CH2 INV MAINT	IV21
AC4EM3	AC4	4.70E-04	AC1=S, AC2=F, AC3=F, CH3 INV MAINT	IV31
AC4EM4	AC4	2.71E-05	AC1=S, AC2=F, AC3=F, CH4 INV MAINT	IV41
AC4F	AC4	3.71E-02	AC1=F, AC2=S, AC3=F	INSTC
AC4FM1	AC4	4.77E-04	AC1=F, AC2=S, AC3=F, CH1 INV MAINT	IV12
AC4FM2	AC4	5.78E-02	AC1=F, AC2=S, AC3=F, CH2 INV MAINT	INSTC
AC4FM3	AC4	4.66E-04	AC1=F, AC2=S, AC3=F, CH3 INV MAINT	IV32
AC4FM4	AC4	2.57E-05	AC1=F, AC2=S, AC3=F, CH4 INV MAINT	IV42
AC4G	AC4	3.42E-02	AC1=F, AC2=F, AC3=S	INSTD
AC4GM1	AC4	4.62E-04	AC1=F, AC2=F, AC3=S, CH1 INV MAINT	IV13
AC4GM2	AC4	4.75E-04	AC1=F, AC2=F, AC3=S, CH2 INV MAINT	IV23
AC4GM3	AC4	5.52E-02	AC1=F, AC2=F, AC3=S, CH3 INV MAINT	INSTD
AC4GM4	AC4	2.62E-05	AC1=F, AC2=F, AC3=S, CH4 INV MAINT	IV43
AC4H	AC4	4.02E-01	AC1=F, AC2=F, AC3=F	INSTA
AC4HM1	AC4	5.90E-02	AC1=F, AC2=F, AC3=F, CH1 INV MAINT	IV1
AC4HM2	AC4	5.70E-02	AC1=F, AC2=F, AC3=F, CH2 INV MAINT	IV2
AC4HM3	AC4	5.92E-02	AC1=F, AC2=F, AC3=F, CH3 INV MAINT	IV3
AC4HM4	AC4	2.80E-05	AC1=F, AC2=F, AC3=F, CH4 INV MAINT	IV4
AC4I	AC4	1.35E-04	AC1=B, AC2=S, AC3=S	INSTL
AC4IM2	AC4	1.35E-04	AC1=B, AC2=S, AC3=S, CH1 INV MAINT	INSTL
AC4IM3	AC4	1.35E-04	AC1=B, AC2=S, AC3=S, CH3 INV MAINT	INSTL
AC4IM4	AC4	2.57E-05	AC1=B, AC2=S, AC3=S, CH4 INV MAINT	IV4123
AC4J	AC4	4.69E-04	AC1=B, AC2=S, AC3=F	INSTF
AC4JM2	AC4	4.97E-04	AC1=B, AC2=S, AC3=F, CH2 INV MAINT	INSTF
AC4JM3	AC4	1.33E-04	AC1=B, AC2=S, AC3=F, CH3 INV MAINT	IV312
AC4JM4	AC4	2.63E-05	AC1=B, AC2=S, AC3=F, CH4 INV MAINT	IV412
AC4K	AC4	4.70E-04	AC1=B, AC2=F, AC3=S	INSTG

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC4KM2	AC4	1.38E-04	AC1=B, AC2=F, AC3=S, CH2 INV MAINT	IV213
AC4KM3	AC4	4.97E-04	AC1=B, AC2=F, AC3=S, CH3 INV MAINT	INSTG
AC4KM4	AC4	2.61E-05	AC1=B, AC2=F, AC3=S, CH4 INV MAINT	IV413
AC4L	AC4	5.48E-02	AC1=B, AC2=F, AC3=F	INSTB
AC4LM2	AC4	5.01E-04	AC1=B, AC2=F, AC3=F, CH2 INV MAINT	IV21
AC4LM3	AC4	4.99E-04	AC1=B, AC2=F, AC3=F, CH3 INV MAINT	IV31
AC4LM4	AC4	2.71E-05	AC1=B, AC2=F, AC3=F, CH4 INV MAINT	IV41
AC4M	AC4	1.35E-04	AC1=S, AC2=B, AC3=S	INSTL
AC4MM1	AC4	1.35E-04	AC1=S, AC2=B, AC3=S, CH1 INV MAINT	INSTL
AC4MM3	AC4	1.35E-04	AC1=S, AC2=B, AC3=S, CH3 INV MAINT	INSTL
AC4MM4	AC4	2.57E-05	AC1=S, AC2=B, AC3=S, CH4 INV MAINT	IV4123
AC4N	AC4	4.68E-04	AC1=S, AC2=B, AC3=F	INSTF
AC4NM1	AC4	4.97E-04	AC1=S, AC2=B, AC3=F, CH1 INV MAINT	INSTF
AC4NM3	AC4	1.33E-04	AC1=S, AC2=B, AC3=F, CH3 INV MAINT	IV312
AC4NM4	AC4	2.63E-05	AC1=S, AC2=B, AC3=F, CH4 INV MAINT	IV412
AC4O	AC4	4.74E-04	AC1=F, AC2=B, AC3=S	INSTI
AC4OM1	AC4	1.33E-04	AC1=F, AC2=B, AC3=S, CH1 INV MAINT	IV123
AC4OM3	AC4	5.03E-04	AC1=F, AC2=B, AC3=S, CH3 INV MAINT	INSTI
AC4OM4	AC4	2.62E-05	AC1=F, AC2=B, AC3=S, CH4 INV MAINT	IV423
AC4P	AC4	5.78E-02	AC1=F, AC2=B, AC3=F	INSTC
AC4PM1	AC4	5.06E-04	AC1=F, AC2=B, AC3=F, CH1 INV MAINT	IV12
AC4PM3	AC4	4.96E-04	AC1=F, AC2=B, AC3=F, CH3 INV MAINT	IV32
AC4PM4	AC4	2.58E-05	AC1=F, AC2=B, AC3=F, CH4 INV MAINT	IV42
AC4Q	AC4	1.35E-04	AC1=S, AC2=S, AC3=B	INSTL
AC4QM1	AC4	1.35E-04	AC1=S, AC2=S, AC3=B, CH1 INV MAINT	INSTL
AC4QM2	AC4	1.35E-04	AC1=S, AC2=S, AC3=B, CH2 INV MAINT	INSTL
AC4QM4	AC4	2.57E-05	AC1=S, AC2=S, AC3=B, CH4 INV MAINT	IV4123

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AC4R	AC4	4.70E-04	AC1=S, AC2=F, AC3=B	INSTG
AC4RM1	AC4	4.97E-04	AC1=S, AC2=F, AC3=B, CH1 INV MAINT	INSTG
AC4RM2	AC4	1.38E-04	AC1=S, AC2=F, AC3=B, CH2 INV MAINT	IV213
AC4RM4	AC4	2.61E-05	AC1=S, AC2=F, AC3=B, CH4 INV MAINT	IV413
AC4S	AC4	4.76E-04	AC1=F, AC2=S, AC3=B	INSTI
AC4SM1	AC4	1.33E-04	AC1=F, AC2=S, AC3=B, CH1 INV MAINT	IV123
AC4SM2	AC4	5.03E-04	AC1=F, AC2=S, AC3=B, CH2 INV MAINT	INSTI
AC4SM4	AC4	2.62E-05	AC1=F, AC2=S, AC3=B, CH4 INV MAINT	IV423
AC4T	AC4	5.52E-02	AC1=F, AC2=F, AC3=B	INSTD
AC4TM1	AC4	4.90E-04	AC1=F, AC2=F, AC3=B, CH1 INV MAINT	IV13
AC4TM2	AC4	5.04E-04	AC1=F, AC2=F, AC3=B, CH2 INV MAINT	IV23
AC4TM4	AC4	2.63E-05	AC1=F, AC2=F, AC3=B, CH4 INV MAINT	IV43
AC4U	AC4	1.35E-04	AC1=B, AC2=B, AC3=S	INSTL
AC4UM3	AC4	1.35E-04	AC1=B, AC2=B, AC3=S, CH3 INV MAINT	INSTL
AC4UM4	AC4	2.57E-05	AC1=B, AC2=B, AC3=S, CH4 INV MAINT	IV4123
AC4V	AC4	4.97E-04	AC1=B, AC2=B, AC3=F	INSTF
AC4VM3	AC4	1.33E-04	AC1=B, AC2=B, AC3=F, CH3 INV MAINT	IV312
AC4VM4	AC4	2.63E-05	AC1=B, AC2=B, AC3=F, CH4 INV MAINT	IV412
AC4W	AC4	1.35E-04	AC1=B, AC2=S, AC3=B	INSTL
AC4WM2	AC4	1.35E-04	AC1=B, AC2=S, AC3=B, CH2 INV MAINT	INSTL
AC4WM4	AC4	2.57E-05	AC1=B, AC2=S, AC3=B, CH4 INV MAINT	IV4123
AC4X	AC4	4.97E-04	AC1=B, AC2=F, AC3=B	INSTG
AC4XM2	AC4	1.38E-04	AC1=B, AC2=F, AC3=B, CH2 INV MAINT	IV213
AC4XM4	AC4	2.61E-05	AC1=B, AC2=F, AC3=B, CH4 INV MAINT	IV413
AC4Y	AC4	0.00E+00	GS	
AC4Z	AC4	1.00E+00	GF	
AF1A	AFWS	3.74E-03	AFWP 11	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AF1B	AFWS	3.76E-03	AFWP 12	
AF1C	AFWS	3.73E-03	AFWP 13	
AF1D	AFWS	1.12E-02	AFWP 14	
AF2AB	AFWS	6.55E-05	AFWP 11 AND 12	
AF2AC	AFWS	6.47E-05	AFWP 11 AND 13	
AF2AD	AFWS	5.42E-05	AFWP 11 AND 14	
AF2BC	AFWS	6.54E-05	AFWP 12 AND 13	
AF2BD	AFWS	5.42E-05	AFWP 12 AND 14	
AF2CD	AFWS	5.48E-05	AFWP 13 AND 14	
AF3ABC	AFWS	1.70E-05	AFWP 11, 12, AND 13	
AF3ABD	AFWS	4.07E-06	AFWP 11, 12, AND 14	
AF3ACD	AFWS	3.93E-06	AFWP 11, 13, AND 14	
AF3BCD	AFWS	4.07E-06	AFWP 12, 13, AND 14	
AF4	AFWS	1.99E-06	ALL AFWP	
AFAA	AFA	3.74E-03	AFA	AF1A
AFAY	AFA	0.00E+00	GS	
AFAZ	AFA	1.00E+00	GF	
AFBA	AFB	3.71E-03	AFB, A=S	AF1B
AFBB	AFB	1.75E-02	AFB, A=F	AF2AB
AFBC	AFB	3.76E-03	AFB, A=B	AF1B
AFBY	AFB	0.00E+00	GS	
AFBZ	AFB	1.00E+00	GF	
AFCA	AFC	3.64E-03	AFC, A=S B=S	AF1C
AFCB	AFC	1.31E-02	AFC, A=S B=F	AF2BC
AFCC	AFC	1.30E-02	AFC, A=F B=S	AF2AC
AFCD	AFC	2.60E-01	AFC, A=F B=F	AF3ABC
AFCE	AFC	3.68E-03	AFC, A=B B=S	AF1C

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AFCF	AFC	1.74E-02	AFC, A=B B=F	AF2BC
AFCG	AFC	3.68E-03	AFC, A=S B=B	AF1C
AFCH	AFC	1.73E-02	AFC, A=F B=B	AF2AC
AFCI	AFC	3.73E-03	AFC, A=B B=B	AF1C
AFCY	AFC	0.00E+00	GS	
AFCZ	AFC	1.00E+00	GF	
AFDA	AFD	1.12E-02	AFD A=S B=S C=S	AF1D
AFDAA	AFD	1.12E-02	AFD A=S B=B C=B	AF1D
AFDAB	AFD	1.45E-02	AFD A=F B=B C=B	AF2AD
AFDAC	AFD	1.12E-02	AFD A=B B=B C=B	AF1D
AFDB	AFD	1.35E-02	AFD A=S B=S C=F	AF2CD
AFDC	AFD	1.32E-02	AFD A=S B=F C=S	AF2BD
AFDD	AFD	4.29E-02	AFD A=S B=F C=F	AF3BCD
AFDE	AFD	1.33E-02	AFD A=F B=S C=S	AF2AD
AFDF	AFD	4.07E-02	AFD A=F B=S C=F	AF2AD
AFDG	AFD	4.29E-02	AFD A=F B=F C=S	AF3ABD
AFDH	AFD	1.17E-01	AFD A=F B=F C=F	AF4
AFDI	AFD	1.12E-02	AFD A=B B=S C=S	AF1D
AFDJ	AFD	1.38E-02	AFD A=B B=S C=F	AF2CD
AFDK	AFD	1.36E-02	AFD A=B B=F C=S	AF2BD
AFDL	AFD	6.22E-02	AFD A=B B=F C=F	AF3BCD
AFDM	AFD	1.12E-02	AFD A=S B=B C=S	AF1D
AFDN	AFD	1.39E-02	AFD A=S B=B C=F	AF2CD
AFDO	AFD	1.37E-02	AFD A=F B=B C=S	AF2AD
AFDP	AFD	6.08E-02	AFD A=F B=B C=F	AF3ACD
AFDQ	AFD	1.12E-02	AFD A=S B=S C=B	AF1D
AFDR	AFD	1.36E-02	AFD A=S B=F C=B	AF2BD

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
AFDS	AFD	1.36E-02	AFD A=F B=S C=B	AF2AD
AFDT	AFD	6.21E-02	AFD A=F B=F C=B	AF3ABD
AFDU	AFD	1.12E-02	AFD A=B B=B C=S	AF1D
AFDV	AFD	1.47E-02	AFD A=B B=B C=F	AF2CD
AFDW	AFD	1.12E-02	AFD A=B B=S C=B	AF1D
AFDX	AFD	1.44E-02	AFD A=B B=F C=B	AF2BD
AFDY	AFD	0.00E+00	GS	
AFDZ	AFD	1.00E+00	GF	
AILL	AI	5.00E-07	ACCUMULATORS A, B, C FOR LLOCA	
AILLAB	AI	8.74E-04	ACCUMULATORS A, B FOR LLOCA	
AILLAC	AI	8.63E-04	ACCUMULATORS A, C FOR LLOCA	
AILLBC	AI	8.69E-04	ACCUMULATORS B, C FOR LLOCA	
AILLY	AI	0.00E+00	GS	
AILLZ	AI	1.00E+00	GF	
AIML	AI	7.58E-11	ACCUMULATOR A, B, C FOR MLOCA	
AIMLA	AI	4.36E-04	ACCUMULATOR A FOR MLOCA	
AIMLAB	AI	1.68E-07	ACCUMULATOR A, B FOR MLOCA	
AIMLAC	AI	1.64E-07	ACCUMULATOR A, C FOR MLOCA	
AIMLB	AI	4.39E-04	ACCUMULATOR B FOR MLOCA	
AIMLBC	AI	1.66E-07	ACCUMULATOR B, C FOR MLOCA	
AIMLC	AI	4.33E-04	ACCUMULATOR C FOR MLOCA	
AIMLY	AI	0.00E+00	GS	
AIMLZ	AI	1.00E+00	GF	
AMA	AM	1.00E-02	AMSAC FAILURE PROBABILITY	
AMY	AM	0.00E+00	GS	
AMZ	AM	1.00E+00	GF	
APH	AP	1.00E-04	RCS PRESSURE > 200 PSIA	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
APL	AP	1.00E-03	RCS PRESSURE < 200 PSIA	
BFA	BF	7.13E-05	FAILURE OF 13.8KV BUS 1F TO ENERGIZE E1A	
BFY	BF	0.00E+00	GS	
BFZ	BF	1.00E+00	GF	
BGA	BG	5.77E-05	FAILURE OF 13.8KV BUS 1G TO ENERGIZE E1B	
BGY	BG	0.00E+00	GS	
BGZ	BG	1.00E+00	GF	
BHA	BH	7.07E-05	FAILURE OF 13.8KV BUS 1H TO ENERGIZE E1C	
BHY	BH	0.00E+00	GS	
BHZ	BH	1.00E+00	GF	
BIY	BI	0.00E+00	PDS BINNING	
BLL1S	**BORON**	**1.25E-03**	**LLOCA, PUMP STATE 1, HLEG=S, WITH GSI-191 ISSUES**	
BLL22S	**BORON**	**2.54E-04**	**LLOCA, PUMP STATE 22, HLEG=S, WITH GSI-191 ISSUES**	
BLL26S	**BORON**	**3.07E-04**	**LLOCA,, PUMP STATE 26, HLEG=S, WITH GSI-191 ISSUES**	
BLL43S	**BORON**	**1.04E-05**	**LLOCA, PUMP STATE 43, HLEG=S, WITH GSI-191 ISSUES**	
BLL9S	**BORON**	**2.85E-03**	**LLOCA, PUMP STATE 9, HLEG=S, WITH GSI-191 ISSUES**	
BLLGF	**BORON**	**2.56E-01**	**LLOCA, DEAFULT PUMP STATES, WITH GSI-191 ISSUES**	
BML1S	**BORON**	**0.00E+00**	**MLOCA, PUMP STATE 1, HLEG=S, WITH GSI-191 ISSUES**	
BML22S	**BORON**	**0.00E+00**	**MLOCA, PUMP STATE 22, HLEG=S, WITH GSI-191 ISSUES**	
BML26S	**BORON**	**0.00E+00**	**MLOCA, PUMP STATE 26, HLEG=S, WITH GSI-191 ISSUES**	
BML43S	**BORON**	**0.00E+00**	**MLOCA, PUMP STATE 43, HLEG=S, WITH GSI-191 ISSUES**	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
BML9S	BORON	0.00E+00	MLOCA, PUMP STATE 9, HLEG=S, WITH GSI-191 ISSUES	
BMLGF	BORON	3.81E-01	MLOCA, DEFAULT PUMP STATES , WITH GSI-191 ISSUES	
BORLL	BORON	2.56E-01	LLOCA CL FRACTION GIVEN HLEG=F, NO GSI 1091 ISSUES	
BORML	BORON	3.81E-01	MLOCA CL FRACTION GIVEN HLEG=F, NO GSI ISSUES	
BORONY	BORON	0.00E+00	HLEG=S NO GIS-191 PHENOMENA	
BORONZ	BORON	1.00E+00	NOT USED	
BRKS0	BRKS	0.00E+00	USED TO ZERO OUT APPROPRIATE STEAM LINE BREAK BRANCHES	
BRKSA	BRKS	2.50E-01	BREAK STEAM LINE A	
BRKSB	BRKS	2.50E-01	BREAK STEAM LINE B	
BRKSC	BRKS	2.50E-01	BREAK STEAM LINE C	
BRKSD	BRKS	2.50E-01	BREAK STEAM LINE D	
BRKSE	BRKS	1.00E+00	NO STEAM LINE BREAK	
BYA	BY	1.00E+00	LETDOWN V SEQUENCE OR UNISOLATED SGTR	
BYB	BY	0.00E+00	NO CONTAINMENT BYPASS	
C1A	C1	0.00E+00	CONTAINMENT ISOLATED PRIOR TO VESSEL BREACH	
C1B	C1	1.00E+00	CONTAINMENT NOT ISOLATED AT UTAF	
C2A	C2	1.00E-05	RCS PRESSURE < 200 PSIA AT VESSEL BREACH	
C2B	C2	1.00E-05	NO HPME, 200 < RCS PRESS < 600 PSIA AT VESSEL BREACH	
C2C	C2	1.04E-04	HPME, 200 < RCS PRESS < 600 PSIA @ VB, NO WATER IN CAVITY, NO CHR	
C2D	C2	1.04E-04	HPME, 200 < RCS PRESS < 600 PSIA @ VB, NO WATER IN CAVITY, CHR	
C2E	C2	1.04E-04	HPME, 200 < RCS PRESS < 600 PSIA @ VB, WATER IN CAVITY, CHR	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
C2I	C2	1.04E-04	HPME, 600 < RCS PRESS < 2000 PSIA @ VB, WATER IN CAVITY	
C2J	C2	1.04E-04	HPME, 600 < RCS PRESS < 2000 PSIA @ VB, NO WATER IN CAVITY	
C2K	C2	1.04E-04	HPME, 600 < RCS PRESS < 2000 PSIA @ VB, NO WATER IN CAVITY, NO CHR	
C2L	C2	1.00E-05	NO HPME, 600 < RCS PRESS < 2000 PSIA @ VB	
C2R	C2	1.10E-03	HPME, RCS PRESS > 2000 PSIA @ VB, WATER IN CAVITY	
C2S	C2	1.10E-03	HPME, RCS PRESS > 2000 PSIA @ VB, NO WATER IN CAVITY	
C2T	C2	1.10E-03	HPME, RCS PRESS > 2000 PSIA @ VB, NO SPRAYS OR CHR	
C2U	C2	1.00E-03	NO HPME, ROCKET MODE FAILURE, RCS PRESS > 2000 PSIA @ VB	
C3A	C3	4.17E-02	BOUNDING BASED ON 12% HYDROGEN	H3A
C3C	C3	0.00E+00	NO CHALLENGE FROM LOW CONC. BURNS	
C3D	C3	1.00E-01	NO CONTAINMENT FAILURE LIKELY	
C41	C4	1.00E+00	CONTAINMENT FAILURE DUE TO LONG TERM OVERPRESSURIZATION	
C4A	C4	3.70E-01	- NO CONTAINMENT HEAT REMOVAL	
C4B	C4	0.00E+00	- HEAT BEING REMOVED FROM CONTAINMENT	
CCW101	CCWS	2.43E-04	TRAIN A (KA) FAILS TO RUN	
CCW102	CCWS	2.40E-04	TRAIN B (KB) FAILS TO RUN	
CCW103	CCWS	2.42E-04	TRAIN C (KC) FAILS TO RUN	
CCW104	CCWS	9.69E-03	KA RESTART (R/S)	
CCW105	CCWS	9.70E-03	KB RESTART (R/S)	
CCW106	CCWS	9.54E-03	KC RESTART (R/S)	
CCW107	CCWS	9.60E-03	KA STANDBY (STBY)	
CCW108	CCWS	9.62E-03	KB STANDBY (STBY)	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CCW109	CCWS	9.67E-03	KC STANDBY (STBY)	
CCW110	CCWS	1.03E-02	KA OFF	
CCW111	CCWS	1.02E-02	KB OFF	
CCW112	CCWS	1.03E-02	KC OFF	
CCW201	CCWS	3.00E-06	KA RUN, KB STBY	
CCW202	CCWS	1.73E-04	KA R/S, KB STBY	
CCW203	CCWS	3.13E-06	KA RUN, KB START	
CCW204	CCWS	1.79E-04	KA R/S, KB START	
CCW205	CCWS	2.94E-06	KA STBY, KB RUN	
CCW206	CCWS	1.73E-04	KA STBY, KB R/S	
CCW207	CCWS	3.14E-06	KA START, KB RUN	
CCW208	CCWS	1.78E-04	KA START, KB R/S	
CCW209	CCWS	1.81E-04	KA STBY, KB START	
CCW210	CCWS	1.79E-04	KA START, KB STBY	
CCW211	CCWS	3.01E-06	KA RUN, KC STBY	
CCW212	CCWS	1.74E-04	KA R/S, KC STBY	
CCW213	CCWS	3.17E-06	KA RUN, KC START	
CCW214	CCWS	1.81E-04	KA R/S, KC START	
CCW215	CCWS	2.96E-06	KA STBY, KC RUN	
CCW216	CCWS	1.73E-04	KA STBY, KC R/S	
CCW217	CCWS	3.18E-06	KA START, KC RUN	
CCW218	CCWS	1.79E-04	KA START, KC R/S	
CCW219	CCWS	1.81E-04	KA STBY, KC START	
CCW220	CCWS	1.81E-04	KA START, KC STBY	
CCW221	CCWS	2.97E-06	KB RUN, KC STBY	
CCW222	CCWS	1.71E-04	KB R/S, KC STBY	
CCW223	CCWS	3.11E-06	KB RUN, KC START	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CCW224	CCWS	1.79E-04	KB R/S, KC START	
CCW225	CCWS	3.00E-06	KB STBY, KC RUN	
CCW226	CCWS	1.73E-04	KB STBY, KC R/S	
CCW227	CCWS	3.14E-06	KB START, KC RUN	
CCW228	CCWS	1.78E-04	KB START, KC R/S	
CCW229	CCWS	1.79E-04	KB STBY, KC START	
CCW230	CCWS	1.79E-04	KB START, KC STBY	
CCW301	CCWS	6.06E-07	KA RUN, KB STBY, KC START	
CCW302	CCWS	2.55E-05	KA R/S, KB STBY, KC START	
CCW303	CCWS	5.85E-07	KA RUN, KB START, KC STBY	
CCW304	CCWS	2.58E-05	KA R/S, KB START, KC STBY	
CCW305	CCWS	5.92E-07	KA STBY, KB RUN, KC START	
CCW306	CCWS	2.55E-05	KA STBY, KB R/S, KC START	
CCW307	CCWS	5.88E-07	KA START, KB RUN, KC STBY	
CCW308	CCWS	2.59E-05	KA START, KB R/S, KC STBY	
CCW309	CCWS	6.10E-07	KA STBY, KB START, KC RUN	
CCW310	CCWS	2.58E-05	KA STBY, KB START, KC R/S	
CCW311	CCWS	5.85E-07	KA START, KB STBY, KC RUN	
CCW312	CCWS	2.52E-05	KA START, KB STBY, KC R/S	
CDSQY	CDSQ	0.00E+00	NON CORE DAMAGE SEQUENCES	
CDSQZ	CDSQ	1.00E+00	CORE DAMAGE SEQUENCES	
CEA	CE	2.08E-03	RCS PRESS < 200 PSIA @ VB, SPRAYS OPERATING @ VB	HEA
CEB	CE	0.00E+00	RCS PRESS < 200 PSIA @ VB, SPRAYS	
CFA	CF	2.34E-05	ALL SUPPORT - STATE ABRUN	CFABA
CFABA	CFAB	2.34E-05	STATE ABRUN - ALL SUPPORT	
CFABB	CFAB	1.65E-04	ABRUN - TRAIN A FAILS	
CFABC	CFAB	1.64E-04	ABRUN - TRAIN B FAILS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CFABD	CFAB	8.89E-05	ABRUN - TRAIN C FAILS	
CFABE	CFAB	3.35E-02	ABRUN - TRAINS A AND B FAIL	
CFABF	CFAB	1.12E-02	ABRUN - TRAINS A AND C FAIL	
CFABG	CFAB	1.11E-02	ABRUN - TRAINS B AND C FAIL	
CFACA	CFAC	2.32E-05	STATE ACRUN - ALL SUPPORT	
CFACB	CFAC	1.64E-04	STATE ACRUN - TRAIN A FAILS	
CFACC	CFAC	8.89E-05	STATE ACRUN - TRAIN B FAILS	
CFACD	CFAC	1.64E-04	STATE ACRUN - TRAIN C FAILS	
CFACE	CFAC	1.12E-02	STATE ACRUN - TRAINS A AND B FAIL	
CFACF	CFAC	3.35E-02	STATE ACRUN - TRAINS A AND C FAIL	
CFACG	CFAC	1.12E-02	STATE ACRUN - TRAINS B AND C FAIL	
CFB	CF	2.32E-05	ALL SUPPORT - STATE BCRUN	CFBCA
CFBCA	CFBC	2.32E-05	STATE BCRUN - ALL SUPPORT	
CFBCB	CFBC	8.92E-05	STATE BCRUN - TRAIN A FAILS	
CFBCC	CFBC	1.64E-04	STATE BCRUN - TRAIN B FAILS	
CFBCD	CFBC	1.63E-04	STATE BCRUN - TRAIN B FAILS	
CFBCE	CFBC	1.12E-02	STATE BCRUN - TRAINS A AND B FAIL	
CFBCF	CFBC	1.12E-02	STATE BCRUN - TRAINS A AND C FAIL	
CFBCG	CFBC	3.30E-02	STATE BCRUN - TRAINS B AND C FAIL	
CFC	CF	2.32E-05	ALL SUPPORT - STATE ACRUN	CFACA
CFD	CF	1.65E-04	STATE ABRUN - TRAIN A FAILS	CFABB
CFE	CF	8.92E-05	STATE BCRUN - TRAIN A FAILS	CFBCB
CFF	CF	1.64E-04	STATE ACRUN - TRAIN A FAILS	CFACB
CFG	CF	1.64E-04	STATE ABRUN - TRAIN B FAILS	CFABC
CFH	CF	1.64E-04	STATE BCRUN - TRAIN B FAILS	CFBCC
CFI	CF	8.89E-05	STATE ACRUN - TRAIN B FAILS	CFACC
CFJ	CF	8.89E-05	STATE ABRUN - TRAIN C FAILS	CFABD

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CFK	CF	1.63E-04	STATE BCRUN - TRAIN C FAILS	CFBCD
CFL	CF	1.64E-04	STATE ACRUN - TRAIN C FAILS	CFACD
CFM	CF	3.35E-02	STATE ABRUN - TRAINS A AND B FAILS	CFABE
CFN	CF	1.12E-02	STATE BCRUN - TRAINS A AND B FAILS	CFBCE
CFO	CF	1.12E-02	STATE ACRUN - TRAINS A AND B FAILS	CFACE
CFP	CF	1.12E-02	STATE ABRUN - TRAINS A AND C FAILS	CFABF
CFQ	CF	1.12E-02	STATE BCRUN - TRAINS A AND C FAILS	CFBCF
CFR	CF	3.35E-02	STATE ACRUN - TRAINS A AND C FAILS	CFACF
CFS	CF	1.11E-02	STATE ABRUN - TRAINS B AND C FAILS	CFABG
CFT	CF	3.30E-02	STATE BCRUN - TRAINS B AND C FAILS	CFBCG
CFU	CF	1.12E-02	STATE ACRUN - TRAINS B AND C FAILS	CFACG
CFY	CF	0.00E+00	GS	
CFZ	CF	1.00E+00	GF	
CHA	CH	2.32E-04	CVCS, ALL SUPPORT, BCRUN OR ACRUN (CCP A RUN)	
CHAA	CH	8.84E-03	LOSP, ABRUN, CCPA START, CCPB=F	
CHAB	CH	8.77E-03	LOSP, BCRUN OR ACRUN, CCPB START, CCPA=F	
CHAC	CH	2.07E-03	SGTR, EB=F, BCRUN OR ACRUN, CCPA RUN, CCPB START	
CHAD	CH	2.05E-03	SGTR, EB=F, ABRUN, CCPB RUN, CCPA START	
CHAE	CH	4.21E-03	SGTR, EB=F, BCRUN OR ACRUN, CCPA R/S, CCPB START	
CHAF	CH	4.20E-03	SGTR, EB=F, ABRUN, CCPB R/S, CCPA START	
CHAG	CH	2.30E-03	SGTR, EB=F, BCRUN OR ACRUN, CCPA R, CCPB=F	
CHAH	CH	2.89E-03	SGTR, EB=F, ABRUN, CCPB RUN, CCPA=F	
CHAI	CH	9.54E-03	SGTR, EB=F, BCRUN OR ACRUN, CCPA R/S, CCPB=F	
CHAJ	CH	1.01E-02	SGTR, EB=F, ABRUN, CCPB R/S, CCPA=F	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CHAK	CH	1.07E-02	SGTR, EB=F, ABRUN, CCPA START, CCPB=F	
CHAL	CH	1.13E-02	SGTR, EB=F, BCRUN OR ACRUN, CCPB START, CCPA=F	
CHB	CH	2.31E-04	CVCS, ALL SUPPORT, ABRUN (CCP B RUN)	
CHC	CH	2.43E-03	BCRUN OR ACRUN, CCPA R/S	
CHCLA	CHCL	1.17E-11	STATE ABRUN, ALL SUPPORT	
CHCLB	CHCL	1.17E-11	STATE BCRUN, ALL SUPPORT	
CHCLC	CHCL	8.42E-11	STATE ACRUN, ALL SUPPORT	
CHCLD	CHCL	2.12E-05	ABRUN * CCWA=F	
CHCLE	CHCL	6.47E-10	BCRUN * CCWA=F	
CHCLF	CHCL	4.92E-10	ACRUN * CCWA=F	
CHCLG	CHCL	6.62E-10	ABRUN * CCWB=F	
CHCLH	CHCL	2.12E-05	BCRUN * CCWB=F	
CHCLI	CHCL	4.86E-10	ACRUN * CCWB=F	
CHCLJ	CHCL	6.56E-10	ABRUN * (CCWC=F + CCPB * LOIA)	
CHCLK	CHCL	6.74E-10	BCRUN * (CCWC=F + CCPB * LOIA)	
CHCLL	CHCL	2.13E-05	ACRUN * (CCWC=F + CCPB * LOIA)	
CHCLM	CHCL	1.20E-03	(ABRUN + BCRUN) * (CCWA=F * CCWB=F + LOIA)	
CHCLO	CHCL	2.76E-07	ACRUN * (CCWA=F * CCWB=F + LOIA)	
CHCLP	CHCL	1.20E-03	(ABRUN + ACRUN) * CCWA=F * (CCWC=F + CCPB * LOIA)	
CHCLQ	CHCL	5.50E-07	BCRUN * CCWA=F * (CCWC=F + CCPB * LOIA)	
CHCLS	CHCL	5.37E-07	ABRUN * CCWB=F * (CCWC=F + CCPB * LOIA)	
CHCLT	CHCL	1.20E-03	(BCRUN + ACRUN) * CCWB=F * (CCWC=F + CCPB * LOIA)	
CHCMA	CHCL	1.18E-11	CCPB, ABRUN	
CHCMB	CHCL	1.17E-11	CCPB, BCRUN	
CHCMC	CHCL	3.25E-10	CCPB, ACRUN	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CHCMD	CHCL	2.13E-05	(CCPB + CCPA) * ABRUN * CCWA=F	
CHCME	CHCL	6.83E-10	CCPB, BCRUN * CCWA=F	
CHCMF	CHCL	1.84E-08	CCPB, ACRUN * CCWA=F	
CHCMG	CHCL	6.91E-10	CCPB, ABRUN * CCWB=F	
CHCMH	CHCL	2.14E-05	(CCPB + CCPA) * BCRUN * CCWB=F	
CHCMI	CHCL	1.87E-08	CCPB, ACRUN * CCWB=F	
CHCMM	CHCL	1.21E-03	CCPB, (ABRUN + BCRUN) * CCWA=F * CCWB=F	
CHCMO	CHCL	1.53E-05	CCPB, ACRUN * CCWA=F * CCWB=F	
CHCNA	CHCL	1.81E-08	CCPA, ABRUN	
CHCNB	CHCL	1.79E-08	CCPA, BCRUN	
CHCNC	CHCL	5.26E-06	CCPA, ACRUN	
CHCNE	CHCL	1.86E-08	CCPA, BCRUN * CCWA=F	
CHCNF	CHCL	1.06E-05	CCPA, ACRUN * CCWA=F	
CHCNG	CHCL	1.86E-08	CCPA, ABRUN * CCWB=F	
CHCNI	CHCL	1.04E-05	CCPA, ACRUN * CCWB=F	
CHCNJ	CHCL	1.50E-05	CCPA, ABRUN * CCWC=F	
CHCNK	CHCL	1.48E-05	CCPA, BCRUN * CCWC=F	
CHCNL	CHCL	3.60E-05	CCPA, ACRUN * CCWC=F	
CHCNP	CHCL	1.20E-03	CCPA, (ABRUN + ACRUN) * CCWA=F * CCWC=F	
CHCNQ	CHCL	1.57E-05	CCPA, BCRUN * CCWA=F * CCWC=F	
CHCNS	CHCL	1.54E-05	CCPA, ABRUN * CCWB=F * CCWC=F	
CHCNT	CHCL	1.21E-03	CCPA, (BCRUN + ACRUN) * CCWB=F * CCWC=F	
CHD	CH	2.43E-03	ABRUN, CCPB R/S	
CHE	CH	1.06E-03	BCRUN OR ACRUN, CCPB=F, CCPA RUN	
CHF	CH	1.05E-03	ABRUN, CCPA=F, CCPB RUN	
CHG	CH	8.33E-03	BCRUN OR ACRUN, CCPB=F, CCPA R/S	
CHH	CH	8.27E-03	ABRUN, CCPA=F, CCPB R/S	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CHI	CH	9.38E-03	ABRUN, CCPB=F, CCPA START	
CHJ	CH	9.51E-03	BCRUN OR ACRUN, CCPA=F, CCPB START	
CHK	CH	9.59E-04	SGTR, BCRUN OR ACRUN	
CHL	CH	9.62E-04	SGTR, ABRUN	
CHM	CH	3.15E-03	SGTR, BCRUN OR ACRUN, CCPA R/S	
CHN	CH	3.13E-03	SGTR, ABRUN, CCPB R/S	
CHO	CH	1.23E-03	SGTR, BCRUN OR ACRUN, CCPA RUN, CCPB=F	
CHP	CH	2.88E-03	SGTR, ABRUN, CCPB RUN, CCPA=F (PWR)	
CHP1	CH	1.78E-03	SGTR, ABRUN, CCPB RUN, CCPA=F (CLG)	
CHQ	CH	8.48E-03	SGTR, BCRUN OR ACRUN, CCPA R/S, CCPB=F	
CHR	CH	1.01E-02	SGTR, ABRUN, CCPB R/S, CCPA=F (PWR)	
CHR1	CH	9.05E-03	SGTR, ABRUN, CCPB R/S, CCPA=F (CLG)	
CHS	CH	9.65E-03	SGTR, ABRUN, CCPA START, CCPB=F	
CHT	CH	1.13E-02	SGTR, ACRUN OR BCRUN, CCPB START, CCPA=F (PWR)	
CHT1	CH	1.01E-02	SGTR, ACRUN OR BCRUN, CCPB START, CCPA=F (CLG)	
CHU	CH	1.77E-03	LOSP, BCRUN OR ACRUN, CCPA R/S, CCPB START	
CHV	CH	1.76E-03	LOSP, ABRUN, CCPB R/S. CCPA START	
CHW	CH	7.64E-03	LOSP, BCRUN OR ACRUN, CCPA R/S, CCPB=F	
CHX	CH	7.59E-03	LOSP, ABRUN, CCPB R/S. CCPA=F	
CHY	CH	0.00E+00	GS	
CHZ	CH	1.00E+00	GF	
CIA	CI	3.96E-03	LETDOWN, SEAL RETURN, AND CONTAINMENT ISOLATION - ALL SUPPORT	
CIB	CI	6.75E-03	LETDOWN, SEAL, AND CNMT ISOL - LOSS OF CI A	
CIC	CI	1.63E-02	LETDOWN, SEAL, AND CNMT ISOL - LOSS OF CI B	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CID	CI	4.47E-03	LETDOWN, SEAL, AND CNMT ISOL - LOSS OF CI C	
CIE	CI	7.38E-03	LETDOWN, SEAL, AND CNMT ISOL - LOSS OF CI A AND CI C	
CIF	CI	3.70E-03	SEAL RETURN AND CONT ISOL - ALL SUPPORT	
CIG	CI	6.74E-03	SEAL RETURN AND CONT ISOL - LOSS OF CI A	
CIH	CI	1.64E-02	SEAL RETURN AND CONT ISOL - LOSS OF CI B	
CII	CI	4.57E-03	SEAL RETURN AND CONT ISOL - LOSS OF CI C	
CIJ	CI	7.49E-03	SEAL RETURN AND CONT ISOL - LOSS OF CI A AND C	
CIK	CI	3.90E-03	CONT ISOL W/O SEAL OR LETDOWN - ALL SUPPORT	
CIL	CI	6.73E-03	CONT ISOL W/O SEAL OR LETDOWN - TRAIN A CI	
CIM	CI	1.58E-02	CONT ISOL W/O SEAL OR LETDOWN - TRAIN B CI	
CIN	CI	3.86E-03	CONT ISOL W/O SEAL OR LETDOWN - TRAIN C CI	
CIO	CI	6.77E-03	CONT ISOL W/O SEAL OR LETDOWN - TRAINS A AND C CI	
CIP	CI	1.56E-02	CONT ISOL W/O SEAL OR LETDOWN - TRAINS B AND C CI	
CIY	CI	0.00E+00	GS	
CIZ	CI	1.00E+00	GF	
CLAA	CLA	1.81E-08	CCPA, ABRUN	CHCNA
CLAB	CLA	1.79E-08	CCPA, BCRUN	CHCNB
CLAC	CLA	5.26E-06	CCPA, ACRUN	CHCNC
CLAD	CLA	2.13E-05	CCPA, ABRUN * CCWA=F	CHCMD
CLAE	CLA	1.86E-08	CCPA, BCRUN * CCWA=F	CHCNE
CLAF	CLA	1.06E-05	CCPA, ACRUN * CCWA=F	CHCNF
CLAG	CLA	1.86E-08	CCPA, ABRUN * CCWB=F	CHCNG

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CLAH	CLA	2.14E-05	CCPA, BCRUN * CCWB=F	CHCMH
CLAI	CLA	1.04E-05	CCPA, ACRUN * CCWB=F	CHCNI
CLAJ	CLA	1.50E-05	CCPA, ABRUN * CCWC=F	CHCNJ
CLAK	CLA	1.48E-05	CCPA, BCRUN * CCWC=F	CHCNK
CLAL	CLA	3.60E-05	CCPA, ACRUN * CCWC=F	CHCNL
CLAM	CLA	1.20E-03	CCPA, (ABRUN + BCRUN) * CCWA=F * CCWB=F	CHCLM
CLAO	CLA	2.76E-07	CCPA, ACRUN * CCWA=F * CCWB=F	CHCLO
CLAP	CLA	1.20E-03	CCPA, (ABRUN + ACRUN) * CCWA=F + CCWB=F	CHCNP
CLAQ	CLA	1.57E-05	CCPA, BCRUN * CCWA=F * CCWC=F	CHCNQ
CLAS	CLA	1.54E-05	CCPA, ABRUN * CCWB=F * CCWC=F	CHCNS
CLAT	CLA	1.21E-03	CCPA, (BCRUN + ACRUN) * CCWB=F * CCWC=F	CHCNT
CLAY	CLA	0.00E+00	GS -(GTRAN + SGTR)	
CLAZ	CLA	1.00E+00	GF (LOIA * CCWC=F)	
CLBA	CLB	1.23E-13	CCPB, ABRUN, CLA=S	CHCMA
CLBAN	CLB	6.49E-04	CLA=F	CHCLA
CLBB	CLB	2.00E-14	CCPB, BCRUN	CHCMB
CLBBN	CLB	6.53E-04	CLA=F	CHCLB
CLBC	CLB	2.41E-10	CCPB, ACRUN	CHCMC
CLBCN	CLB	1.60E-05	CLA=F	CHCLC
CLBD	CLB	1.05E-07	CCPB, ABRUN * CCWA=F	CHCMD
CLBDN	CLB	9.95E-01	CLA=F	CHCLD
CLBE	CLB	3.60E-11	CCPB, BCRUN * CCWA=F	CHCME
CLBEN	CLB	3.48E-02	CLA=F	CHCLE
CLBF	CLB	1.79E-08	CCPB, ACRUN * CCWA=F	CHCMF
CLBFN	CLB	4.66E-05	CLA=F	CHCLF
CLBG	CLB	2.90E-11	CCPB, ABRUN * CCWB=F	CHCMG
CLBGN	CLB	3.55E-02	CLA=F	CHCLG

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CLBH	CLB	2.66E-07	CCPB, BCRUN * CCWB=F	CHCMH
CLBHN	CLB	9.88E-01	CLA=F	CHCLH
CLBI	CLB	1.82E-08	CCPB, ACRUN * CCWB=F	CHCMI
CLBIN	CLB	4.65E-05	CLA=F	CHCLI
CLBJ	CLB	0.00E+00	CCPB, ABRUN * (CCWC=F + LOIA)	
CLBJN	CLB	4.38E-05	CLA=F	CHCLJ
CLBK	CLB	0.00E+00	CCPB, BCRUN * (CCWC=F + LOIA)	
CLBKN	CLB	4.57E-05	CLA=F	CHCLK
CLBL	CLB	0.00E+00	CCPB, ACRUN * (CCWC=F + LOIA)	
CLBLN	CLB	5.90E-01	CLA=F	CHCLL
CLBM	CLB	1.63E-05	CCPB, (ABRUN + BCRUN) * CCWA=F * CCWB=F	CHCMM
CLBMN	CLB	1.00E+00	CLA=F	
CLBO	CLB	1.51E-05	CCPB, ACRUN * CCWA=F * CCWB=F	CHCMO
CLBON	CLB	1.00E+00	CLA=F	
CLBP	CLB	0.00E+00	CCPB, (ABRUN + ACRUN) * CCWA=F * (CCWC=F + LOIA)	
CLBPN	CLB	9.99E-01	CLA=F	CHCLP
CLBQ	CLB	0.00E+00	CCPB, BCRUN * CCWA=F * (CCWC=F + LOIA)	
CLBQN	CLB	3.51E-02	CLA=F	CHCLQ
CLBS	CLB	0.00E+00	CCPB, ABRUN * CCWB=F * (CCWC=F + LOIA)	
CLBSN	CLB	3.50E-02	CLA=F	CHCLS
CLBT	CLB	0.00E+00	CCPB, (BCRUN + ACRUN) * CCWB=F * (CCWC=F + LOIA)	
CLBTN	CLB	9.92E-01	CLA=F	CHCLT
CLBY	CLB	0.00E+00	GS -(GTRAN + SGTR)	
CLBZ	CLB	1.00E+00	GF (LOIA * CCWA=F * CCWB=F)	
CLDA	CLB	6.45E-10	CCPB, ABRUN * LOIA	CHCLJ
CLDAN	CLB	9.78E-09	CLA=F	CHCLA

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CLDB	CLB	6.63E-10	CCPB, BCRUN * LOIA	CHCLK
CLDBN	CLB	9.76E-09	CLA=F	CHCLB
CLDC	CLB	2.13E-05	CCPB, ACRUN * LOIA	CHCLL
CLDCN	CLB	3.05E-04	CLA=F	CHCLC
CLDD	CLB	1.18E-03	CCPB, ABRUN * LOIA * CCWA=F	CHCLP
CLDDN	CLB	1.77E-02	CLA=F	CHCLD
CLDE	CLB	5.50E-07	CCPB, BCRUN * LOIA * CCWA=F	CHCLQ
CLDEN	CLB	5.40E-07	CLA=F	CHCLE
CLDF	CLB	1.20E-03	CCPB, ACRUN * LOIA * CCWA=F	CHCLP
CLDFN	CLB	1.78E-03	CLA=F	CHCLF
CLDG	CLB	5.37E-07	CCPB, ABRUN * LOIA * CCWB=F	CHCLS
CLDGN	CLB	5.52E-07	CLA=F	CHCLG
CLDH	CLB	1.18E-03	CCPB, BCRUN * LOIA * CCWB=F	CHCLT
CLDHN	CLB	1.77E-02	CLA=F	CHCLH
CLDI	CLB	1.20E-03	CCPB, ACRUN * LOIA * CCWB=F	CHCLT
CLDIN	CLB	1.76E-03	CLA=F	CHCLI
CLDJ	CLB	6.56E-10	CCWB, ABRUN * LOIA * CCWC=F	CHCLJ
CLDK	CLB	6.74E-10	CCWB, BCRUN * LOIA * CCWC=F	CHCLK
CLDL	CLB	2.13E-05	CCWB, ACRUN * LOIA * CCWC=F	CHCLL
CLDP	CLB	1.20E-03	CCWB, ABRUN * LOIA * CCWA=F * CCWC=F	CHCLP
CLDQ	CLB	5.50E-07	CCWB, BCRUN * LOIA * CCWA=F * CCWC=F	CHCLQ
CLDS	CLB	5.37E-07	CCWB, ABRUN * LOIA * CCWB=F * CCWC=F	CHCLS
CLDT	CLB	1.20E-03	CCWB, BCRUN * LOIA * CCWB=F * CCWC=F	CHCLT
CNDA	CND	1.30E-02	CONDENSATE SYSTEM - POST TRIP	
CNDY	CND	0.00E+00	GS	
CNDZ	CND	1.00E+00	GF	
CPA	CP	5.93E-08	CONTAINMENT PURGE (CP) ISOLATION - ALL SUPPORT	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CPB	CP	5.71E-06	CP - LOSS OF TRAIN B SUPPORT	
CPC	CP	8.28E-03	CP - NO SUPPORT AVAILABLE	
CPD	CP	9.74E-06	CP - LOSS OF TRAIN A SUPPORT	
CPE	CP	7.02E-06	CP - ALL SUPPORT, PURGE OPEN	
CPF	CP	6.92E-04	CP - LOSS OF TRAIN B, PURGE OPEN	
CPG	CP	1.00E+00	CP - NO SUPPORT, PURGE OPEN	
CPH	CP	1.18E-03	CP - LOSS OF TRAIN A, PURGE OPEN	
CPY	CP	0.00E+00	GS	
CS1AA	CS	9.87E-01	State: CSABC: CSS TRAIN ABC SUPPORT AVAILABLE	
CS1AB	CS	0.00E+00	State: CSABC: CSS TRAIN BC SUPPORT AVAILABLE	
CS1AC	CS	0.00E+00	State: CSABC: CSS TRAIN AC SUPPORT AVAILABLE	
CS1AD	CS	0.00E+00	State: CSABC: CSS TRAIN C SUPPORT AVAILABLE	
CS1AE	CS	0.00E+00	State: CSABC: CSS TRAIN AB SUPPORT AVAILABLE	
CS1AF	CS	0.00E+00	State: CSABC: CSS TRAIN B SUPPORT AVAILABLE	
CS1AG	CS	0.00E+00	State: CSABC: CSS TRAIN A SUPPORT AVAILABLE	
CS1AH	CS	0.00E+00	State: CSABC: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS2AA	CS	4.20E-03	State: CSAB: CSS TRAIN ABC SUPPORT AVAILABLE	
CS2AB	CS	0.00E+00	State: CSAB: CSS TRAIN BC SUPPORT AVAILABLE	
CS2AC	CS	0.00E+00	State: CSAB: CSS TRAIN AC SUPPORT AVAILABLE	
CS2AD	CS	0.00E+00	State: CSAB: CSS TRAIN C SUPPORT AVAILABLE	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CS2AE	CS	9.92E-01	State: CSAB: CSS TRAIN AB SUPPORT AVAILABLE	
CS2AF	CS	0.00E+00	State: CSAB: CSS TRAIN B SUPPORT AVAILABLE	
CS2AG	CS	0.00E+00	State: CSAB: CSS TRAIN A SUPPORT AVAILABLE	
CS2AH	CS	0.00E+00	State: CSAB: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS3AA	CS	4.05E-03	State: CSAC: CSS TRAIN ABC SUPPORT AVAILABLE	
CS3AB	CS	0.00E+00	State: CSAC: CSS TRAIN BC SUPPORT AVAILABLE	
CS3AC	CS	9.91E-01	State: CSAC: CSS TRAIN AC SUPPORT AVAILABLE	
CS3AD	CS	0.00E+00	State: CSAC: CSS TRAIN C SUPPORT AVAILABLE	
CS3AE	CS	0.00E+00	State: CSAC: CSS TRAIN AB SUPPORT AVAILABLE	
CS3AF	CS	0.00E+00	State: CSAC: CSS TRAIN B SUPPORT AVAILABLE	
CS3AG	CS	0.00E+00	State: CSAC: CSS TRAIN A SUPPORT AVAILABLE	
CS3AH	CS	0.00E+00	State: CSAC: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS4AA	CS	4.20E-03	State: CSBC: CSS TRAIN ABC SUPPORT AVAILABLE	
CS4AB	CS	9.92E-01	State: CSBC: CSS TRAIN BC SUPPORT AVAILABLE	
CS4AC	CS	0.00E+00	State: CSBC: CSS TRAIN AC SUPPORT AVAILABLE	
CS4AD	CS	0.00E+00	State: CSBC: CSS TRAIN C SUPPORT AVAILABLE	
CS4AE	CS	0.00E+00	State: CSBC: CSS TRAIN AB SUPPORT AVAILABLE	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CS4AF	CS	0.00E+00	State: CSBC: CSS TRAIN B SUPPORT AVAILABLE	
CS4AG	CS	0.00E+00	State: CSBC: CSS TRAIN A SUPPORT AVAILABLE	
CS4AH	CS	0.00E+00	State: CSBC: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS5AA	CS	9.37E-05	State: CSA: CSS TRAIN ABC SUPPORT AVAILABLE	
CS5AB	CS	0.00E+00	State: CSA: CSS TRAIN BC SUPPORT AVAILABLE	
CS5AC	CS	4.29E-03	State: CSA: CSS TRAIN AC SUPPORT AVAILABLE	
CS5AD	CS	0.00E+00	State: CSA: CSS TRAIN C SUPPORT AVAILABLE	
CS5AE	CS	4.14E-03	State: CSA: CSS TRAIN AB SUPPORT AVAILABLE	
CS5AF	CS	0.00E+00	State: CSA: CSS TRAIN B SUPPORT AVAILABLE	
CS5AG	CS	9.96E-01	State: CSA: CSS TRAIN A SUPPORT AVAILABLE	
CS5AH	CS	0.00E+00	State: CSA: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS6AA	CS	9.47E-05	State: CSB: CSS TRAIN ABC SUPPORT AVAILABLE	
CS6AB	CS	4.29E-03	State: CSB: CSS TRAIN BC SUPPORT AVAILABLE	
CS6AC	CS	0.00E+00	State: CSB: CSS TRAIN AC SUPPORT AVAILABLE	
CS6AD	CS	0.00E+00	State: CSB: CSS TRAIN C SUPPORT AVAILABLE	
CS6AE	CS	4.29E-03	State: CSB: CSS TRAIN AB SUPPORT AVAILABLE	
CS6AF	CS	9.96E-01	State: CSB: CSS TRAIN B SUPPORT AVAILABLE	
CS6AG	CS	0.00E+00	State: CSB: CSS TRAIN A SUPPORT AVAILABLE	
CS6AH	CS	0.00E+00	State: CSB: CSS TRAIN ABC SUPPORT UNAVAILABLE	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CS7AA	CS	9.37E-05	State: CSC: CSS TRAIN ABC SUPPORT AVAILABLE	
CS7AB	CS	4.14E-03	State: CSC: CSS TRAIN BC SUPPORT AVAILABLE	
CS7AC	CS	4.29E-03	State: CSC: CSS TRAIN AC SUPPORT AVAILABLE	
CS7AD	CS	9.96E-01	State: CSC: CSS TRAIN C SUPPORT AVAILABLE	
CS7AE	CS	0.00E+00	State: CSC: CSS TRAIN AB SUPPORT AVAILABLE	
CS7AF	CS	0.00E+00	State: CSC: CSS TRAIN B SUPPORT AVAILABLE	
CS7AG	CS	0.00E+00	State: CSC: CSS TRAIN A SUPPORT AVAILABLE	
CS7AH	CS	0.00E+00	State: CSC: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CS8AA	CS	3.66E-05	State: CSNO: CSS TRAIN ABC SUPPORT AVAILABLE	
CS8AB	CS	1.30E-04	State: CSNO: CSS TRAIN BC SUPPORT AVAILABLE	
CS8AC	CS	1.31E-04	State: CSNO: CSS TRAIN AC SUPPORT AVAILABLE	
CS8AD	CS	4.42E-03	State: CSNO: CSS TRAIN C SUPPORT AVAILABLE	
CS8AE	CS	1.30E-04	State: CSNO: CSS TRAIN AB SUPPORT AVAILABLE	
CS8AF	CS	4.27E-03	State: CSNO: CSS TRAIN B SUPPORT AVAILABLE	
CS8AG	CS	4.42E-03	State: CSNO: CSS TRAIN A SUPPORT AVAILABLE	
CS8AH	CS	1.00E+00	State: CSNO: CSS TRAIN ABC SUPPORT UNAVAILABLE	
CSY	CS	0.00E+00	GS	
CSZ	CS	1.00E+00	GF	
CV1G	CV	9.08E-02	GR LOOP with 1 SDG at 4 hrs	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
CV1P	CV	8.44E-02	PC LOOP with 1 SDG at 4 hrs	OMA
CV1S	CV	9.34E-02	SC LOOP with 1 SDG at 4 hrs	
CV1W	CV	2.67E-01	WR LOOP with 1 SDG at 4 hrs	
CV2G	CV	3.98E-02	GR LOOP with 2 SDGs at 4 hrs	
CV2P	CV	3.82E-02	PC LOOP with 2 SDGs at 4 hrs	OMB
CV2S	CV	4.24E-02	SC LOOP with 2 SDGs at 4 hrs	
CV2W	CV	1.44E-01	WR LOOP with 2 SDGs at 4 hrs	
CV3G	CV	5.33E-02	GR LOOP with 3 SDGs at 4 hrs	OMC
CV3P	CV	5.09E-02	PC LOOP with 3 SGDs at 4 hrs	OMC
CV3S	CV	5.65E-02	SC LOOP with 3 SDGs at 4 hrs	OMC
CV3W	CV	1.89E-01	WR LOOP with 3 SDGs at 4 hrs	OMC
CVY	CV	0.00E+00	GS	
CVZ	CV	1.00E+00	GUARANTEED NO RECOVERY	
D4ABCD	DCLP	1.42E-11	E1A11, E1B11, E1C11, E1D11, LOOP	
DAA	DA	2.82E-05	E1A11, ALL SUPPORT	DCAA
DAB	DA	4.30E-03	E1A11, LOSP	DC1A
DAC	DA	4.30E-03	E1A11, NO AC (4 HOURS)	DC1A
DAD	DA	2.73E-05	E1A11, BATTERY OUT OF SERVICE	DCAD
DAY	DA	0.00E+00	GS	
DAZ	DA	1.00E+00	GF	
DBA	DB	2.79E-05	E1B11, ALL SUPPORT	DCBA
DBB	DB	4.31E-03	E1B11, LOSP	DC1B
DBC1	DB	4.32E-03	E1B11, NO AC (4 HOURS), NO AC FOR TRAIN A, A=S	DC1B
DBC2	DB	1.05E-03	E1B11, NO AC (4 HOURS), NO AC FOR TRAIN A, A=F	DC2AB
DBC3	DB	4.31E-03	E1B11, NO AC (4 HOURS), NO AC FOR TRAIN A, A=B	DC1B

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
DBCA	DBC	5.00E-01	- DEBRIS TRAPPED IN CAVITY	
DBCC	DBC	0.00E+00	- DEBRIS DISPURSED AND WATER AVAILABLE	
DBCZ	DBC	1.00E+00	DEBRIS NOT COOLED	
DBD	DB	2.72E-05	E1B11, BATTERY OUT OF SERVICE	
DBY	DB	0.00E+00	GS	
DBZ	DB	1.00E+00	GF	
DC1A	DCLP	4.30E-03	E1A11, LOOP	
DC1B	DCLP	4.31E-03	E1B11, LOOP	
DC1C	DCLP	4.33E-03	E1C11, LOOP	
DC1D	DCLP	4.40E-03	E1D11, LOOP	
DC2AB	DCLP	4.51E-06	E1A11, E1B11, LOOP	
DC2AC	DCLP	4.42E-06	E1A11, E1C11, LOOP	
DC2AD	DCLP	4.55E-06	E1A11, E1C11, LOOP	
DC2BC	DCLP	4.51E-06	E1B11, E1C11, LOOP	
DC2BD	DCLP	4.45E-06	E1B11, E1D11, LOOP	
DC2CD	DCLP	4.47E-06	E1C11, E1D11, LOOP	
DC3ABC	DCLP	6.57E-09	E1A11, E1B11, E1C11, LOOP	
DC3ABD	DCLP	6.80E-09	E1A11, E1B11, E1D11, LOOP	
DC3ACD	DCLP	6.10E-09	E1A11, E1C11, E1D11, LOOP	
DC3BCD	DCLP	6.58E-09	E1B11, E1C11, E1D11, LOOP	
DCA	DC	2.80E-05	E1C11, ALL SUPPORT	DCCA
DCAA	DCLP	2.82E-05	E1A11, ALL SUPPORT	
DCAC	DCLP	4.29E-03	E1A11, NO AC (4 HOURS)	
DCAD	DCLP	2.73E-05	E1A11, BATTERY OUT OF SERVICE	
DCB	DC	4.33E-03	E1C11, LOSP	DC1C
DCBA	DCLP	2.79E-05	E1B11, ALL SUPPORT	
DCBC	DCLP	4.29E-03	E1B11, NO AC (4 HOURS)	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
DCBD	DCLP	2.72E-05	E1B11, BATTERY OUT OF SERVICE	
DCC1	DC	4.36E-03	E1C11, NO AC (4 HOURS) TO A, B, C, A=S B=S	DC1C
DCC2	DC	1.05E-03	E1C11, NO AC (4 HOURS) TO A, B, C, A=S B=F	DC2BC
DCC3	DC	1.03E-03	E1C11, NO AC (4 HOURS) TO A, B, C, A=F B=S	DC2AC
DCC4	DC	1.46E-03	E1C11, NO AC (4 HOURS) TO A, B, C, A=F B=F	DC3ABC
DCC5	DC	4.34E-03	E1C11, NO AC (4 HOURS) TO B, C, A=B B=S	DC1C
DCC6	DC	1.05E-03	E1C11, NO AC (4 HOURS) TO B, C, A=B B=F	DC2BC
DCC7	DC	4.34E-03	E1C11, NO AC (4 HOURS) TO A, C, A=S B=B	DC1C
DCC8	DC	1.03E-03	E1C11, NO AC (4 HOURS) TO A, C, A=F B=B	DC2AC
DCC9	DC	4.33E-03	E1C11, NO AC (4 HOURS) TO C, A=B B=B	DC1C
DCCA	DCLP	2.80E-05	E1C11, ALL SUPPORT	
DCCC	DCLP	4.33E-03	E1C11, NO AC (4 HOURS)	
DCCD	DCLP	2.72E-05	E1C11, BATTERY OUT OF SERVICE	
DCD	DC	2.72E-05	E1C11, BATTERY OUT OF SERVICE	DCCD
DCDA	DCLP	2.23E-05	E1D11, ALL SUPPORT	
DCDC	DCLP	4.32E-03	E1D11, NO AC (4 HOURS)	
DCDD	DCLP	2.13E-05	E1D11, BATTERY OUT OF SERVICE	
DCY	DC	0.00E+00	GS	
DCZ	DC	1.00E+00	GF	
DDA	DD	2.23E-05	E1D11, ALL SUPPORT	DCDA
DDB	DD	4.40E-03	E1D11, LOSP	DC1D
DDC1	DD	4.45E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=S B=S C=S	DC1D
DDC10	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO B, C ,D A=B B=S C=F	DC2CD
DDC11	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO B, C ,D A=B B=F C=S	DC2BD
DDC12	DD	1.46E-03	E1D11, NO AC (4 HOURS) TO B, C ,D A=B B=F C=F	DC3BCD

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
DDC13	DD	4.43E-03	E1D11, NO AC (4 HOURS) TO A, C ,D A=S B=B C=S	DC1D
DDC14	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO A, C ,D A=S B=B C=F	DC2CD
DDC15	DD	1.06E-03	E1D11, NO AC (4 HOURS) TO A, C ,D A=F B=B C=S	DC2AD
DDC16	DD	1.38E-03	E1D11, NO AC (4 HOURS) TO A, C ,D A=F B=B C=F	DC3ACD
DDC17	DD	4.43E-03	E1D11, NO AC (4 HOURS) TO A, B ,D A=S B=S C=B	DC1D
DDC18	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO A, B ,D A=S B=F C=B	DC2BD
DDC19	DD	1.06E-03	E1D11, NO AC (4 HOURS) TO A, B ,D A=F B=S C=B	DC2AD
DDC2	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=S B=S C=F	DC2CD
DDC20	DD	1.51E-03	E1D11, NO AC (4 HOURS) TO A, B ,D A=F B=F C=B	DC3ABD
DDC21	DD	4.42E-03	E1D11, NO AC (4 HOURS) TO C ,D A=B B=B C=S	DC1D
DDC22	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO C ,D A=B B=B C=F	DC2CD
DDC23	DD	4.42E-03	E1D11, NO AC (4 HOURS) TO B ,D A=B B=S C=B	DC1D
DDC24	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO B ,D A=B B=F C=B	DC2BD
DDC25	DD	4.42E-03	E1D11, NO AC (4 HOURS) TO A ,D A=S B=B C=B	DC1D
DDC26	DD	1.06E-03	E1D11, NO AC (4 HOURS) TO A ,D A=F B=B C=B	DC2AD
DDC27	DD	4.40E-03	E1D11, NO AC (4 HOURS) TO D A=B B=B C=B	DC1D
DDC3	DD	1.03E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=S B=F C=S	DC2BD
DDC4	DD	1.46E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=S B=F C=F	DC3BCD
DDC5	DD	1.06E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=F B=S C=S	DC2AD

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
DDC6	DD	1.38E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=F B=S C=F	DC3ACD
DDC7	DD	1.51E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=F B=F C=S	DC3ABC
DDC8	DD	2.16E-03	E1D11, NO AC (4 HOURS) TO A, B, C ,D A=F B=F C=F	D4ABCD
DDC9	DD	4.43E-03	E1D11, NO AC (4 HOURS) TO B, C ,D A=B B=S C=S	DC1D
DDD	DD	2.13E-05	E1D11, BATTERY OUT OF SERVICE	DCDD
DDY	DD	0.00E+00	GS	
DDZ	DD	1.00E+00	GF	
DM2A	DM	9.73E-03	THREE SMOKE PURGE, TWO REQUIRED	
DM2B	DM	6.53E-02	TWO SMOKE PURGE, TWO REQUIRED, A AND B	
DM2C	DM	6.56E-02	TWO SMOKE PURGE, TWO REQUIRED, A AND C	
DM2D	DM	6.38E-02	TWO SMOKE PURGE, TWO REQUIRED, B AND C	
DMA	DM	2.12E-03	3 SMOKE PURGE TRAINS	
DMB	DM	4.26E-03	SMOKE PURGE TRAINS A AND B	
DMC	DM	4.79E-03	SMOKE PURGE TRAINS A AND C	
DMD	DM	4.53E-03	SMOKE PURGE TRAINS B AND C	
DME	DM	3.51E-02	SMOKE PURGE TRAIN A	
DMF	DM	3.73E-02	SMOKE PURGE TRAIN B	
DMG	DM	3.52E-02	SMOKE PURGE TRAIN C	
DMY	DM	0.00E+00	GS	
DMZ	DM	1.00E+00	GF	
DUM1	DUM	0.00E+00	SLOCA, Hazard Levels: .501 to 2	
DUM2	DUM	3.79E-01	MLOCA, Hazard Levels: 2 to 6	
DUM3	DUM	1.00E+00	LLOCA, Hazard Levels: 6 to 9.99	
DUMF	DUM	1.00E+00	Guaranteed Failure	
DUMS	DUM	0.00E+00	Guaranteed Success	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
EAA	EA	2.40E-04	BUS E1A - 13.8 KV BUS 1F AVAILABLE	
EAB	EA	2.63E-04	BUS E1A - TRAIN A SUPPORT EQUIPMENT NOT OPERATING	
EAC	EA	8.53E-03	BUS E1A-O - LOOP	EP4A1
EAC1	EA	8.57E-03	BUS E1A-O - LOOP	
EAC2	EA	3.80E-03	BUS E1A-S - LOOP	
EAD	EA	3.79E-03	BUS E1A-S - LOOP	EP4A2
EAY	EA	0.00E+00	GS	
EAZ	EA	1.00E+00	GF	
EB1	EB	8.14E-03	BUS E1B-O - LOOP, EA=B	
EB2	EB	3.82E-03	BUS E1B-S - LOOP, EA=B	
EBA	EB	2.42E-04	BUS E1B - 13.8KV BUS 1G AVAILABLE	
EBB	EB	2.66E-04	BUS E1B - TRAIN B SUPPORT EQUIPMENT NOT OPERATING	
EBC	EB	8.08E-03	BUS E1B - LOOP, EA=S (A=O, B=O)	EP4B1
EBD	EB	2.13E-02	BUS E1B, EA=F	EP4AB1
EBE	EB	3.67E-03	BUS E1B - LOOP, EA=S (A=O, B=S)	EP4B2
EBF	EB	1.63E-02	BUS E1B, EA=F	EP4AB2
EBG	EB	8.09E-03	BUS E1B, LOOP, EA=S (EA=S, EB=O)	EP4B1
EBH	EB	3.64E-02	BUS E1B, EA=F	EP4AB3
EBI	EB	8.19E-03	BUS E1B-O - LOOP, EA=B	EP4B1
EBJ	EB	3.78E-03	BUS E1B-S - LOOP, EA=B	EP4B2
EBY	EB	0.00E+00	GS	
EBZ	EB	1.00E+00	GF	
EC1	EC	9.35E-03	BUS E1C-O, EA=B, EB=B	
EC101	ECHS	1.37E-03	ECH TRAIN A (ECA) RUN	
EC102	ECHS	1.38E-03	ECH TRAIN B (ECB) RUN	
EC103	ECHS	1.37E-03	ECH TRAIN C (ECC) RUN	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
EC104	ECHS	1.29E-02	ECH A RESTART (R/S)	
EC105	ECHS	1.29E-02	ECH B R/S	
EC106	ECHS	1.29E-02	ECH C R/S	
EC107	ECHS	1.52E-02	ECH A OFF	
EC108	ECHS	1.51E-02	ECH B OFF	
EC109	ECHS	1.53E-02	ECH C OFF	
EC2	EC	3.84E-03	BUS E1C-S - LOOP, EA=B, EB=B	
EC201	ECHS	5.02E-06	ECH A RUN, ECH B RUN, ECC=B	
EC202	ECHS	2.09E-05	ECH A RUN, ECH B R/S, ECC=B	
EC203	ECHS	2.09E-05	ECH A R/S, ECH B RUN, ECC=B	
EC204	ECHS	2.39E-04	ECH A R/S, ECH B R/S, ECC=B	
EC205	ECHS	2.41E-05	ECH A RUN, ECH B OFF, ECC=B	
EC206	ECHS	2.70E-04	ECH A R/S, ECH B OFF, ECC=B	
EC207	ECHS	2.40E-05	ECH A OFF, ECH B RUN, ECC=B	
EC208	ECHS	2.70E-04	ECH A OFF, ECH B R/S, ECC=B	
EC209	ECHS	5.02E-06	ECH A RUN, ECH C RUN, ECB=B	
EC210	ECHS	2.08E-05	ECH A RUN, ECH C R/S, ECB=B	
EC211	ECHS	2.08E-05	ECH A R/S, ECH C RUN, ECB=B	
EC212	ECHS	2.38E-04	ECH A R/S, ECH C R/S, ECB=B	
EC213	ECHS	2.41E-05	ECH A RUN, ECH C OFF, ECB=B	
EC214	ECHS	2.69E-04	ECH A R/S, ECH C OFF, ECB=B	
EC215	ECHS	2.41E-05	ECH A OFF, ECH C RUN, ECB=B	
EC216	ECHS	2.68E-04	ECH A OFF, ECH C R/S, ECB=B	
EC217	ECHS	5.03E-06	ECH B RUN, ECH C RUN, ECA=B	
EC218	ECHS	2.10E-05	ECH B RUN, ECH C R/S, ECA=B	
EC219	ECHS	2.10E-05	ECH B R/S, ECH C RUN, ECA=B	
EC220	ECHS	2.40E-04	ECH B R/S, ECH C R/S, ECA=B	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
EC221	ECHS	2.40E-05	ECH B RUN, ECH C OFF, ECA=B	
EC222	ECHS	2.68E-04	ECH B R/S, ECH C OFF, ECA=B	
EC223	ECHS	2.42E-05	ECH B OFF, ECH C RUN, ECA=B	
EC224	ECHS	2.70E-04	ECH B OFF, ECH C R/S, ECA=B	
EC301	ECHS	9.63E-07	ECH A RUN, ECH B RUN, ECH C OFF	
EC302	ECHS	1.31E-06	ECH A RUN, ECH B R/S, ECH C OFF	
EC303	ECHS	1.32E-06	ECH A R/S, ECH B RUN, ECH C OFF	
EC304	ECHS	2.20E-05	ECH A R/S, ECH B R/S, ECH C OFF	
EC305	ECHS	9.54E-07	ECH A RUN, ECH B OFF, ECH C RUN	
EC306	ECHS	1.32E-06	ECH A RUN, ECH B OFF, ECH C R/S	
EC307	ECHS	1.32E-06	ECH A R/S, ECH B OFF, ECH C RUN	
EC308	ECHS	2.18E-05	ECH A R/S, ECH B OFF, ECH C R/S	
EC309	ECHS	9.56E-07	ECH A OFF, ECH B RUN, ECH C RUN	
EC310	ECHS	1.33E-06	ECH A OFF, ECH B RUN, ECH C R/S	
EC311	ECHS	1.32E-06	ECH A OFF, ECH B R/S, ECH C RUN	
EC312	ECHS	2.17E-05	ECH A OFF, ECH B R/S, ECH C R/S	
ECA	EC	2.41E-04	BUS E1C - 13.8KV BUS 1H AVAILABLE	
ECAA	ECA	1.37E-03	ECH TRAIN A RUN	EC101
ECAB	ECA	1.29E-02	ECH TRAIN A R/S	EC104
ECAC	ECA	1.52E-02	ECH TRAIN A OFF	EC107
ECAE	EC	9.23E-03	EA=B, E1B-S, E1C-O	EP4C1
ECAF	EC	3.80E-02	EA=B, EB=F, E1C-O	EP4BC2
ECAG	EC	9.23E-03	EA=B, E1B-O, E1C-O	EP4C1
ECAH	EC	2.29E-02	EA=B, EB=F, E1C-O	EP4BC3
ECAI	EC	9.34E-03	BUS E1C-O, EA=B, EB=B	EP4C1
ECAJ	EC	3.80E-03	BUS E1C-S - LOOP, EA=B, EB=B	EP4C2
ECAK	EC	9.24E-03	EB=B, E1A-S, E1C-O	EP4C1

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECAL	EC	3.74E-02	EB=B, EA=F, E1C-O	EP4AC4
ECAM	EC	3.69E-03	EA=B, E1B-O, E1C-S	EP4C2
ECAN	EC	1.68E-02	EA=B, EB=F, E1C-S	EP4BC1
ECAY	ECA	0.00E+00	GS	
ECAZ	ECA	1.00E+00	GF	
ECB	EC	2.62E-04	BUS E1C - TRAIN C SUPPORT EQUIPMENT NOT OPERATING	
ECBA	ECB	1.38E-03	ECH A RUN, ECH B RUN	EC102
ECBB	ECB	3.66E-03	ECA=F, ECH B RUN	EC201
ECBC	ECB	1.29E-02	ECH A RUN, ECH B R/S	EC105
ECBD	ECB	1.53E-02	ECA=F, ECH B R/S	EC202
ECBE	ECB	1.38E-03	ECH A R/S, ECH B RUN	EC102
ECBF	ECB	1.62E-03	ECA=F, ECH B RUN	EC203
ECBG	ECB	1.28E-02	ECH A R/S, ECH B R/S	EC105
ECBH	ECB	1.85E-02	ECA=F, ECH B R/S	EC204
ECBI	ECB	1.51E-02	ECH A RUN, ECH B OFF	EC108
ECBJ	ECB	1.75E-02	ECA=F, ECH B OFF	EC205
ECBK	ECB	1.51E-02	ECH A R/S, ECH B OFF	EC108
ECBL	ECB	2.09E-02	ECA=F, ECH B OFF	EC206
ECBM	ECB	1.38E-03	ECH A OFF, ECH B RUN	EC102
ECBN	ECB	1.58E-03	ECA=F, ECH B RUN	EC207
ECBO	ECB	1.28E-02	ECH A OFF, ECH B R/S	EC105
ECBP	ECB	1.77E-02	ECA=F, ECH B R/S	EC208
ECBQ	ECB	1.38E-03	ECH TRAIN B RUN	EC102
ECBR	ECB	1.29E-02	ECH TRAIN B R/S	EC105
ECBS	ECB	1.51E-02	ECH TRAIN B OFF	EC108
ECBY	ECB	0.00E+00	GS	
ECBZ	ECB	1.00E+00	GF	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECC	EC	3.59E-03	BUS E1C - LOOP, EA-O, EB-O, EC-S	EP4C2
ECCA	ECC	1.53E-02	ECH A RUN, ECH B RUN, ECH C OFF	EC109
ECCAA	ECC	1.42E-03	ECH A R/S, ECH B OFF, ECH C RUN	EC103
ECCAB	ECC	1.54E-03	ECA=S, ECB=F, ECH C RUN	EC223
ECCAC	ECC	1.54E-03	ECA=F, ECB=S, ECH C RUN	EC211
ECCAD	ECC	4.89E-03	ECA=F, ECB=F, ECH C RUN	EC307
ECCAE	ECC	1.28E-02	ECH A R/S, ECH B OFF, ECH C R/S	EC106
ECCAF	ECC	1.67E-02	ECA=S, ECB=F, ECH C R/S	EC224
ECCAG	ECC	1.71E-02	ECA=F, ECB=S, ECH C R/S	EC212
ECCAH	ECC	8.06E-02	ECA=F, ECB=F, ECH C R/S	EC308
ECCAI	ECC	1.37E-03	ECH A OFF, ECH B RUN, ECH C RUN	EC103
ECCAJ	ECC	4.25E-03	ECA=S, ECB=F, ECH C RUN	EC217
ECCAK	ECC	1.52E-03	ECA=F, ECB=S, ECH C RUN	EC215
ECCAL	ECC	3.98E-02	ECA=F, ECB=F, ECH C RUN	EC309
ECCAM	ECC	1.28E-02	ECH A OFF, ECH B RUN, ECH C R/S	EC106
ECCAN	ECC	1.44E-02	ECA=S, ECB=F, ECH C R/S	EC218
ECCAO	ECC	1.75E-02	ECA=F, ECB=S, ECH C R/S	EC216
ECCAP	ECC	5.53E-02	ECA=F, ECB=F, ECH C R/S	EC310
ECCAQ	ECC	1.37E-03	ECH A OFF, ECH B R/S, ECH C RUN	EC103
ECCAR	ECC	1.56E-03	ECA=S, ECB=F, ECH C RUN	EC219
ECCAS	ECC	1.52E-03	ECA=F, ECB=S, ECH C RUN	EC215
ECCAT	ECC	4.89E-03	ECA=F, ECB=F, ECH C RUN	EC311
ECCAU	ECC	1.28E-02	ECH A OFF, ECH B R/S, ECH C R/S	ECCCJ
ECCAV	ECC	1.73E-02	ECA=S, ECB=F, ECH C R/S	EC220
ECCAW	ECC	1.65E-02	ECA=F, ECB=S, ECH C R/S	EC216
ECCAX	ECC	8.04E-02	ECA=F, ECB=F, ECH C R/S	EC312
ECCB	ECC	1.67E-02	ECA=S, ECB=F, ECH C OFF	EC221

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECCBA	ECC	1.37E-03	ECH A RUN, ECH C RUN, ECB=B	EC103
ECCBB	ECC	3.66E-03	ECA=F, ECH C RUN, ECB=B	EC209
ECCBC	ECC	1.29E-02	ECH A RUN, ECH C R/S, ECB=B	EC106
ECCBD	ECC	1.52E-02	ECA=F, ECH C R/S, ECB=B	EC210
ECCBE	ECC	1.37E-03	ECH A R/S, ECH C RUN, ECB=B	EC103
ECCBF	ECC	1.61E-03	ECA=F, ECH C RUN, ECB=B	EC211
ECCBG	ECC	1.28E-02	ECH A R/S, ECH C R/S, ECB=B	EC106
ECCBH	ECC	1.84E-02	ECA=F, ECH C R/S, ECB=B	EC212
ECCBI	ECC	1.53E-02	ECH A RUN, ECH C OFF, ECB=B	EC109
ECCBJ	ECC	1.76E-02	ECA=F, ECH C OFF, ECB=B	EC213
ECCBK	ECC	1.53E-02	ECH A R/S, ECH C OFF, ECB=B	EC109
ECCBL	ECC	2.08E-02	ECA=F, ECH C OFF, ECB=B	EC214
ECCBM	ECC	1.37E-03	ECH A OFF, ECH C RUN, ECB=B	EC103
ECCBN	ECC	1.58E-03	ECA=F, ECH C RUN, ECB=B	EC215
ECCBO	ECC	1.28E-02	ECH A OFF, ECH C R/S, ECB=B	EC106
ECCBP	ECC	1.76E-02	ECA=F, ECH C R/S, ECB=B	EC216
ECCBQ	ECC	1.37E-03	ECH B RUN, ECH C EUN, ECA=B	EC103
ECCBR	ECC	3.64E-03	ECB=F, ECH C RUN, ECA=B	EC217
ECCBS	ECC	1.29E-02	ECH B RUN, ECH C R/S, ECA=B	EC106
ECCBT	ECC	1.52E-02	ECB=F, ECH C R/S, ECA=B	EC218
ECCBU	ECC	1.37E-03	ECH B R/S, ECH C RUN, ECA=B	EC103
ECCBV	ECC	1.63E-03	ECB=F, ECH C RUN, ECA=B	EC219
ECCBW	ECC	1.28E-02	ECH B R/S, ECH C R/S, ECA=B	EC106
ECCBX	ECC	1.86E-02	ECB=F, ECH C R/S, ECA=B	EC220
ECCC	ECC	1.69E-02	ECA=F, ECB=S, ECH C OFF	EC213
ECCCA	ECC	1.53E-02	ECH B RUN, ECH C OFF, ECA=B	EC109
ECCCB	ECC	1.74E-02	ECB=F, ECH C OFF, ECA=B	EC221

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECCCC	ECC	1.53E-02	ECH B R/S, ECH C OFF, ECA=F	EC109
ECCCD	ECC	2.08E-02	ECB=F, ECH C OFF, ECA=B	EC222
ECCCE	ECC	1.37E-03	ECH B OFF, ECH C RUN, ECA=B	EC103
ECCCF	ECC	1.60E-03	ECB=F, ECH C RUN, ECA=B	EC223
ECCCG	ECC	1.28E-02	ECH B OFF, ECH C R/S, ECA=B	EC106
ECCCH	ECC	1.78E-02	ECB=F, ECH C R/S, ECA=B	EC224
ECCCI	ECC	1.37E-03	ECH TRAIN C RUN	EC103
ECCCJ	ECC	1.29E-02	ECH TRAIN C R/S	EC106
ECCCK	ECC	1.53E-02	ECH TRAIN C OFF	EC109
ECCD	ECC	1.92E-01	ECA=F, ECB=F, ECH C OFF	EC301
ECCE	ECC	1.53E-02	ECH A RUN, ECH B R/S, ECH C OFF	EC109
ECCF	ECC	2.07E-02	ECA=S, ECB=F, ECH C OFF	EC222
ECCG	ECC	1.69E-02	ECA=F, ECB=S, ECH C OFF	EC213
ECCH	ECC	6.27E-02	ECA=F, ECB=F, ECH C OFF	EC302
ECCI	ECC	1.53E-02	ECH A R/S, ECH B RUN, ECH C OFF	EC109
ECCJ	ECC	1.67E-02	ECA=S, ECB=F, ECH C OFF	EC221
ECCK	ECC	2.08E-02	ECA=F, ECB=S, ECH C OFF	EC214
ECCL	ECC	6.31E-02	ECA=F, ECB=F, ECH C OFF	EC303
ECCM	ECC	1.52E-02	ECH A R/S, ECH B R/S, ECH C OFF	EC109
ECCN	ECC	1.94E-02	ECA=S, ECB=F, ECH C OFF	EC222
ECCO	ECC	1.95E-02	ECA=F, ECB=S, ECH C OFF	EC214
ECCP	ECC	9.21E-02	ECA=F, ECB=F, ECH C OFF	EC304
ECCQ	ECC	1.37E-03	ECH A RUN, ECH B OFF, ECH C RUN	EC103
ECCR	ECC	1.54E-03	ECA=S, ECB=F, ECH C RUN	EC223
ECCS	ECC	3.02E-03	ECA=F, ECB=S, ECH C RUN	EC209
ECCT	ECC	3.97E-02	ECA=F, ECB=F, ECH C RUN	EC305
ECCU	ECC	1.28E-02	ECH A RUN, ECH B OFF, ECH C R/S	EC106

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECCV	ECC	1.78E-02	ECA=S, ECB=F, ECH C R/S	EC224
ECCW	ECC	1.45E-02	ECA=F, ECB=S, ECH C R/S	EC210
ECCX	ECC	5.50E-02	ECA=F, ECB=F, ECH C R/S	EC306
ECCY	ECC	0.00E+00	GS	
ECCZ	ECC	1.00E+00	GF	
ECD	EC	1.58E-02	EA=S, EB=F, EC-S	EP4BC1
ECE	EC	1.52E-02	EA=F, EB=S, EC-S	EP4AC1
ECF	EC	5.97E-02	EA=F, EB=F, EC-S	EPABC1
ECG	EC	9.14E-03	BUS E1C - LOOP, EA=O, EC=O(1)	EP4C1
ECH	EC	3.64E-02	EA=S, EB=F, EC-O(1)	EP4BC2
ECI	EC	2.04E-02	EA=F, EB=S, EC-O(1)	EP4AC2
ECJ	EC	7.83E-02	EA=F, EB=F, EC-O(1)	EPABC2
ECK	EC	9.14E-03	BUS E1C - LOOP, EA-O, EC-O(2)	EP4C1
ECL	EC	3.64E-02	EA=S, EB=F, EC-O(2)	EP4BC2
ECM	EC	2.08E-02	EA=F, EB=S, EC-O(2)	EP4AC3
ECN	EC	8.02E-02	EA=F, EB=F, EC-O(2)	EPABC3
ECO	EC	9.13E-03	BUS E1C - LOOP, EB-O, EC-O	EP4C1
ECP	EC	2.20E-02	EA=S, EB=F, EC-O	EP4BC3
ECQ	EC	3.58E-02	EA=F, EB=S, EC-O	EP4AC4
ECR	EC	7.78E-02	EA=F, EB=F, EC-O	EPABC4
ECS	EC	3.69E-03	EB=B, E1A-O, E1C-S	EP4C2
ECT	EC	1.62E-02	EB=B, EA=F, E1C-S	EP4AC1
ECU	EC	9.24E-03	EB=B, E1A-O(1), E1C-O	EP4C1
ECV	EC	2.13E-02	EB=B, EA=F, E1C-O	EP4AC2
ECW	EC	9.24E-03	EB=B, E1A-O, E1C-O(2)	EP4C1
ECW101	ECWS	2.86E-04	ECW TRAIN A (WA) - RUN	
ECW102	ECWS	2.87E-04	ECW TRAIN B (WB) - RUN	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECW103	ECWS	2.87E-04	ECW TRAIN C (WC) - RUN	
ECW104	ECWS	1.36E-03	ECW TRAIN A - R/S (LOOP)	
ECW105	ECWS	1.36E-03	ECW TRAIN B - R/S (LOOP)	
ECW106	ECWS	1.35E-03	ECW TRAIN C - R/S (LOOP)	
ECW107	ECWS	2.59E-03	ECW TRAIN A - START	
ECW108	ECWS	2.59E-03	ECW TRAIN B - START	
ECW109	ECWS	2.58E-03	ECW TRAIN C - START	
ECW201	ECWS	3.49E-07	WA RUN, WB RUN, WC=B	
ECW202	ECWS	6.39E-07	WA RUN, WB R/S, WC=B	
ECW203	ECWS	6.46E-07	WA R/S, WB RUN, WC=B	
ECW204	ECWS	1.37E-05	WA R/S, WB R/S, WC=B	
ECW205	ECWS	1.01E-06	WA RUN, WB START, WC=B	
ECW206	ECWS	1.51E-05	WA R/S, WB START, WC=B	
ECW207	ECWS	1.02E-06	WA START, WB RUN, WC=B	
ECW208	ECWS	1.51E-05	WA START, WB R/S, WC=B	
ECW209	ECWS	3.42E-07	WA RUN, WC RUN, WB=B	
ECW210	ECWS	6.63E-07	WA RUN, WC R/S, WB=B	
ECW211	ECWS	6.72E-07	WA R/S, WC RUN, WB=B	
ECW212	ECWS	1.33E-05	WA R/S, WC R/S, WB=B	
ECW213	ECWS	1.02E-06	WA RUN, WC START, WB=B	
ECW214	ECWS	1.47E-05	WA R/S, WC START, WB=B	
ECW215	ECWS	1.02E-06	WA START, WC RUN, WB=B	
ECW216	ECWS	1.49E-05	WA START, WC R/S, WB=B	
ECW217	ECWS	3.46E-07	WB RUN, WC RUN, WA=B	
ECW218	ECWS	6.56E-07	WB RUN, WC R/S, WA=B	
ECW219	ECWS	6.50E-07	WB R/S, WC RUN, WA=B	
ECW220	ECWS	1.33E-05	WB R/S, WC R/S, WA=B	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ECW221	ECWS	1.01E-06	WB RUN, WC START, WA=B	
ECW222	ECWS	1.44E-05	WB R/S, WC START, WA=B	
ECW223	ECWS	1.01E-06	WB START, WC RUN, WA=B	
ECW224	ECWS	1.46E-05	WB START, WC R/S, WB=B	
ECW301	ECWS	2.88E-08	WA RUN, WB RUN, WC START	
ECW302	ECWS	3.27E-08	WA RUN, WB R/S, WC START	
ECW303	ECWS	3.43E-08	WA R/S, WB RUN, WC START	
ECW304	ECWS	3.27E-06	WA R/S, WB R/S, WC START	
ECW305	ECWS	2.96E-08	WA RUN, WC RUN, WB START	
ECW306	ECWS	3.44E-08	WA RUN, WC R/S, WB START	
ECW307	ECWS	3.35E-08	WA R/S, WC RUN, WB START	
ECW308	ECWS	3.29E-06	WA R/S, WC R/S, WB START	
ECW309	ECWS	2.91E-08	WB RUN, WC RUN, WA START	
ECW310	ECWS	3.34E-08	WB RUN, WC R/S, WA START	
ECW311	ECWS	3.29E-08	WB R/S, WC RUN, WA START	
ECW312	ECWS	3.36E-06	WB R/S, WC R/S, WA START	
ECX	EC	2.18E-02	EB=B, EA=F, E1C-O(2)	EP4AC3
ECY	EC	0.00E+00	GS	
ECZ	EC	1.00E+00	GF	
EP4A1	EP4KV	8.53E-03	E1A-O - LOOP	
EP4A2	EP4KV	3.79E-03	E1A-S - LOOP	
EP4AB1	EP4KV	1.82E-04	E1A-O, E1B-O - LOOP	
EP4AB2	EP4KV	1.39E-04	E1A-O, E1B-S - LOOP	
EP4AB3	EP4KV	1.38E-04	E1A-S, E1B-O - LOOP	
EP4AC1	EP4KV	1.38E-04	E1A-O, E1C-S - LOOP	
EP4AC2	EP4KV	1.82E-04	E1A-O, E1C-O (1) - LOOP	
EP4AC3	EP4KV	1.86E-04	E1A-O, E1C-O (2) - LOOP	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
EP4AC4	EP4KV	1.42E-04	E1A-S, E1C-O - LOOP	
EP4B1	EP4KV	8.19E-03	E1B-O - LOOP	
EP4B2	EP4KV	3.78E-03	E1B-S - LOOP	
EP4BC1	EP4KV	1.38E-04	E1B-O, E1C-S - LOOP	
EP4BC2	EP4KV	1.44E-04	E1B-S, E1C-O - LOOP	
EP4BC3	EP4KV	1.88E-04	E1B-O, E1C-O - LOOP	
EP4C1	EP4KV	9.34E-03	E1C-O - LOOP	
EP4C2	EP4KV	3.80E-03	E1C-S - LOOP	
EPABC1	EP4KV	1.08E-05	E1A-O, E1B-O, E1C-S - LOOP	
EPABC2	EP4KV	1.08E-05	E1A-O, E1C-O (1), E1B-S - LOOP	
EPABC3	EP4KV	1.11E-05	E1A-O, E1C-O (2), E1B-S - LOOP	
EPABC4	EP4KV	1.08E-05	E1B=O, E1C=O, E1A=S - LOOP	
EXA	EX	4.25E-01	EMERGENCY XFMR FAILURE - AFTER GRID RELATED LOOP	
EXB	EX	3.96E-02	EMERG XFMR - NO LOOP OR PLANT CENTERED OR SWITCHYARD	
EXY	EX	0.00E+00	GS	
EXZ	EX	1.00E+00	GF	
F101	EABHV	1.29E-04	TRAIN A - RUN	
F102	EABHV	1.29E-04	TRAIN B - RUN	
F103	EABHV	1.32E-04	TRAIN C - RUN	
F104	EABHV	2.30E-03	TRAIN A - R/S (LOOP)	
F105	EABHV	2.29E-03	TRAIN B - R/S (LOOP)	
F106	EABHV	2.27E-03	TRAIN C - R/S (LOOP)	
F107	EABHV	2.71E-03	TRAIN A - START	
F108	EABHV	2.67E-03	TRAIN B - START	
F109	EABHV	2.66E-03	TRAIN C - START	
F201	EABHV	9.73E-08	FA RUN, FB RUN, FC=B	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
F202	EABHV	3.70E-07	FA RUN, FB R/S, FC=B	
F203	EABHV	3.76E-07	FA R/S, FB RUN, FC=B	
F204	EABHV	2.84E-05	FA R/S, FB R/S, FC=B	
F205	EABHV	4.28E-07	FA RUN, FB START, FC=B	
F206	EABHV	3.01E-05	FA R/S, FB START, FC=B	
F207	EABHV	4.30E-07	FA START, FB RUN, FC=B	
F208	EABHV	2.94E-05	FA START, FB R/S, FC=B	
F209	EABHV	9.65E-08	FA RUN, FC RUN, FB=B	
F210	EABHV	3.74E-07	FA RUN, FC R/S, FB=B	
F211	EABHV	3.82E-07	FA R/S, FC RUN, FB=B	
F212	EABHV	2.91E-05	FA R/S, FC R/S, FB=B	
F213	EABHV	4.27E-07	FA RUN, FC START, FB=B	
F214	EABHV	2.92E-05	FA R/S, FC START, FB=B	
F215	EABHV	4.28E-07	FA START, FC RUN, FB=B	
F216	EABHV	2.97E-05	FA START, FC R/S, FB=B	
F217	EABHV	9.66E-08	FB RUN, FC RUN, FA=B	
F218	EABHV	3.75E-07	FB RUN, FC R/S, FA=B	
F219	EABHV	3.77E-07	FB R/S, FC RUN, FA=B	
F220	EABHV	2.92E-05	FB R/S, FC R/S, FA=B	
F221	EABHV	4.20E-07	FB RUN, FC START, FA=B	
F222	EABHV	2.96E-05	FB R/S, FC START, FA=B	
F223	EABHV	4.32E-07	FB START, FC RUN, FA=B	
F224	EABHV	2.99E-05	FB START, FC R/S, FA=B	
F301	EABHV	9.81E-09	FA RUN, FB RUN, FC START	
F302	EABHV	1.35E-08	FA RUN, FB R/S, FC START	
F303	EABHV	1.39E-08	FA R/S, FB RUN, FC START	
F304	EABHV	5.44E-06	FA R/S, FB R/S, FC=START	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
F305	EABHV	9.65E-09	FA RUN, FC RUN, FB START	
F306	EABHV	1.36E-08	FA RUN, FC R/S, FB START	
F307	EABHV	1.35E-08	FA R/S, FC RUN, FB START	
F308	EABHV	5.48E-06	FA R/S, FC R/S, FB START	
F309	EABHV	1.00E-08	FB RUN, FC RUN, FA START	
F310	EABHV	1.42E-08	FB RUN, FC R/S, FA START	
F311	EABHV	1.36E-08	FB R/S, FC RUN, FA START	
F312	EABHV	5.58E-06	FB R/S, FC R/S, FA START	
FAA	FA	1.29E-04	FA RUN	F101
FAB	FA	2.30E-03	FA R/S (LOOP)	F104
FAC	FA	2.71E-03	FA START	F107
FAY	FA	0.00E+00	GS	
FAZ	FA	1.00E+00	GF	
FBA	FB	1.29E-04	FA RUN, FB RUN	F102
FBB	FB	7.55E-04	FA=F, FB RUN	F201
FBC	FB	2.29E-03	FA RUN, FB R/S	F105
FBD	FB	2.87E-03	FA=F, FB R/S	F202
FBE	FB	1.29E-04	FA R/S, FB RUN	F102
FBF	FB	1.63E-04	FA=F, FB RUN	F203
FBG	FB	2.26E-03	FA R/S, FB R/S (LOOP)	F105
FBH	FB	1.23E-02	FA=F, FB R/S	F204
FBI	FB	2.67E-03	FA RUN, FB START	F108
FBJ	FB	3.32E-03	FA=F, FB START	F205
FBK	FB	2.65E-03	FA R/S, FB START	F108
FBL	FB	1.31E-02	FA=F, FB START	F206
FBM	FB	1.29E-04	FA START, FB RUN	F102
FBN	FB	1.59E-04	FA=F, FB RUN	F207

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
FBO	FB	2.26E-03	FA START, FB R/S	F105
FBP	FB	1.09E-02	FA=F, FB R/S	F208
FBQ	FB	1.29E-04	FB RUN	F102
FBR	FB	2.29E-03	FB R/S	F105
FBS	FB	2.67E-03	FB START	F108
FBY	FB	0.00E+00	GS	
FBZ	FB	1.00E+00	GF	
FCA	FC	2.66E-03	FA RUN, FB RUN, FC START	F109
FCAA	FC	1.31E-04	FA R/S, FB START FC RUN	F103
FCAB	FC	1.58E-04	FA=S, FB=F, FC RUN	F223
FCAC	FC	1.62E-04	FA=F, FB=S, FC RUN	F211
FCAD	FC	4.50E-04	FA=F, FB=F, FC RUN	F307
FCAE	FC	2.22E-03	FA R/S, FB START, FC R/S	F106
FCAF	FC	9.24E-03	FA=S, FB=F, FC R/S	F224
FCAG	FC	1.04E-02	FA=F, FB=S, FC R/S	F212
FCAH	FC	1.82E-01	FA=F, FB=F, FC R/S	F308
FCAI	FC	1.31E-04	FA START, FB RUN, FC RUN	F103
FCAJ	FC	6.72E-04	FA=S, FB=F, FC RUN	F217
FCAK	FC	1.54E-04	FA=F, FB=S, FC RUN	F215
FCAL	FC	2.33E-02	FA=F, FB=F, FC RUN	F309
FCAM	FC	2.24E-03	FA START, FB RUN, FC R/S	F106
FCAN	FC	2.81E-03	FA=S, FB=F, FC R/S	F218
FCAO	FC	1.10E-02	FA=F, FB=S, FC R/S	F216
FCAP	FC	3.29E-02	FA=F, FB=F, FC R/S	F310
FCAQ	FC	1.32E-04	FA START, FB R/S, FC RUN	F103
FCAR	FC	1.61E-04	FA=S, FB=F, FC RUN	F219
FCAS	FC	1.55E-04	FA=F, FB=S, FC RUN	F215

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
FCAT	FC	4.63E-04	FA=F, FB=F, FC R/S	F311
FCAU	FC	2.22E-03	FA START, FB R/S, FC R/S	F106
FCAV	FC	1.05E-02	FA=S, FB=F, FC R/S	F220
FCAW	FC	8.99E-03	FA=F, FB=S, FC R/S	F216
FCAX	FC	1.90E-01	FA=F, FB=F, FC R/S	F312
FCB	FC	3.18E-03	FA=S, FB=F, FC START	F221
FCBA	FC	1.32E-04	FB=B, FA RUN, FC RUN	F103
FCBB	FC	7.49E-04	FB=B, FA=F, FC RUN	F209
FCBC	FC	2.27E-03	FB=B, FA RUN, FC R/S	F106
FCBD	FC	2.90E-03	FB=B, FA=F, FC R/S	F210
FCBE	FC	1.32E-04	FB=B, FA R/S, FC RUN	F103
FCBF	FC	1.66E-04	FB=B, FA=F, FC RUN	F211
FCBG	FC	2.24E-03	FB=B, FA R/S FC R/S	F106
FCBH	FC	1.27E-02	FB=B, FA=F, FC R/S	F212
FCBI	FC	2.66E-03	FB=B, FA RUN FC START	F109
FCBJ	FC	3.31E-03	FB=B, FA=F, FC START	F213
FCBK	FC	2.63E-03	FB=B, FA R/S, FC START	F109
FCBL	FC	1.27E-02	FB=B, FA=F, FC START	F214
FCBM	FC	1.32E-04	FB=B, FA START FC RUN	F103
FCBN	FC	1.58E-04	FB=B, FA=F, FC RUN	F215
FCBO	FC	2.24E-03	FB=B, FA START FC R/S	F106
FCBP	FC	1.10E-02	FB=B, FA=F, FC R/S	F216
FCBQ	FC	1.32E-04	FA=B, FB RUN, FC RUN	F103
FCBR	FC	7.48E-04	FA=B, FB=F, FC RUN	F217
FCBS	FC	2.27E-03	FA=B, FB RUN FC R/S	F106
FCBT	FC	2.91E-03	FA=B, FB=F, FC R/S	F218
FCBU	FC	1.32E-04	FA=B, FB R/S, FC RUN	F103

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
FCBV	FC	1.65E-04	FA=B, FB=F, FC RUN	F219
FCBW	FC	2.24E-03	FA=B, FB R/S FC R/S	F106
FCBX	FC	1.28E-02	FA=B, FB=F, FC R/S	F220
FCC	FC	3.24E-03	FA=F, FB=S, FC START	F213
FCCA	FC	2.66E-03	FA=B, FB RUN, FC START	F109
FCCB	FC	3.25E-03	FA=B, FB=F, FC START	F221
FCCC	FC	2.63E-03	FA=B, FB R/S, FC START	F109
FCCD	FC	1.30E-02	FA=B, FB=F, FC START	F222
FCCE	FC	1.32E-04	FA=B, FB START, FC RUN	F103
FCCF	FC	1.61E-04	FA=B, FB=F, FC RUN	F223
FCCG	FC	2.24E-03	FA=B, FB START, FC R/S	F106
FCCH	FC	1.12E-02	FA=B, FB=F, FC R/S	F224
FCCI	FC	1.32E-04	FC RUN	F103
FCCJ	FC	2.27E-03	FC R/S	F106
FCCK	FC	2.66E-03	FC START	F109
FCD	FC	1.01E-01	FA=F, FB=F, FC START	F301
FCE	FC	2.63E-03	FA RUN, FB R/S, FC START	F109
FCF	FC	1.30E-02	FA=S, FB=F, FC START	F222
FCG	FC	3.22E-03	FA=F, FB=S, FC START	F213
FCH	FC	3.64E-02	FA=F, FB=F, FC START	F302
FCI	FC	2.63E-03	FA R/S, FB RUN, FC START	F109
FCJ	FC	3.15E-03	FA=S, FB=F, FC START	F221
FCK	FC	1.27E-02	FA=F, FB=S, FC START	F214
FCL	FC	3.71E-02	FA=F, FB=F, FC START	F303
FCM	FC	2.61E-03	FA R/S, FB R/S, FC START	F109
FCN	FC	1.07E-02	FA=S, FB=F, FC START	F222
FCO	FC	1.05E-02	FA=F, FB=S, FC RUN	F214

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
FCP	FC	1.92E-01	FA=F, FB=F, FC START	F304
FCQ	FC	1.31E-04	FA RUN, FB START, FC RUN	F103
FCR	FC	1.58E-04	FA=S, FB=F, FC RUN	F223
FCS	FC	6.76E-04	FA=F, FB=S, FC RUN	F209
FCT	FC	2.25E-02	FA=F, FB=F, FC RUN	F305
FCU	FC	2.24E-03	FA RUN, FB START, FC R/S	F106
FCV	FC	1.12E-02	FA=S, FB=F, FC R/S	F224
FCW	FC	2.81E-03	FA=F, FB=S, FC RUN	F210
FCX	FC	3.19E-02	FA=F, FB=F, FC RUN	F306
FCY	FC	0.00E+00	GS	
FCZ	FC	1.00E+00	GF	
FLL1	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE LLOCA PUMP STATE 1**	
FLL22	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE LLOCA PUMP STATE 22**	
FLL26	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE LLOCA PUMP STATE 26**	
FLL43	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE LLOCA PUMP STATE 43**	
FLL9	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE LLOCA PUMP STATE 9**	
FML1	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE, MLOCA STATE 1**	
FML22	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE MLOCA STATE 22**	
FML26	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE MLOCA PUMP STATE 26**	
FML43	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE MLOCA PUMP STATE 43**	
FML9	**FBLK**	**0.00E+00**	**CORE FLOW BLOCKAGE MLOCA STATE 9**	
FPS1	FPD	1.30E-04	FP Diesel All Pumps	
FPS2	FPD	4.25E-04	FP Diesels - Two Pumps	
FPS3	FPD	9.45E-03	FP Diesels - One Pump	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
FWSA	FWS	5.00E-03	MAIN FEEDWATER RESPONSE - ATWS	
FWSY	FWS	0.00E+00	GS	
FWSZ	FWS	1.00E+00	GF	
FWY	FBLK	0.00E+00	no description entered	
FWZ	FBLK	1.00E+00	no description entered	
G1A	DGX	2.30E-02	TRAIN A DIESEL GENERATOR	
G1B	DGX	2.29E-02	TRAIN B DIESEL GENERATOR	
G1C	DGX	2.28E-02	TRAIN C DIESEL GENERATOR	
G2AB	DGX	7.14E-04	TRAINS A AND B DIESEL GENERATORS	
G2AC	DGX	7.15E-04	TRAINS A AND C DIESEL GENERATORS	
G2BC	DGX	7.07E-04	TRAINS B AND C DIESEL GENERATORS	
G3ABC	DGX	8.77E-05	TRAINS A, B, AND C DIESEL GENERATORS	
GAA	GA	2.30E-02	DG 11 FAILS - ALL SUPPORT AVAILABLE	G1A
GAY	GA	0.00E+00	GS	
GAZ	GA	1.00E+00	GF	
GBA	GB	2.27E-02	DG 12 FAILS - GA=S	G1B
GBB	GB	3.10E-02	DG 12 FAILS - GA=F	G2AB
GBC	GB	2.29E-02	DG 12 FAILS - GA=B	G1B
GBY	GB	0.00E+00	GS	
GBZ	GB	1.00E+00	GF	
GCA	GC	2.25E-02	DG 13 FAILS - GA=S, GB=S	G1C
GCB	GC	2.80E-02	DG 13 FAILS - GA=S, GB=F	G2BC
GCC	GC	2.81E-02	DG 13 FAILS - GA=F, GB=S	G2AC
GCD	GC	1.23E-01	DG 13 FAILS - GA=F, GB=F	G3ABC
GCE	GC	2.26E-02	DG 13 FAILS - GA=B, GB=S	G1C
GCF	GC	3.09E-02	DG 13 FAILS - GA=B, GB=F	G2BC
GCG	GC	2.26E-02	DG 13 FAILS - GA=S, GB=B	G1C

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
GCH	GC	3.11E-02	DG 13 FAILS - GA=F, GB=B	G2AC
GCI	GC	2.28E-02	DG 13 FAILS - GA=B, GB=B	G1C
GCY	GC	0.00E+00	GS	
GCZ	GC	1.00E+00	GF	
H3A	H3	7.20E-01	NO CCI, NO PREVIOUS BURNS	
H3C	H3	1.00E+00	BURNS AT LOW CONCENTRATIONS	
H3D	H3	1.00E+00	BURN IN CAVITY	
HAA	HA	2.55E-03	HHSI TRAIN A - ALL SUPPORT	HI1A
HAY	HA	0.00E+00	GS	
HAZ	HA	1.00E+00	GF	
HBA	HB	2.50E-03	HHSI TRAIN B - HA=S	HI1B
HBB	HB	2.28E-02	HHSI TRAIN B - HA=F	HI2AB
HBC	HB	2.55E-03	HHSI TRAIN B - HA=B	HI1B
HBY	HB	0.00E+00	GS	
HBZ	HB	1.00E+00	GF	
HCA	HC	2.43E-03	HHSI TRAIN C - HA=S, HB=S	HI1C
HCB	HC	1.79E-02	HHSI TRAIN C - HA=S, HB=F	HI2BC
HCC	HC	1.78E-02	HHSI TRAIN C - HA=F, HB=S	HI2AC
HCD	HC	2.32E-01	HHSI TRAIN C - HA=F, HB=F	HI3ABC
HCE	HC	2.47E-03	HHSI TRAIN C - HA=B, HB=S	HI1C
HCF	HC	2.28E-02	HHSI TRAIN C - HA=B, HB=F	HI2BC
HCG	HC	2.47E-03	HHSI TRAIN C - HA=S, HB=B	HI1C
HCH	HC	2.27E-02	HHSI TRAIN C - HA=F, HB=B	HI2AC
HCI	HC	2.52E-03	HHSI TRAIN C - HA=B, HB=B	HI1C
HCY	HC	0.00E+00	GS	
HCZ	HC	1.00E+00	GF	
HEA	HE	7.20E-01	RCS PRESS < 200 PSIA @ VB, SPRAYS OPERATING @ VB	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
HEB	HE	0.00E+00	RCS PRESS < 200 PSIA @ VB, SPRAYS UNAVAILABLE	
HI1A	HI	2.55E-03	HHSI TRAIN A	
HI1B	HI	2.55E-03	HHSI TRAIN B	
HI1C	HI	2.52E-03	HHSI TRAIN C	
HI2AB	HI	5.81E-05	HHSI TRAINS A AND B	
HI2AC	HI	5.78E-05	HHSI TRAINS A AND C	
HI2BC	HI	5.81E-05	HHSI TRAINS B AND C	
HI3ABC	HI	1.35E-05	3 HHSI TRAINS FAIL	
HIY	HI	0.00E+00	GS	
HIZ	HI	1.00E+00	GF	
HLEG3	HLEG	4.40E-05	ALL SUPPORT AVAILABLE	
HLEGA	HLEG	1.45E-03	TRAIN A HOT LEG RECIRCULATION FAILS	
HLEGAB	HLEG	5.66E-05	TRAIN A,B HOT LEG RECIRCULATION FAILS	
HLEGAC	HLEG	5.67E-05	TRAIN A,C HOT LEG RECIRCULATION FAILS	
HLEGB	HLEG	1.45E-03	TRAIN B HOT LEG RECIRCULATION FAILS	
HLEGBC	HLEG	5.71E-05	TRAIN B,C HOT LEG RECIRCULATION FAILS	
HLEGC	HLEG	1.45E-03	TRAIN C HOT LEG RECIRCULATION FAILS	
HLEGY	HLEG	0.00E+00	GUARANTEED SUCCESS (GS)	
HLEGZ	HLEG	1.00E+00	GUARANTEED FALURE (GF)	
HMEA	HME	0.00E+00	RCS PRESS < 200 PSIA	
HMEH	HME	9.20E-01	RCS PRESS > 600 PSIA @ VB	
HMEI	HME	7.30E-01	200 PSIA < RCS PRESS < 600 PSIA @ VB	
IAA	IA	1.12E-03	ESFAS TRAIN A - GT	IG1A
IAB	IA	6.73E-03	ESFAS TRAIN A - LOCA	IS1A
IAC	IA	5.34E-03	ESFAS TRAIN A - LOSP	IO1A
IAS1	IAS	3.79E-06	IAS - OFFSITE POWER AVAILABLE - 11, 12 OPER	
IAS10	IAS	7.86E-05	IAS - MAINT CMPR 14 - 12, 13 OPER	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
IAS11	IAS	7.96E-05	IAS - MAINT CMPR 14 - AVG	
IAS12	IAS	1.57E-03	IAS - CMPR 14 ONLY (RUN), NO LOOP	
IAS13	IAS	1.32E-02	IAS - CMPR 14 ONLY (START), NO LOOP	
IAS14	IAS	2.01E-01	IAS - CMPR 14 ONLY, LOOP	
IAS15	IAS	8.61E-05	IAS - MAINT CMPRS 13 AND 14	
IAS16	IAS	8.45E-05	IAS - MAINT CMPRS 12 AND 14	
IAS17	IAS	8.06E-06	IAS - MAINT CMPRS 12 AND 13	
IAS18	IAS	8.67E-05	IAS - MAINT CMPRS 11 AND 14	
IAS19	IAS	8.02E-06	IAS - MAINT CMPRS 11 AND 13	
IAS2	IAS	3.81E-06	IAS - CMPR 11, 13 OPER	
IAS20	IAS	8.02E-06	IAS - MAINT CMPRS 11 AND 12	
IAS21	IAS	1.55E-03	IAS - MAINT COMPRS 11, 12, AND 13	
IAS22	IAS	1.64E-03	IAS - MAINT COMPRS 11, 12, AND 14	
IAS23	IAS	1.63E-03	IAS - MAINT COMPRS 11, 13, AND 14	
IAS24	IAS	1.65E-03	IAS - MAINT COMPRS 12, 13, AND 14	
IAS3	IAS	3.82E-06	IAS - CMPR 12, 13 OPER	
IAS4	IAS	3.81E-06	IAS - AVERG IAS1 + IAS2 + IAS3	
IAS5	IAS	3.47E-06	IAS - MAINT CMPR 11	
IAS6	IAS	3.45E-06	IAS - MAINT CMPR 12	
IAS7	IAS	3.46E-06	IAS - MAINT CMPR 13	
IAS8	IAS	7.96E-05	IAS - MAINT CMPR 14 - 11, 12 OPER	
IAS9	IAS	8.04E-05	IAS - MAINT CMPR 14 - 11, 13 OPER	
IASY	IAS	0.00E+00	GS	
IASZ	IAS	1.00E+00	GF	
IAY	IA	0.00E+00	GS	
IAZ	IA	1.00E+00	GF	
IBA	IB	1.03E-03	ESFAS TRAIN B - GT - IA=S	IG1B

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
IBB	IB	5.23E-04	ESFAS TRAIN B - GT - IA=F	IG2AB
IBC	IB	1.02E-03	ESFAS TRAIN B - GT - IA=B	IG1B
IBD	IB	6.72E-03	ESFAS TRAIN B - LOCA - IA=S	IS1B
IBE	IB	7.93E-03	ESFAS TRAIN B - LOCA - IA=F	IS2AB
IBF	IB	6.72E-03	ESFAS TRAIN B - LOCA - IA=B	IS1B
IBG	IB	5.30E-03	ESFAS TRAIN B - LOSP - IA=S	IO1B
IBH	IB	6.26E-03	ESFAS TRAIN B - LOSP - IA=F	IO2AB
IBI	IB	5.31E-03	ESFAS TRAIN B - LOSP - IA=B	IO1B
IBY	IB	0.00E+00	GS	
IBZ	IB	1.00E+00	GF	
ICA	IC	1.03E-03	ESFAS TRAIN C - GT - IA=S, IB=S	IG1C
ICAA	IC	5.27E-03	ESFAS TRAIN C - LOSP - IA=B, IB=S	IO1C
ICAB	IC	6.33E-03	ESFAS TRAIN C - LOSP - IA=B, IB=F	IO2BC
ICAC	IC	5.27E-03	ESFAS TRAIN C - LOSP - IA=B, IB=B	IO1C
ICB	IC	3.54E-04	ESFAS TRAIN C - GT - IA=S, IB=F	IG2BC
ICC	IC	4.02E-04	ESFAS TRAIN C - GT - IA=F, IB=S	IG2AC
ICD	IC	2.18E-01	ESFAS TRAIN C - GT - IA=F, IB=F	IG3ABC
ICE	IC	1.03E-03	ESFAS TRAIN C - GT - IA=S, IB=B	IG1C
ICF	IC	5.16E-04	ESFAS TRAIN C - GT - IA=F, IB=B	IG2AC
ICG	IC	1.03E-03	ESFAS TRAIN C - GT - IA=B, IB=S	IG1C
ICH	IC	4.79E-04	ESFAS TRAIN C - GT - IA=B, IB=F	IG2BC
ICI	IC	1.03E-03	ESFAS TRAIN C - GT IA=B, IB=B	IG1C
ICJ	IC	6.77E-03	ESFAS TRAIN C - LOCA - IA=S, IB=S	IS1C
ICK	IC	7.36E-03	ESFAS TRAIN C - LOCA - IA=S, IB=F	IS2BC
ICL	IC	7.58E-03	ESFAS TRAIN C - LOCA - IA=F, IB=S	IS2AC
ICM	IC	3.05E-02	ESFAS TRAIN C - LOCA - IA=F, IB=F	IS3ABC
ICN	IC	6.77E-03	ESFAS TRAIN C - LOCA - IA=S, IB=B	IS2AC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ICO	IC	7.76E-03	ESFAS TRAIN C - LOCA - IA=F, IB=B	IS2AC
ICP	IC	6.77E-03	ESFAS TRAIN C - LOCA - IA=B, IB=S	IS1C
ICQ	IC	7.54E-03	ESFAS TRAIN C - LOCA - IA=B, IB=F	IS2BC
ICR	IC	6.78E-03	ESFAS TRAIN C - LOCA - IA=F, IB=F	IS1C
ICS	IC	5.26E-03	ESFAS TRAIN C - LOSP - IA=S, IB=S	IO1C
ICT	IC	6.22E-03	ESFAS TRAIN C - LOSP - IA=S, IB=F	IO2BC
ICU	IC	6.26E-03	ESFAS TRAIN C - LOSP - IA=F, IB=S	IO2AC
ICV	IC	2.36E-02	ESFAS TRAIN C - LOSP - IA=F, IB=F	IO3ABC
ICW	IC	5.26E-03	ESFAS TRAIN C - LOSP - IA=S, IB=B	IO1C
ICX	IC	6.37E-03	ESFAS TRAIN C - LOSP - IA=F, IB=B	IO2AC
ICY	IC	0.00E+00	GS	
ICZ	IC	1.00E+00	GF	
IG1A	ESFAS	1.12E-03	GT - ESFAS TRAIN A FAILS	
IG1B	ESFAS	1.02E-03	GT - ESFAS TRAIN B FAILS	
IG1C	ESFAS	1.03E-03	GT - ESFAS TRAIN C FAILS	
IG2AB	ESFAS	5.88E-07	GT - ESFAS TRAINS A, B FAIL	
IG2AC	ESFAS	5.80E-07	GT - ESFAS TRAINS A, C FAIL	
IG2BC	ESFAS	4.91E-07	GT - ESFAS TRAINS B, C FAIL	
IG3ABC	ESFAS	1.28E-07	GT - ESFAS TRAINS A, B, C FAIL	
INA	IN	3.72E-05	ALL SUPPORT	
INB	IN	1.85E-03	LOSS OF SUPPORT TO SFP HX HEADER MOV-0032 (TRAIN B)	
INC	IN	3.62E-03	LOSS OF SUPPORT SFP HX MOV 0447, OTHER MOV 0236	
IND	IN	1.83E-03	LOSS OF SUPPORT OTHER MOV 0235	
INE	IN	3.62E-03	LOSS OF SUPPORT SFP HX MOV 0032, OTHER MOV 0235	
INSTA	INST	1.56E-09	120V VITAL AC - ALL SUPPORT	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
INSTB	INST	3.72E-09	LOSS OF CHANNEL I	
INSTC	INST	3.94E-09	LOSS OF CHANNEL II	
INSTD	INST	3.73E-09	LOSS OF CHANNEL III	
INSTE	INST	3.88E-09	LOSS OF CHANNEL IV	
INSTF	INST	6.71E-08	LOSS OF CHANNELS I, II	
INSTG	INST	6.82E-08	LOSS OF CHANNELS I, III	
INSTH	INST	6.78E-08	LOSS OF CHANNELS I, IV	
INSTI	INST	6.78E-08	LOSS OF CHANNELS II, III	
INSTJ	INST	6.81E-08	LOSS OF CHANNELS II, IV	
INSTK	INST	6.76E-08	LOSS OF CHANNELS III, IV	
INSTL	INST	1.35E-04	LOSS OF CHANNELS I, II, III	
INSTM	INST	1.35E-04	LOSS OF CHANNELS I, II, IV	
INSTN	INST	1.37E-04	LOSS OF CHANNELS I, III, IV	
INSTO	INST	1.35E-04	LOSS OF CHANNELS II, III, IV	
INY	IN	0.00E+00	GS	
INZ	IN	1.00E+00	GF	
IO1A	ESFAS	5.34E-03	LOOP - TRAIN A FAILS	
IO1B	ESFAS	5.31E-03	LOOP - TRAIN B FAILS	
IO1C	ESFAS	5.27E-03	LOOP - TRAIN C FAILS	
IO2AB	ESFAS	3.34E-05	LOOP - TRAINS A, B FAIL	
IO2AC	ESFAS	3.40E-05	LOOP - TRAINS A, C FAIL	
IO2BC	ESFAS	3.36E-05	LOOP - TRAINS B, C FAIL	
IO3ABC	ESFAS	7.89E-07	LOOP - TRAINS A, B, C FAIL	
IPA	IP	0.00E+00	- RCS PRESS < 2000 PSIA @ UTAF	
IPS	IP	7.20E-01	- RCS PRESS > 2000 PSIA @ UTAF, NO SEAL LOCA	
IPX	IP	1.50E-01	- RCS PRESS > 2000 PSI, SEAL LOCA	
IS1A	ESFAS	6.73E-03	LOCA - TRAIN A FAILS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
IS1B	ESFAS	6.72E-03	LOCA - TRAIN B FAILS	
IS1C	ESFAS	6.78E-03	LOCA - TRAIN C FAILS	
IS2AB	ESFAS	5.33E-05	LOCA - TRAINS A, B FAIL	
IS2AC	ESFAS	5.22E-05	LOCA - TRAINS A, C FAIL	
IS2BC	ESFAS	5.07E-05	LOCA - ESFAS TRAINS B, C FAIL	
IS3ABC	ESFAS	1.63E-06	LOCA - ESFAS TRAINS A, B, C FAIL	
ISA	IS	0.00E+00	RCS PRESS < 2000 PSIA @ UTAF	
ISS	IS	6.33E-02	RCS PRESS > 2000 PSIA @ UTAF, NO SORV OR SEAL LOCA	
ISX	IS	2.29E-01	RCS PRESS > 2000 PSI, SEAL LOCA	
ISY	IS	3.92E-02	STUCK OPEN SRV OR PORV	
IV0	INST	1.50E-09	NO INVERTER MAINT	
IV1	INST	1.01E-13	IV1201 INVERTER MAINT	
IV12	INST	1.79E-12	IV1201 INVERTER MAINT - CH II=F	
IV123	INST	3.53E-09	IV1201 INVERTER MAINT - CH I, II=F	
IV1234	INST	2.66E-05	IV1201 INVERTER MAINT - CH II, III, IV=F	
IV124	INST	3.54E-09	IV1201 INVERTER MAINT - CH II, IV=F	
IV13	INST	1.77E-12	IV1201 INVERTER MAINT - CH III=F	
IV134	INST	3.62E-09	IV1201 INVERTER MAINT - CH III, IV=F	
IV14	INST	1.70E-12	IV1201 INVERTER MAINT - CH IV=F	
IV2	INST	1.03E-13	IV1202 INVERTER MAINT	
IV21	INST	1.76E-12	IV1202 INVERTER MAINT - CH I=F	
IV213	INST	3.55E-09	IV1202 INVERTER MAINT - CH I, III=F	
IV2134	INST	2.57E-05	IV1202 INVERTER MAINT - CH I, III, IV=F	
IV214	INST	3.50E-09	IV1202 INVERTER MAINT - CH I, IV=F	
IV23	INST	1.80E-12	IV1202 INVERTER MAINT - CH III=F	
IV234	INST	3.58E-09	IV1202 INVERTER MAINT - CH III, IV=F	
IV24	INST	1.81E-12	IV1202 INVERTER MAINT - CH IV=F	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
IV3	INST	1.06E-13	IV1203 INVERTER MAINT	
IV31	INST	1.80E-12	IV1203 INVERTER MAINT - CH I=F	
IV312	INST	3.56E-09	IV1203 INVERTER MAINT - CH I, II=F	
IV3124	INST	2.68E-05	IV1203 INVERTER MAINT - CH I, II, IV=F	
IV314	INST	3.60E-09	IV1203 INVERTER MAINT - CH I, IV=F	
IV32	INST	1.72E-12	IV1203 INVERTER MAINT - CH II=F	
IV324	INST	3.47E-09	IV1203 INVERTER MAINT - CH II, IV=F	
IV34	INST	1.79E-12	IV1203 INVERTER MAINT - CH IV=F	
IV4	INST	1.09E-13	IV1204 INVERTER MAINT	
IV41	INST	1.84E-12	IV1204 INVERTER MAINT - CH I=F	
IV412	INST	3.56E-09	IV1204 INVERTER MAINT - CH I, II=F	
IV4123	INST	2.57E-05	IV1204 INVERTER MAINT - CH I, II, III=F	
IV413	INST	3.58E-09	IV1204 INVERTER MAINT - CH I, III=F	
IV42	INST	1.76E-12	IV1204 INVERTER MAINT - CH II=F	
IV423	INST	3.53E-09	IV1204 INVERTER MAINT - CH II, III=F	
IV43	INST	1.78E-12	IV1204 INVERTER MAINT - CH III=F	
IXR	ESFAS	1.70E-06	LOSS OF SSPS TRAIN R - LOCA	
IXS	ESFAS	1.68E-06	LOSS OF SSPS TRAIN S - LOCA	
KAA	KA	2.43E-04	KA - RUN	CCW101
KAB	KA	9.69E-03	KA - R/S	CCW104
KAC	KA	9.60E-03	KA - STBY	CCW107
KAD	KA	1.03E-02	KA - START	CCW110
KAY	KA	0.00E+00	GS	
KAZ	KA	1.00E+00	GF	
KBA	KB	9.62E-03	KA RUN, KB STBY	CCW108
KBB	KB	1.23E-02	KA=F, KB STBY	CCW201
KBC	KB	9.54E-03	KA R/S, KB STBY	CCW108

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
KBD	KB	1.78E-02	KA=F, KB STBY	CCW202
KBE	KB	1.02E-02	KA RUN, KB START	CCW111
KBF	KB	1.29E-02	KA=F, KB START	CCW203
KBG	KB	1.02E-02	KA R/S, KB START	CCW111
KBH	KB	1.85E-02	KA=F, KB START	CCW204
KBI	KB	2.39E-04	KA STBY, KB RUN	CCW102
KBJ	KB	3.06E-04	KA=F, KB RUN	CCW205
KBK	KB	9.62E-03	KA STBY, KB R/S	CCW105
KBL	KB	1.81E-02	KA=F, KB R/S	CCW206
KBM	KB	2.39E-04	KA START, KB RUN	CCW102
KBN	KB	3.05E-04	KA=F, KB RUN	CCW207
KBO	KB	9.62E-03	KA START, KB R/S	CCW105
KBP	KB	1.73E-02	KA=F, KB R/S	CCW208
KBQ	KB	1.02E-02	KA STBY, KB START	CCW111
KBR	KB	1.89E-02	KA=F, KB START	CCW209
KBS	KB	9.54E-03	KA START, KB STBY	CCW108
KBT	KB	1.74E-02	KA=F, KB STBY	CCW210
KBU	KB	2.40E-04	KB - RUN	CCW102
KBV	KB	9.70E-03	KB - RESTART (R/S)	CCW105
KBW	KB	9.62E-03	KB - STANDBY (STBY)	CCW108
KBX	KB	1.02E-02	KB - START	CCW111
KBY	KB	0.00E+00	GS	
KBZ	KB	1.00E+00	GF	
KCA	KC	1.02E-02	KA RUN, KB STBY, KC START	CCW112
KCAA	KC	9.59E-03	KA START, KB RUN, KC STBY	CCW109
KCAB	KC	1.01E-02	KA=S, KB=F, KC STBY	CCW221
KCAC	KC	1.75E-02	KA=F, KB=S, KC STBY	CCW220

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
KCAD	KC	1.87E-01	KA=F, KB=F, KC STBY	CCW307
KCAE	KC	9.54E-03	KA START, KB R/S, KC STBY	CCW109
KCAF	KC	1.53E-02	KA=S, KB=F, KC STBY	CCW222
KCAG	KC	1.53E-02	KA=F, KB=S, KC STBY	CCW220
KCAH	KC	1.45E-01	KA=F, KB=F, KC STBY	CCW308
KCAI	KC	2.41E-04	KA STBY, KB START, KC RUN	CCW103
KCAJ	KC	2.52E-04	KA=S, KB=F, KC RUN	CCW227
KCAK	KC	2.49E-04	KA=F, KB=S, KC RUN	CCW215
KCAL	KC	3.37E-03	KA=F, KB=F, KC RUN	CCW309
KCAM	KC	9.40E-03	KA STBY, KB START, KC R/S	CCW106
KCAN	KC	1.51E-02	KA=S, KB=F, KC R/S	CCW228
KCAO	KC	1.56E-02	KA=F, KB=S, KC R/S	CCW216
KCAP	KC	1.43E-01	KA=F, KB=F, KC R/S	CCW310
KCAQ	KC	2.41E-04	KA START, KB STBY, KC RUN	CCW103
KCAR	KC	2.56E-04	KA=S, KB=F, KC RUN	CCW225
KCAS	KC	2.56E-04	KA=F, KB=S, KC RUN	CCW217
KCAT	KC	3.26E-03	KA=F, KB=F, KC RUN	CCW311
KCAU	KC	9.40E-03	KA START, KB STBY, KC R/S	CCW106
KCAV	KC	1.57E-02	KA=S, KB=F, KC R/S	CCW226
KCAW	KC	1.52E-02	KA=F, KB=S, KC R/S	CCW218
KCAX	KC	1.41E-01	KA=F, KB=F, KC R/S	CCW312
KCB	KC	1.86E-02	KA=S, KB=F, KC START	CCW229
KCBA	KC	9.67E-03	KA RUN, KB=B, KC STBY	CCW109
KCBB	KC	1.24E-02	KA=F, KB=B, KC STBY	CCW211
KCBC	KC	9.59E-03	KA R/S, KB=B, KC STBY	CCW109
KCBD	KC	1.79E-02	KA=F, KB=B, KC STBY	CCW212
KCBE	KC	1.03E-02	KA RUN, KB=B, KC START	CCW112

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
KCBF	KC	1.30E-02	KA=F, KB=B, KC START	CCW213
KCBG	KC	1.02E-02	KA R/S, KB=B, KC START	CCW112
KCBH	KC	1.87E-02	KA=F, KB=B, KC START	CCW214
KCBI	KC	2.41E-04	KA STBY, KB=B, KC RUN	CCW103
KCBJ	KC	3.08E-04	KA=F, KB=B, KC RUN	CCW215
KCBK	KC	9.46E-03	KA STBY, KB=B, KC R/S	CCW106
KCBL	KC	1.80E-02	KA=F, KB=B, KC R/S	CCW216
KCBM	KC	2.41E-04	KA START, KB=B, KC RUN	CCW103
KCBN	KC	3.09E-04	KA=F, KB=B, KC RUN	CCW217
KCBO	KC	9.46E-03	KA START, KB=B, KC R/S	CCW106
KCBP	KC	1.74E-02	KA=F, KB=B, KC R/S	CCW218
KCBQ	KC	1.02E-02	KA STBY, KB=B, KC START	CCW112
KCBR	KC	1.88E-02	KA=F, KB=B, KC START	CCW219
KCBS	KC	9.59E-03	KA START, KB=B, KC STBY	CCW109
KCBT	KC	1.75E-02	KA=F, KB=B, KC STBY	CCW220
KCBU	KC	9.67E-03	KA=B, KB RUN, KC STBY	CCW109
KCBV	KC	1.24E-02	KA=B, KB=F, KC STBY	CCW221
KCBW	KC	9.59E-03	KA=B, KB R/S, KC STBY	CCW109
KCBX	KC	1.77E-02	KA=B, KB=F, KC STBY	CCW222
KCC	KC	1.07E-02	KA=F, KB=S, KC START	CCW213
KCCA	KC	1.03E-02	KA=B, KB RUN, KC START	CCW112
KCCB	KC	1.30E-02	KA=B, KB=F, KC START	CCW223
KCCC	KC	1.02E-02	KA=B, KB R/S, KC START	CCW112
KCCD	KC	1.84E-02	KA=B, KB=F, KC START	CCW224
KCCE	KC	2.41E-04	KA=B, KB STBY, KC RUN	CCW103
KCCF	KC	3.12E-04	KA=B, KB=F, KC RUN	CCW225
KCCG	KC	9.46E-03	KA=B, KB STBY, KC R/S	CCW106

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
KCCH	KC	1.80E-02	KA=B, KB=F, KC R/S	CCW226
KCCI	KC	2.41E-04	KA=B, KC START, KC RUN	CCW103
KCCJ	KC	3.07E-04	KA=B, KB=F, KC RUN	CCW227
KCCK	KC	9.46E-03	KA=B, KB START, KC R/S	CCW106
KCCL	KC	1.74E-02	KA=B, KB=F, KC R/S	CCW228
KCCM	KC	1.02E-02	KA=B, KB STBY, KC START	CCW112
KCCN	KC	1.86E-02	KA=B, KB=F, KC START	CCW229
KCCO	KC	9.59E-03	KA=B, KB START, KC STBY	CCW109
KCCP	KC	1.75E-02	KA=B, KB=F, KC STBY	CCW230
KCCQ	KC	2.42E-04	KC - RUN	CCW103
KCCR	KC	9.54E-03	KC - RESTART (R/S)	CCW106
KCCS	KC	9.67E-03	KC - STANDBY (STBY)	CCW109
KCCT	KC	1.03E-02	KC - START	CCW112
KCD	KC	2.02E-01	KA=F, KB=F, KC START	CCW301
KCE	KC	1.02E-02	KA R/S, KB STBY, KC START	CCW112
KCF	KC	1.63E-02	KA=S, KB=F, KC START	CCW229
KCG	KC	1.63E-02	KA=F, KB=S, KC START	CCW214
KCH	KC	1.48E-01	KA=F, KB=F, KC START	CCW302
KCI	KC	9.59E-03	KA RUN, KB START, KC STBY	CCW109
KCJ	KC	1.74E-02	KA=S, KB=F, KC STBY	CCW230
KCK	KC	1.01E-02	KA=F, KB=S, KC STBY	CCW211
KCL	KC	1.87E-01	KA=F, KB=F, KC STBY	CCW303
KCM	KC	9.53E-03	KA R/S, KB START, KC STBY	CCW109
KCN	KC	1.52E-02	KA=S, KB=F, KC STBY	CCW230
KCO	KC	1.56E-02	KA=F, KB=S, KC STBY	CCW212
KCP	KC	1.44E-01	KA=F, KB=F, KC STBY	CCW304
KCQ	KC	1.02E-02	KA STBY, KB RUN, KC START	CCW112

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
KCR	KC	1.06E-02	KA=S, KB=F, KC START	CCW223
KCS	KC	1.88E-02	KA=F, KB=S, KC START	CCW219
KCT	KC	2.02E-01	KA=F, KB=F, KC START	CCW305
KCU	KC	1.02E-02	KA STBY, KB R/S, KC START	CCW112
KCV	KC	1.61E-02	KA=S, KB=F, KC START	CCW224
KCW	KC	1.65E-02	KA=F, KB=S, KC START	CCW219
KCX	KC	1.47E-01	KA=F, KB=F, KC START	CCW306
KCY	KC	0.00E+00	GS	
KCZ	KC	1.00E+00	GF	
L1A	L1	0.00E+00	NO LARGE ISOLATION FAIL PRIOR TO CORE DAMAGE	
L1B	L1	1.00E+00	LARGE ISOLATION FAILURE	
L2A	L2	3.85E-02	- RCS PRESS < 200 PSIA @ VB	
L2B	L2	3.85E-02	- NO HPME, 200 < RCS PRESS < 600 PSIA @ VB	
L2C	L2	3.85E-02	- HPME, 200 < RCS PRESS < 600 PSIA @ VB, NO WATER IN CAVITY, NO CHR	C2C
L2D	L2	3.85E-02	- HPME, 200 < RCS PRESS < 600 PSIA @ VB, NO WATER IN CAVITY, NO CHR	C2D
L2E	L2	3.85E-02	- HPME, 200 < RCS PRESS < 600 PSIA @ VB, WATER IN CAVITY	C2E
L2I	L2	3.85E-02	- HPME, 600 < RCS PRESS < 2000 PSIA @ VB, WATER IN CAVITY	C2I
L2J	L2	3.85E-02	- HPME, 600 < RCS PRESS < 2000 PSIA @ VB, NO WATER IN CAVITY	C2J
L2K	L2	3.85E-02	- HPME, 600 < RCS PRESS < 2000 PSIA @ VB, NO SPRAYS OR CHR	C2K
L2L	L2	3.85E-02	- NO HPME, 600 < RCS PRESS < 2000 PSIA @ VB,	
L2R	L2	9.09E-01	- HPME, RCS PRESS > 2000 PSIA @ VB, WATER IN CAVITY, SPRAYS, CHR	C2R

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
L2S	L2	9.09E-01	- HPME, RCS PRESS > 2000 PSIA @ VB, NO WATER IN CAVITY, NO SPRAYS, CHR	C2S
L2T	L2	9.09E-01	- HPME, RCS PRESS > 200 PSIA @ VB, NO SPRAYS OR CHR0	C2T
L2U	L2	1.00E+00	- NO HPME, ROCKET MODEL FAILURE, RCS PRESS > 2000 PSIA @ VB	C2U
L41	L4	1.00E+00	LARGE, LATE CONTAINMENT FAILURE	
L4A	L4	1.00E-02	- NO LONG TERM CHR	
L4B	L4	0.00E+00	- LONG TERM CHR AVAILABLE	
LAA	LA	4.51E-03	LHSI TRAIN A - ALL SUPPORT	LHIA
LAY	LA	0.00E+00	GS	
LAZ	LA	1.00E+00	GF	
LBA	LB	4.45E-03	LHSI TRAIN B - LA=S	LHIB
LBB	LB	1.41E-02	LHSI TRAIN B - LA=F	LHIAB
LBC	LB	4.50E-03	LHSI TRAIN B - LA=B	LHIB
LBY	LB	0.00E+00	GS	
LBYA	LBY	1.00E+00	RHR/LHSI INTERFACING LOCA	
LBYB	LBY	0.00E+00	NO LARGE BYPASS	
LBZ	LB	1.00E+00	GF	
LCA	LC	4.37E-03	LHSI TRAIN C - LA=S, LB=S	LHIC
LCB	LC	1.25E-02	LHSI TRAIN C - LA=S, LB=F	LHIBC
LCC	LC	1.22E-02	LHSI TRAIN C - LA=F, LB=S	LHIAC
LCD	LC	1.54E-01	LHSI TRAIN C - LA=F, LB=F	LHIABC
LCE	LC	4.40E-03	LHSI TRAIN C - LA=B, LB=S	LHIC
LCF	LC	1.45E-02	LHSI TRAIN C - LA=B, LB=F	LHIBC
LCG	LC	4.40E-03	LHSI TRAIN C - LA=S, LB=B	LHIC
LCH	LC	1.42E-02	LHSI TRAIN C - LA=F, LB=B	LHIAC
LCI	LC	4.45E-03	LHSI TRAIN C - LA=B, LB=B	LHIC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
LCY	LC	0.00E+00	GS	
LCZ	LC	1.00E+00	GF	
LHIA	LHSI	4.51E-03	LHSI TRAIN A	
LHIAB	LHSI	6.35E-05	LHSI TRAINS A AND B	
LHIABC	LHSI	9.79E-06	LHSI TRAINS A, B, AND C	
LHIAC	LHSI	6.42E-05	LHSI TRAINS A AND C	
LHIB	LHSI	4.50E-03	LHSI TRAIN B	
LHIBC	LHSI	6.50E-05	LHSI TRAINS B AND C	
LHIC	LHSI	4.45E-03	LHSI TRAIN C	
LIA	LI	5.17E-09	LETDOWN ISOLATION (LI) - ALL SUPPORT	
LIB	LI	1.73E-07	LI - FAILURE OF TRAIN A POWER	
LIC	LI	3.07E-04	LI - FAILURE OF TRAIN A AND C POWER	
LID	LI	7.29E-06	LI - FAILURE OF PD PUMP	
LIE	LI	7.58E-06	LI - FAILURE OF PD PUMP AND TRAIN A POWER	
LIF	LI	5.56E-04	LI - FAILURE OF PD PUMP AND TRAIN B POWER	
LIG	LI	5.52E-04	LI - FAILURE OF PD PUMP AND TRAIN C POWER	
LIH	LI	8.55E-04	LI - FAILURE OF PD PUMP, TRAIN A AND C POWER	
LII	LI	5.55E-04	LI - FAILURE OF TRAIN C SIGNAL	
LIJ	LI	1.11E-03	LI - FAILURE OF TRAIN C SIGNAL AND PD PUMP	
LIK	LI	1.69E-07	LI - FAILURE OF TRAIN C POWER	
LIL	LI	5.55E-04	LI - FAILURE OF PD PUMP, TRAIN A AND B POWER	
LIY	LI	0.00E+00	GS	
LIZ	LI	1.00E+00	GF	
LOA	LO	1.93E-05	ALL SUPPORT	
LOAT	LI	9.97E-14	LI AND LETDOWN CONTAINMENT ISOLATION FAILURE (LCI)	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
LOB	LO	1.83E-05	LO - NO TRAIN A SUPPORT	
LOBT	LI	3.16E-12	LI AND LCI FAILURE - NO TRAIN A POWER	
LOC	LO	5.96E-04	LO - NO TRAIN B SUPPORT	
LOCT	LI	3.08E-12	LI AND LCI FAILURE - NO TRAIN B POWER	
LOD	LO	6.08E-04	LO - NO TRAIN C SUPPORT	
LODT	LI	1.03E-10	LI AND LCI FAILURE - NO TRAIN C POWER	
LOE	LO	5.54E-04	LO - NO TRAIN A & C SUPPORT	
LOEX	LI	1.70E-07	LI AND LCI FAILURE - NO TRAIN A & C POWER	
LOF	LO	6.04E-04	LO - NO TRAIN A & B SUPPORT	
LOFX	LI	1.04E-10	LI AND LCI FAILURE - NO TRAIN A & B POWER	
LOG	LO	6.11E-04	LO - NO TRAIN C SIGNAL	
LOGX	LI	3.39E-07	LI AND LCI FAILURE - NO TRAIN C SIGNAL	
LOH	LO	5.50E-04	LO - NO TRAIN A POWER OR TRAIN C SIGNAL	LOHX
LOHX	LI	5.50E-04	LI AND LCI FAILURE - NO TRAIN A POWER OR TRAIN C SIGNAL	
LOY	LO	0.00E+00	NOT REQUIRED	
LOZ	LO	1.00E+00	GF	
LSA	LS	0.00E+00	- NO PORV FAILURE PRIOR TO VB	
LSB	LS	8.00E-01	INDUCED PORV FAILURE WEN RCS PRESS > 2000 PSIA OR OP OPENS PORV	
LSC	LS	1.00E+00	- PORV STUCK OPEN AT UTAF	
MFFA	MFS	5.00E-02	MFW SYSTEM - POST TRIP	
MFFY	MFS	0.00E+00	GS	
MFFZ	MFS	1.00E+00	GF	
N1Y	N1	0.00E+00	GS	
N1Z	N1	1.00E+00	SEQUENCES INVOLVING SUMP RECIRC	
N2Y	N2	0.00E+00	GS	
N2Z	N2	1.00E+00	EARLY CORE DAMAGE CORE SEQUENCES	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
N3Y	N3	0.00E+00	GS	
N3Z	N3	1.00E+00	ISOLATION OF SECONDARY SIDE FAILED	
N4Y	N4	0.00E+00	SGTR SEQUENCES NOT RECOVERED	
N4Z	N4	1.00E+00	RECOVERABLE SGTR SEQUENCES	
OBA	OB	1.79E-02	OPERATOR OPENS PORVS FOR BLEED AND FEED (GT)	
OBA1	OB	6.71E-02	BLEED AND FEED (GT), OR=F DEPENDENCY	
OBA1A	OB	8.53E-02	OBA1 - TRAIN B=F	
OBA1B	OB	8.53E-02	OBA1 - TRAIN A=F	
OBA1C	OB	6.81E-02	OBA1 - PORV A BLOCKED	
OBA1D	OB	6.74E-02	OBA1 - PORV B BLOCKED	
OBA1E	OB	6.80E-02	OBA1 - PORVS A AND B BLOCKED	
OBAA	OB	3.56E-02	OBA - TRAIN B=F	
OBAB	OB	3.65E-02	OBA - TRAIN A=F	
OBAC	OB	1.84E-02	OBA - PORV A BLOCKED	
OBAD	OB	1.82E-02	OBA - PORV B BLOCKED	
OBAE	OB	1.91E-02	OBA - PORV'S A AND B BLOCKED	
OBD	OB	9.10E-03	OPERATOR OPENS PORVS FOR B&F (SGTR NO AF)	
OBDA	OB	2.69E-02	OBD - TRAIN B=F	
OBDB	OB	2.73E-02	OBD - TRAIN A=F	
OBDC	OB	9.64E-03	OBD - PORV A BLOCKED	
OBDD	OB	9.73E-03	OBD - PORV B BLOCKED	
OBDE	OB	1.03E-02	OBD - PORV'S A AND B BLOCKED	
OBF	OB	1.36E-02	OPERATOR OPENS PORVS FOR B&F (SLOCA)	
OBF1	OB	6.37E-02	BLEED AND FEED (SLOCA), OR=F DEPENDENCY	
OBF1A	OB	8.08E-02	OBF1 - TRAIN B=F	
OBF1B	OB	8.05E-02	OBF1 - TRAIN A=F	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
OBF1C	OB	6.41E-02	OBF - PORV A BLOCKED	
OBF1D	OB	6.40E-02	OBF - PORV B BLOCKED	
OBF1E	OB	6.45E-02	OBF - PORVS A AND B BLOCKED	
OBFA	OB	3.07E-02	OBF - TRAIN B=F	
OBFB	OB	3.17E-02	OBF - TRAIN A=F	
OBFC	OB	1.42E-02	OBF - PORV A BLOCKED	
OBFD	OB	1.42E-02	OBF - PORV B BLOCKED	
OBFE	OB	1.45E-02	OBF - PORV'S A AND B BLOCKED	
OBG	OB	1.57E-02	OPERATOR OPENS PORVS FOR B&F (SLOCA&TT)	
OBGA	OB	3.32E-02	OBG - TRAIN B=F	
OBGB	OB	3.34E-02	OBG - TRAIN A=F	
OBGC	OB	1.61E-02	OBG - PORV A BLOCKED	
OBGD	OB	1.61E-02	OBG - PORV B BLOCKED	
OBGE	OB	1.65E-02	OBG - PORV'S A AND B BLOCKED	
OBH	OB	1.82E-02	OPERATOR OPENS PORVS FOR B&F (SEISMIC EVENT)	
OBHA	OB	3.58E-02	OBH - TRAIN B=F	
OBHB	OB	3.60E-02	OBH - TRAIN A=F	
OBHC	OB	1.88E-02	OBH - PORV A BLOCKED	
OBHD	OB	1.83E-02	OBH - PORV B BLOCKED	
OBHE	OB	1.92E-02	OBH - PORV'S A AND B BLOCKED	
OBY	OB	0.00E+00	GS	
OBZ	OB	1.00E+00	GF	
OCA	OC	1.17E-04	OPERATORS START AT LEAST 1 OF 3 AVAILABLE TRAINS	
OCB	OC	2.82E-04	OPERATORS START AT LEAST ONE RHR TRAIN (A AND B AVAILABLE)	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
OCC	OC	2.90E-04	OPERATORS START AT LEAST ONE RHR TRAIN (A AND C AVAILABLE)	
OCD	OC	2.81E-04	OPERATORS START AT LEAST ONE RHR TRAIN (B AND C AVAILABLE)	
OCE	OC	8.76E-03	OPERATORS START ONE TRAIN (A AVAILABLE)	
OCF	OC	8.72E-03	OPERATORS START ONE TRAIN (B AVAILABLE)	
OCG	OC	8.77E-03	OPERATORS START ONE TRAIN (C AVAILABLE)	
OCL	OC	2.74E-05	AT LEAST 1 OF 3 AVAILABLE RHR TRAINS START (RECOVERY ACTION; NO OPERATOR ERROR)	
OCM	OC	1.90E-04	AT LEAST 1 OF 2 AVAILABLE RHR TRAINS START (RECOVERY ACTION; NO OPERATOR ERROR)	
OCN	OC	8.65E-03	1 AVAILABLE RHR TRAIN STARTS (RECOVERY ACTION; NO OPERATOR ERROR)	
OCY	OC	0.00E+00	GS	
OCZ	OC	1.00E+00	GF	
ODA	OD	1.08E-04	RCS COOLDOWN AND DEPRESS - SGTR	
ODC	OD	5.76E-03	RAPID RCS COOLDOWN, HHSI=F	
ODE	OD	1.29E-02	RCS COOLDOWN W/LOCAL OPERATION OF SG PORV	
ODSBO1	ODSBO	1.69E-02	Operator Depressurizes in SBO Conditions	
ODSBOY	ODSBO	0.00E+00	Guarantee Success	
ODSBOZ	ODSBO	1.00E+00	Guarantee Failure	
ODY	OD	0.00E+00	GS	
ODZ	OD	1.00E+00	GF	
OFA	OF	4.32E-03	GT - SI NOT REQUIRED, AFW=F	
OFFS1	OFFS	1.00E-03	Operators secure all operating spray pumps during recirculation	
OFFSY	OFFS	0.00E+00	Operators secure all operating spray pumps during recirculation	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
OFFSZ	OFFS	1.00E+00	Operators secure all operating spray pumps during recirculation	
OFY	OF	0.00E+00	GS	
OFZ	OF	1.00E+00	GF	
OGA	OG	5.39E-03	LOOP AFTER EVENT	
OGRA	OGR	3.34E-01	NON-RECOVERY OF PLANT CENTERED LOOP	
OGRB	OGR	4.00E-01	NON-RECOVERY OF SWITCHYARD CENTERED LOOP	
OGRC	OGR	6.57E-01	NON-RECOVERY OF GRID RELATED LOOP	
OGRD	OGR	6.80E-01	NON-RECOVERY OF WEATHER RELATED LOOP	
OGRY	OGR	0.00E+00	GS	
OGRZ	OGR	1.00E+00	GF	
OGY	OG	0.00E+00	GS	
OGZ	OG	1.00E+00	GF	
OLA	OL	5.67E-03	OPER DEPRESS BY BLOWING DOWN SGS	
OLY	OL	0.00E+00	NOT REQUIRED	
OLZ	OL	1.00E+00	GF	
OMA	OM	8.71E-01	DG RECOVERY - ONE DG FAILED	
OMB	OM	8.72E-01	DG RECOVERY - TWO DGS FAILED	
OMC	OM	8.69E-01	DG RECOVERY - THREE DGS FAILED	
OMY	OM	0.00E+00	NOT REQUIRED	
OMZ	OM	1.00E+00	GF	
ORA	OR	3.97E-04	OPER STARTS TRAIN (GT)	
ORE	OR	9.42E-04	OPER STARTS TRAIN (LOOP)	
ORG	OR	8.10E-02	OPER STARTS TRAIN (LOCA)	
ORM	OR	2.08E-03	OPER STARTS TRAIN (CNTRL RM FIRE)	
ORO	OR	1.37E-01	OPER STARTS TRAIN (SEISMIC)	
ORY	OR	0.00E+00	GS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
ORZ	OR	1.00E+00	GF	
OS11	OS1	5.00E-03	Operators initially secure one spray pump if all three trains operating	
OS1Y	OS1	0.00E+00	Operators initially secure one spray pump if all three trains operating	
OS1Z	OS1	1.00E+00	Operators initially secure one spray pump if all three trains operating	
OSA	OS	6.11E-03	OPERATOR FAILS TO OPEN EAB DOORS AND START SMOKE PURGE	
OSY	OS	0.00E+00	GS	
OSZ	OS	1.00E+00	GF	
OTA	OT	1.43E-02	OPER MANUALLY TRIPS REACTOR - NO MFW, ATWS	
OTY	OT	0.00E+00	GS	
OTZ	OT	1.00E+00	GF	
OXB	OX	3.07E-03	OPERATOR ALIGNS EMERG XFMR - OG=F	
OXB1	OX	5.33E-02	OPER ALIGNS EMERG XFMR-OG=F, CONDITIONAL (LD)	
OXY	OX	0.00E+00	GS	
OXZ	OX	1.00E+00	GF	
PAA	PA	1.38E-03	SI COMMON TRAIN A FAILS	SICA
PAXA	PA	1.53E-03	SI COMMON TRAIN A FAILS	SIXA
PAY	PA	0.00E+00	GS	
PAZ	PA	1.00E+00	GF	
PBA	PB	1.35E-03	SI COMMON TRAIN B - PA=S	SICB
PBB	PB	4.73E-03	SI COMMON TRAIN B - PA=F	SICAB
PBC	PB	1.35E-03	SI COMMON TRAIN B - PA=B	SICB
PBXA	PB	1.53E-03	SI COMMON TRAIN B - PA=S	SIXB
PBXB	PB	4.62E-03	SI COMMON TRAIN B - PA=F	SIXAB
PBXC	PB	1.53E-03	SI COMMON TRAIN B - PA=B	SIXB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
PBY	PB	0.00E+00	GS	
PBZ	PB	1.00E+00	GF	
PDA	PD	1.21E-02	OFF SITE POWER AVAILABLE	
PDB	PD	2.63E-01	LOSS OF 4.16kV ESF/EAB HVAC	
PDC	PD	3.12E-02	OFF SITE POWER AVAILABLE (HE0003)	
PDD	PD	1.03E-01	OFF SITE POWER AVAILABLE (HE0004) SEISMIC	
PDE	PD	1.76E-02	OFF SITE POWER AVAILABLE (HE0005) SEISMIC	
PDF	PD	2.57E-01	LOOP/SBO	
PDY	PD	0.00E+00	GS	
PDZ	PD	1.00E+00	GF	
POSA	PO	7.73E-05	SGTR, ALL SUPPORT	
POSAC	PO	7.98E-05	POSA - PORV A Blocked	
POSAD	PO	7.89E-05	POSA - PORV B Blocked	
POSAE	PO	9.62E-05	POSA - Both PORVs Blocked	
POSB	PO	4.56E-03	SGTR, LOSS OF DC TRAIN A	
POSBC	PO	4.43E-03	POSB - PORV A Blocked	
POSBD	PO	5.00E-03	POSB - PORV B Blocked	
POSBE	PO	4.97E-03	POSB - Both PORVs Blocked	
POSC	PO	4.42E-03	SGTR, LOSS OF DC TRAIN B	
POSCC	PO	4.91E-03	POSC - PORV A Blocked	
POSCD	PO	4.40E-03	POSC - PORV B Blocked	
POSCE	PO	4.97E-03	POSC - Both PORVs Blocked	
POSD	PO	2.19E-02	SGTR, LOSS OF DC TRAIN A AND AC TRAIN B	
POSDC	PO	2.25E-02	POSD - PORV A Blocked	
POSDD	PO	1.00E+00	POSD - PORV B Blocked	
POSDE	PO	1.00E+00	POSD - Both PORVs Blocked	
POSE	PO	2.20E-02	SGTR, LOSS OF DC TRAIN B AND AC TRAIN A	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
POSEC	PO	1.00E+00	POSE - PORV A Blocked	
POSED	PO	2.24E-02	POSE - PORV B Blocked	
POSEE	PO	1.00E+00	POSE - Both PORVs Blocked	
POSF	PO	3.69E-03	SGTR, LOSS OF AC TRAIN A AND AC TRAIN B	
POSFC	PO	2.17E-02	POSF - PORV A Blocked	
POSFD	PO	2.29E-02	POSF - PORV B Blocked	
POSFE	PO	1.00E+00	POSF - Both PORVs Blocked	
POSG	PO	1.57E-04	SGTR, LOSS OF AC TRAIN A	
POSGC	PO	4.40E-03	POSG - PORV A Blocked	
POSGD	PO	1.77E-04	POSG - PORV B Blocked	
POSGE	PO	4.97E-03	POSG - Both PORVs Blocked	
POSH	PO	1.56E-04	SGTR, LOSS OF AC TRAIN B	
POSHC	PO	4.44E-03	POSH - PORV A Blocked	
POSHD	PO	1.68E-04	POSH - PORV B Blocked	
POSHE	PO	4.90E-03	POSH - Both PORVs Blocked	
POY	PO	0.00E+00	GS	
POZ	PO	1.00E+00	GF	
PPV1A	PPV1	3.97E-02	1/2 PORVS FAIL - ALL SUPPORT - ATWS	
PPV1AC	PPV1	1.00E+00	PPV1A - PORV A Blocked	
PPV1AD	PPV1	1.00E+00	PPV1A - PORV B Blocked	
PPV1AE	PPV1	1.00E+00	PPV1A - Both PORVs Blocked	
PPV1Y	PPV1	0.00E+00	GS	
PPV1Z	PPV1	1.00E+00	GF	
PPV2A	PPV2	3.78E-03	2/2 PORVS FAIL - ALL SUPPORT - ATWS	
PPV2AC	PPV2	2.26E-02	PPV2A - PORV A Blocked	
PPV2AD	PPV2	2.26E-02	PPV2A - PORV B Blocked	
PPV2AE	PPV2	1.00E+00	PPV2A - Both PORVs Blocked	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
PPV2B	PPV2	2.32E-02	2/2 PORVS FAIL - LOSS OF DC TRAIN A - ATWS	
PPV2BC	PPV2	2.27E-02	PPV2B - PORV A Blocked	
PPV2BD	PPV2	1.00E+00	PPV2B - PORV B Blocked	
PPV2BE	PPV2	1.00E+00	PPV2B - Both PORVs Blocked	
PPV2C	PPV2	2.22E-02	2/2 PORVS FAIL - LOSS OF DC TRAIN B - ATWS	
PPV2CC	PPV2	1.00E+00	PPV2C - PORV A Blocked	
PPV2CD	PPV2	2.25E-02	PPV2C - PORV B Blocked	
PPV2CE	PPV2	1.00E+00	PPV2C - Both PORVs Blocked	
PPV2Y	PPV2	0.00E+00	GS	
PPV2Z	PPV2	1.00E+00	GF	
PRA	PR	8.54E-03	2 OF 2 PORVS RESEAT AFTER OPENING	
PRB	PR	4.31E-03	1 OF 1 PORV RESEATS AFTER OPENING	
PRC	PR	2.41E-01	2 OF 2 PORVS AND 3 SRVS RESEAT AFTER WATER RELIEF	
PRD	PR	1.34E-02	2 OF 2 PORVS AND 3 SRVS RESEAT AFTER STEAM RELIEF	
PRE	PR	2.43E-01	1 OF 1 PORVS RESEAT AND 3 SRVS RESEAT AFTER WATER RELIEF	
PRF	PR	2.43E-01	3 OF 3 SRVS RESEAT AFTER ATWS - WATER RELIEF	
PRG	PR	4.83E-03	1 OF 1 PORVS AND 3 SRVS RESEAT AFTER STEAM RELIEF	
PRH	PR	4.74E-03	3 OF 3 SRVS RESEAT AFTER STEAM RELIEF	
PRI	PR	5.74E-05	OPER FAILS TO CLOSE BLOCK VALVE A - POWER AVAIL AT E1A, E1B	
PRJ	PR	4.42E-03	OPER FAILS TO CLOSE BLOCK VALVE A - POWER AVAIL AT E1A	
PRY	PR	0.00E+00	GS	
PRZ	PR	1.00E+00	GF	
PSCA	PSC	0.00E+00	SEAL COOLING / INJECTION AVAILABLE	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
PSCB	PSC	2.82E-01	NO SEAL COOLING / INJECTION	
PSV1A	PSV1	1.03E-02	1 OF 3 PSVs FAIL TO OPEN - ATWS	
PSV1Y	PSV1	0.00E+00	GS	
PSV1Z	PSV1	1.00E+00	GF	
PSV2A	PSV2	1.82E-04	2 OF 3 PSVs FAIL TO OPEN - ATWS	
PSV2Y	PSV2	0.00E+00	GS	
PSV2Z	PSV2	1.00E+00	GF	
PV1A	PORV	6.51E-03	PORV A AVAILABLE	
PV1B	PORV	6.45E-03	PORV B AVAILABLE	
PV1C	PORV	6.49E-03	PORV C AVAILABLE	
PV1D	PORV	6.46E-03	PORV D AVAILABLE	
PV2AB	PORV	1.22E-04	PORVS A&B AVAILABLE	
PV2AC	PORV	1.21E-04	PORVS A&C AVAILABLE	
PV2AD	PORV	1.23E-04	PORVS A&D AVAILABLE	
PV2BC	PORV	1.23E-04	PORVS B&C AVAILABLE	
PV2BD	PORV	1.19E-04	PORVS B&D AVAILABLE	
PV2CD	PORV	1.24E-04	PORVS C&D AVAILABLE	
PV3ABC	PORV	1.38E-05	PORVS A,B,&C AVAILABLE	
PV3ABD	PORV	1.44E-05	PORVS A,B,&D AVAILABLE	
PV3ACD	PORV	1.40E-05	PORVS A,C,&D AVAILABLE	
PV3BCD	PORV	1.45E-05	PORVS B,C,&D AVAILABLE	
PV4	PORV	5.30E-06	ALL PORVS AVAILABLE	
PV4D	PORV	2.54E-02	PORV'S - RAPID DEPRESSURIZATION	
PV4DX	PORV	2.58E-02	PORVS-RAPID DEPRESS SBO	
PVY	PORV	0.00E+00	GS	
PVZ	PORV	1.00E+00	GF	
PZA	PZ	1.37E-03	SI COMMON TRAIN C - PA=S, PB=S	SICC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
PZB	PZ	3.26E-03	SI COMMON TRAIN C - PA=S, PB=F	SICBC
PZC	PZ	3.21E-03	SI COMMON TRAIN C - PA=F, PB=S	SICAC
PZD	PZ	3.30E-01	SI COMMON TRAIN C - PA=F, PB=F	SICABC
PZE	PZ	1.38E-03	SI COMMON TRAIN C - PA=B, PB=S	SICC
PZF	PZ	4.83E-03	SI COMMON TRAIN C - PA=B, PB=F	SICBC
PZG	PZ	1.38E-03	SI COMMON TRAIN C - PA=S, PB=B	SICC
PZH	PZ	4.76E-03	SI COMMON TRAIN C - PA=F, PB=B	SICAC
PZI	PZ	1.38E-03	SI COMMON TRAIN C - PA=B, PB=B	SICC
PZXA	PZ	1.52E-03	SI COMMON TRAIN C - PA=S, PB=S	SIXC
PZXB	PZ	3.19E-03	SI COMMON TRAIN C - PA=S, PB=F	SIXBC
PZXC	PZ	3.21E-03	SI COMMON TRAIN C - PA=F, PB=S	SIXAC
PZXD	PZ	3.00E-01	SI COMMON TRAIN C - PA=F, PB=F	SIXABC
PZXE	PZ	1.53E-03	SI COMMON TRAIN C - PA=B, PB=S	SIXC
PZXF	PZ	4.56E-03	SI COMMON TRAIN C - PA=B, PB=F	SIXBC
PZXG	PZ	1.53E-03	SI COMMON TRAIN C - PA=S, PB=B	SIXC
PZXH	PZ	4.58E-03	SI COMMON TRAIN C - PA=F, PB=B	SIXAC
PZXI	PZ	1.53E-03	SI COMMON TRAIN C - PA=B, PB=B	SIXC
PZY	PZ	0.00E+00	GS	
PZZ	PZ	1.00E+00	GF	
QAA	QA	2.10E-03	QDPS A - ALL SUPPORT	QDPO
QAY	QA	0.00E+00	GS	
QAZ	QA	1.00E+00	GF	
QBA	QB	2.01E-03	QDPS B - ALL SUPPORT	QDPN
QBB	QB	1.11E-03	QA=F	QDPK
QBC	QB	2.01E-03	SINGLE TRAIN	QDPN
QBY	QB	0.00E+00	GS	
QBZ	QB	1.00E+00	GF	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
QCA	QC	2.07E-03	QDPS C - ALL SUPPORT	QDPM
QCB	QC	1.15E-03	QB=F	QDPH
QCC	QC	1.08E-03	QA=F	QDPJ
QCD	QC	1.14E-02	QA=F, QB=F	QDPE
QCE	QC	2.06E-03	QA BYPASS	QDPM
QCF	QC	1.16E-03	QB=F, QA=B	QDPH
QCG	QC	2.07E-03	QB BYPASS	QDPM
QCH	QC	1.10E-03	QA=F, QB=B	QDPJ
QCI	QC	2.06E-03	SINGLE TRAIN	QDPM
QCY	QC	0.00E+00	GS	
QCZ	QC	1.00E+00	GF	
QDA	QD	2.05E-03	QDPS D - ALL SUPPORT	QDPL
QDAA	QD	2.04E-03	QB=B, QC=B	QDPL
QDAB	QD	1.12E-03	QB=B, QC=B, QA=F	QDPI
QDAC	QD	2.04E-03	SINGLE TRAIN	QDPL
QDB	QD	1.14E-03	QC=F	QDPF
QDC	QD	1.15E-03	QB=F	QDPG
QDD	QD	1.11E-03	QA=F	QDPI
QDE	QD	7.60E-03	QB=F, QC=F	QDPB
QDF	QD	7.38E-03	QA=F, QC=F	QDPC
QDG	QD	7.26E-03	QA=F, QB=F	QDPD
QDH	QD	3.30E-01	QA, QB, QC=F	QDPA
QDI	QD	2.05E-03	QA=B	QDPL
QDJ	QD	1.14E-03	QA=B, QC=F	QDPF
QDK	QD	1.16E-03	QA=B, QB=F	QDPG
QDL	QD	1.13E-02	QA=B, QB=F, QC=F	QDPB
QDM	QD	2.05E-03	QB=B	QDPL

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
QDN	QD	1.14E-03	QB=B, QC=F	QDPF
QDO	QD	1.11E-03	QB=B, QA=F	QDPI
QDP	QD	1.11E-02	QB=B, QA=F, QC=F	QDPC
QDPA	QDPS	8.76E-09	QDPS - ALL SUPPORT	
QDPB	QDPS	2.63E-08	LOSS OF TRAIN A	
QDPC	QDPS	2.55E-08	LOSS OF TRAIN B	
QDPD	QDPS	2.55E-08	LOSS OF TRAIN C	
QDPE	QDPS	2.66E-08	LOSS OF TRAIN D	
QDPF	QDPS	2.38E-06	LOSS OF TRAINS A, B	
QDPG	QDPS	2.35E-06	LOSS OF TRAINS A, C	
QDPH	QDPS	2.34E-06	LOSS OF TRAINS A, D	
QDPI	QDPS	2.36E-06	LOSS OF TRAINS B, C	
QDPJ	QDPS	2.30E-06	LOSS OF TRAINS B, D	
QDPK	QDPS	2.34E-06	LOSS OF TRAINS C, D	
QDPL	QDPS	2.04E-03	LOSS OF TRAINS A, B, C	
QDPM	QDPS	2.06E-03	LOSS OF TRAINS A, B, D	
QDPN	QDPS	2.01E-03	LOSS OF TRAINS A, C, D	
QDPO	QDPS	2.10E-03	LOSS OF TRAINS B, C, D	
QDQ	QD	2.05E-03	QC=B	QDPL
QDR	QD	1.16E-03	QC=B, QB=F	QDPG
QDS	QD	1.11E-03	QC=B, QA=F	QDPI
QDT	QD	1.09E-02	QC=B, QA=F, QB=F	QDPD
QDU	QD	2.04E-03	QA=B, QB=B	QDPL
QDV	QD	1.16E-03	QA=B, QB=B, QC=F	QDPF
QDW	QD	2.04E-03	QA=B, QC=B	QDPL
QDX	QD	1.17E-03	QA=B, QC=B, QB=F	QDPG
QDY	QD	0.00E+00	GS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
QDZ	QD	1.00E+00	GF	
QUANT	TYPE	0.00E+00	TYPE OF QUANTIFICATION, 0 FOR AVG CDF OR 1 FOR SPECIFIC MAINTENANCE	
RAA	RA	1.25E-03	RECIRC TRAIN A FAILS - ALL SUPPORT	SIRA
RAR	RA	2.13E-04	RECIRC TRAIN A FAILS WITH OPERATOR RECOVERY ACTION	
RAY	RA	0.00E+00	GS	
RAZ	RA	1.00E+00	GF	
RBA	RB	1.22E-03	RECIRC TRAIN B - RA=SIN A SUCCESS	SIRB
RBB	RB	2.53E-02	RECIRC TRAIN B - RA=F	SIRAB
RBC	RB	1.25E-03	RECIRC TRAIN B - RA=B	SIRB
RBR	RB	2.12E-04	Recirculation Train B Recovery	
RBY	RB	0.00E+00	GS	
RBZ	RB	1.00E+00	GF	
RCA	RC	1.18E-03	RECIRC TRAIN C - RA=S, RB=S	SIRC
RCB	RC	9.89E-03	RECIRC TRAIN C - RA=S, RB=F	SIRBC
RCC	RC	1.03E-02	RECIRC TRAIN C - RA=F, RB=S	SIRAC
RCD	RC	6.12E-01	RECIRC TRAIN C - RA=F, RB=F	SIRABC
RCE	RC	1.19E-03	RECIRC TRAIN C - RA=B, RB=S	SIRC
RCF	RC	2.50E-02	RECIRC TRAIN C - RA=B, RB=F	SIRBC
RCG	RC	1.19E-03	RECIRC TRAIN C - RA=S, RB=B	SIRC
RCH	RC	2.55E-02	RECIRC TRAIN C - RA=F, RB=B	SIRAC
RCJ	RC	1.22E-03	RECIRC TRAIN C - RA=B, RB=B	SIRC
RCR	RC	2.19E-04	Operator Recovery Recirculation Train C	
RCY	RC	0.00E+00	GS	
RCZ	RC	1.00E+00	GF	
RE1	RE	5.73E-04	FAIL TO ISOLATE STUCK OPEN PORV	
RE4A	RE	1.71E-01	Recovery Emergency Sump Recirc MOV Train A	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RE4B	RE	1.69E-01	Recovery Emergency Sump Recirc MOV Train B	
RE4C	RE	1.80E-01	Recovery Emergency Sump Recirc MOV Train C	
RE5	REAF	6.85E-01	OPERATOR FAILS TO RECOVER TDAFW PUMP	
REA	RE	5.73E-04	SGTR SEQ RECOVERY FOR ALL SUPPORT AVAIL	
REAFY	REAF	0.00E+00	AFW SUCCESSFUL	
REAFZ	REAF	1.00E+00	AFW GUARANTEED FAILED	
REB	RE	1.12E-01	TDAFWP RECOVERY (SEISMIC)	
REC	RE	8.81E-03	SGTR SEQ RECOVERY WITH 1 TRAIN AVAILABLE	
REG10	RE	1.12E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G2AB
REG11	RE	2.39E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G2AB
REG12	RE	1.45E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G1A
REG13	RE	3.98E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G1A
REG14	RE	2.34E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G3ABC
REG15	RE	2.34E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G3ABC
REG16	RE	2.05E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G2AB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REG17	RE	2.05E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G2AB
REG18	RE	3.29E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G1A
REG19	RE	3.29E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G1A
REG2	RE	6.82E-02	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REG20	RE	6.76E-02	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REG21	RE	6.76E-02	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REG22	RE	6.79E-02	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REG23	RE	6.79E-02	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REG24	RE	6.58E-02	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
REG25	RE	6.58E-02	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REG26	RE	2.77E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G3ABC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REG27	RE	2.77E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G3ABC
REG28	RE	2.39E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G2AB
REG29	RE	2.39E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G2AB
REG3	RE	7.20E-02	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REG30	RE	3.98E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G1A
REG31	RE	3.98E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G1A
REG4	RE	6.84E-02	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REG5	RE	7.16E-02	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REG6	RE	6.65E-02	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
REG7	RE	7.20E-02	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REG8	RE	1.20E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G3ABC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REG9	RE	2.77E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REP10	RE	1.80E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G2AB
REP11	RE	2.93E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G2AB
REP12	RE	2.08E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G1A
REP13	RE	4.31E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G1A
REP14	RE	2.86E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G3ABC
REP15	RE	2.86E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G3ABC
REP16	RE	2.60E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G2AB
REP17	RE	2.60E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G2AB
REP18	RE	3.65E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G1A
REP19	RE	3.65E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G1A

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REP2	RE	1.35E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REP20	RE	1.35E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REP21	RE	1.35E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REP22	RE	1.35E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REP23	RE	1.35E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REP24	RE	1.31E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
REP25	RE	1.31E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REP26	RE	3.26E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G3ABC
REP27	RE	3.26E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G3ABC
REP28	RE	2.93E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G2AB
REP29	RE	2.93E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G2AB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REP3	RE	1.40E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REP30	RE	4.31E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G1A
REP31	RE	4.31E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G1A
REP4	RE	1.36E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REP5	RE	1.40E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REP6	RE	1.32E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
REP7	RE	1.39E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REP8	RE	1.88E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G3ABC
REP9	RE	3.26E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G3ABC
RES10	RE	1.65E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G2AB
RES11	RE	2.83E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G2AB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RES12	RE	1.98E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G1A
RES13	RE	4.29E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G1A
RES14	RE	2.78E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G3ABC
RES15	RE	2.78E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G3ABC
RES16	RE	2.50E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G2AB
RES17	RE	2.50E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G2AB
RES18	RE	3.63E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G1A
RES19	RE	3.63E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G1A
RES2	RE	1.15E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
RES20	RE	1.14E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
RES21	RE	1.14E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RES22	RE	1.15E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
RES23	RE	1.15E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
RES24	RE	1.12E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
RES25	RE	1.12E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
RES26	RE	3.18E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G3ABC
RES27	RE	3.18E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G3ABC
RES28	RE	2.83E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G2AB
RES29	RE	2.83E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G2AB
RES3	RE	1.21E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
RES30	RE	4.29E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G1A
RES31	RE	4.29E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G1A

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RES4	RE	1.15E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
RES5	RE	1.20E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
RES6	RE	1.13E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A
RES7	RE	1.20E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
RES8	RE	1.74E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G3ABC
RES9	RE	3.18E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REW10	RE	3.87E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G2AB
REW11	RE	4.98E-01	2DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G2AB
REW12	RE	4.82E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G1A
REW13	RE	6.68E-01	1DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G1A
REW14	RE	5.18E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G3ABC

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REW15	RE	5.18E-01	3DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G3ABC
REW16	RE	4.76E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G2AB
REW17	RE	4.76E-01	2DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G2AB
REW18	RE	6.29E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Success	G1A
REW19	RE	6.29E-01	1DG Failure with no planned maintenance, Primary System Valve Closed, AFW Failed, Operator Depressurize Failure	G1A
REW2	RE	2.41E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REW20	RE	2.36E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G3ABC
REW21	RE	2.36E-01	3DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REW22	RE	2.27E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REW23	RE	2.27E-01	2DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REW24	RE	2.55E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REW25	RE	2.55E-01	1DG Failure with no planned maintenance, PDP Successful, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REW26	RE	5.44E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G3ABC
REW27	RE	5.44E-01	3DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G3ABC
REW28	RE	4.98E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G2AB
REW29	RE	4.98E-01	2DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G2AB
REW3	RE	2.68E-01	3DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REW30	RE	6.68E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Success	G1A
REW31	RE	6.68E-01	1DG Failure with no planned maintenance, Primary System Valve not Closed, AFW Failure, Operator Depressurize Failure	G1A
REW4	RE	2.32E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G2AB
REW5	RE	2.56E-01	2DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G2AB
REW6	RE	2.62E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Success	G1A

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
REW7	RE	2.94E-01	1DG Failure with no planned maintenance, PDP Failed, Primary System Valve Closed, AFW Successful, Operator Depressurize Failure	G1A
REW8	RE	4.14E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Success	G3ABC
REW9	RE	5.44E-01	3DG Failure with no planned maintenance, Primary System Valve Not Closed, AFW Successful, Operator Depressurize Failure	G3ABC
REY	RE	0.00E+00	GS	
REZ	RE	1.00E+00	GF	
RP1	RP	1.00E+00	RCS PRESSURE AT VESSEL BREECH	
RP2	RP	0.00E+00	- DEFAULT RCS PRESS<200 PSIA @VB GIVEN RCS PRESS>2000 @UTAF	
RP3	RP	0.00E+00	- DEFAULT 200<RCS PRESS<600 PSIA @VB	
RP4	RP	0.00E+00	- DEFAULT 600<RCS PRESS<2000 PSIA @VB GIVEN RCS PRESS>2000 PSIA @UTAF *	
RP5	RP	1.00E+00	- DEFAULT RCS PRESS>2000 PSIA @VB GIVEN RCS PRESS>2000 PSIA @UTAF	
RPA	RP	6.32E-01	STUCK OPEN PORV & SEAL LOCA, RCS PRESS<200 PSIA	
RPB	RP	3.68E-01	- STUCK OPEN PORV & SEAL LOCA, 200<RCS PRESS<600 PSIA	
RPC	RP	0.00E+00	- STUCK OPEN PORV & SEAL LOCA, 600<RCS PRESS<2000 PSIA	
RPD	RP	0.00E+00	- STUCK OPEN PORV & SEAL LOCA, RCS PRESS>2000 PSIA	
RPDS1	RPDS	5.14E-02	RECOVERY OF PDS - LOSP	
RPDS2	RPDS	4.13E-02	RECOVERY OF PDS - LOEAB	
RPDS3	RPDS	4.54E-02	RECOVERY OF PDS - LOECW	
RPDSZ	RPDS	1.00E+00	GF	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RPE	RP	0.00E+00	- DEFAULT RCS PRESS<200 PSIA @VB GIVEN 200<RCS PRESS<600 PSIA @UTAF	
RPF	RP	1.00E+00	- DEFAULT 200<RCS PRESS<600 PSIA @VB GIVEN 200<RCS PRESS<600 PSIA*UTAF	
RPG	RP	0.00E+00	- DEFAULT 600<RCS PRESS<2000 PSIA @VB GIVEN 200<RCS PRESS<600 PSIA @UTAF	
RPH	RP	0.00E+00	- DEFAULT RCS PRESS>2000 PSIA @VB GIVEN 200<RCS PRESS<600 PSIA @UTAF	
RPI	RP	0.00E+00	- DEFAULT RCS PRESS<200 PSIA @VB GIVEN 600<RCS PRESS< 2000 PSIA @UTAF	
RPJ	RP	0.00E+00	- DEFAULT 200<RCS PRESS<600 PSIA @VB GIVEN 600<RCS PRESS<2000 PSIA @UTAF	
RPK	RP	1.00E+00	- DEFAULT 600<RCS PRESS<2000 PSIA @VB GIVEN 600<RCS PRESS<2000 PSIA @UTAF	
RPL	RP	0.00E+00	- DEFAULT RCS PRESS>2000 PSIA @VB GIVEN 600<RCS PRESS<2000 PSIA @UTAF	
RPO	RP	5.00E-03	- RCS PRESS<200 PSIA @VB GIVEN A SEAL LOCA @UTAF	
RPP	RP	5.35E-01	- 200<RCS PRESS<600 PSIA @VB GIVEN A SEAL LOCA @UTAF	
RPQ	RP	1.70E-01	- 600<RCS PRESS<2000 PSIA @VB GIVEN A SEAL LOCA @UTAF	
RPR	RP	2.90E-01	- RCS PRESS>2000 PSIA @VB GIVEN A STUCK OPEN PORV @UTAF	
RPS	RP	5.00E-01	- RCS PRESS<200 PSIA @VB GIVEN A STUCK OPEN PORV @UTAF	
RPT	RP	5.00E-01	- 200<RCS PRESS<600 PSIA @VB GIVEN A STUCK OPEN PORV @UTAF	
RPU	RP	0.00E+00	- 600<RCS PRESS<2000 PSIA @VB GIVEN A STUCK OPEN PORV @UTAF	
RPV	RP	0.00E+00	- RCS PRESS>2000 PSIA @VB GIVEN A STUCK OPEN PORV @UTAF	
RPW	RP	1.00E+00	- RCS PRESS<200 PSIA @VB GIVEN THAT RCS PRESS<200 PSIA @UTAF	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RPX	RP	0.00E+00	- 200<RCS PRESS<600 PSIA @VB GIVEN THAT RCS PRESS<200 PSIA @UTAF	
RPY	RP	0.00E+00	- 600<RCS PRESS<2000 PSIA @VB GIVEN RCS PRESS<200 PSIA @UTAF	
RPZ	RP	0.00E+00	- RCS PRESS>2000 PSIA @VB GIVEN RCS PRESS<200 PSIA @UTAF	
RTA	RT	8.37E-06	REACTOR TRIP - POWER AVAILABLE AT M/G SETS	
RTB	RT	3.57E-06	REACTOR TRIP WITH NO POWER AT M/G SETS - LOSP	
RTC	RT	3.92E-06	MANUAL TRIP FROM CONTROL ROOM	
RTD	RT	1.01E-03	REACTOR TRIP - SSPS "R" FAILED	
RTE	RT	1.00E-03	REACTOR TRIP - SSPS "S" FAILED	
RTF	RT	8.03E-06	LOSS OF DC TRAIN A	
RTG	RT	7.97E-06	LOSS OF DC TRAIN B	
RTH	RT	4.14E-04	LOSS OF ALL DC TO SHUNT TRIP	
RTY	RT	0.00E+00	GS	
RTZ	RT	1.00E+00	GF	
RX1A	RX	4.95E-04	ONE RHR HEAT EXCHANGER OPERATES (A AVAILABLE)	
RX1B	RX	4.95E-04	ONE RHR HEAT EXCHANGER OPERATES (B AVAILABLE)	
RX1C	RX	4.93E-04	ONE RHR HEAT EXCHANGER OPERATES (C AVAILABLE)	
RX2AB	RX	1.26E-05	AT LEAST ONE OF TWO RHR HEAT EXCHANGERS OPERATE (A & B AVAILABLE)	
RX2AC	RX	1.24E-05	AT LEAST ONE OF TWO RHR HEAT EXCHANGERS OPERATE (A & C AVAILABLE)	
RX2BC	RX	1.25E-05	AT LEAST ONE OF TWO RHR HEAT EXCHANGERS OPERATE (B & C AVAILABLE)	
RX3	RX	3.04E-06	AT LEAST ONE OF THREE AVAILABLE TRAINS OF RHR HEAT EXCHANGERS OPERATE	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
RXY	RX	0.00E+00	GS	
RXZ	RX	1.00E+00	GF	
S1A	S1	7.44E-01	1 OF 5 SG SRVS PROVIDE STEAM RELIEF - S2 FAILED	S1B
S1B	S1	1.30E-06	1 OF 5 SG SRVS PROVIDE STEAM RELIEF	
S1Y	S1	0.00E+00	GS	
S1Z	S1	1.00E+00	GF	
S2A	S2	1.75E-06	FAILURE OF FOUR OR MORE SRVS TO PROVIDE STEAM RELIEF (SLOCA)	
S2Y	S2	0.00E+00	GS	
S2Z	S2	1.00E+00	GF	
SAC1	SAC	1.86E-05	MEAN - FREQ. - SEIS G LEVEL 1	
SAC2	SAC	8.12E-04	MEAN - FREQ. - SEIS G LEVEL 2	
SAC3	SAC	9.83E-03	MEAN - FREQ. - SEIS G LEVEL 3	
SAC4	SAC	6.81E-02	MEAN - FREQ. - SEIS G LEVEL 4	
SACY	SAC	0.00E+00	FOR NON-SEISMIC EVENTS	
SAF1	SAF	1.15E-04	MEAN - FREQ. - SEIS G LEVEL 1	
SAF2	SAF	3.96E-03	MEAN - FREQ. - SEIS G LEVEL 2	
SAF3	SAF	3.56E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SAF4	SAF	1.81E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SAFY	SAF	0.00E+00	FOR NON-SEISMIC EVENTS	
SCL1	SCL	1.67E-04	MEAN - FREQ. - SEIS G LEVEL 1	
SCL2	SCL	6.33E-03	MEAN - FREQ. - SEIS G LEVEL 2	
SCL3	SCL	6.50E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SCL4	SCL	3.80E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SCLY	SCL	0.00E+00	FOR NON-SEISMIC EVENTS	
SCW1	SCW	1.21E-04	MEAN - FREQ. - SEIS G LEVEL 1	
SCW2	SCW	4.35E-03	MEAN - FREQ. - SEIS G LEVEL 2	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SCW3	SCW	4.25E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SCW4	SCW	2.41E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SCWY	SCW	0.00E+00	FOR NON-SEISMIC EVENTS	
SDC1	SDC	5.03E-06	MEAN - FREQ. - SEIS G LEVEL 1	
SDC2	SDC	2.89E-04	MEAN - FREQ. - SEIS G LEVEL 2	
SDC3	SDC	4.86E-03	MEAN - FREQ. - SEIS G LEVEL 3	
SDC4	SDC	4.27E-02	MEAN - FREQ. - SEIS G LEVEL 4	
SDCY	SDC	0.00E+00	FOR NON-SEISMIC EVENTS	
SDG1	SDG	1.19E-04	MEAN - FREQ. - SEIS G LEVEL 1	
SDG2	SDG	4.27E-03	MEAN - FREQ. - SEIS G LEVEL 2	
SDG3	SDG	4.17E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SDG4	SDG	2.38E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SDGY	SDG	0.00E+00	FOR NON-SEISMIC EVENTS	
SEA	SE	2.61E-06	SEAL INJECTION, ALL SUPPORT, PDP=B	
SEB	SE	1.08E-01	CCW TO RCPs, NO SEAL INJECTION	
SEC	SE	5.03E-03	SEAL INJECTION TO RCPs (PDP), NO CCW	
SED	SE	5.10E-05	CCW TO RCPs, SEAL INJECTION, CCP=F	
SEE	SE	6.91E-05	LOOP, PDP=B	
SEF	SE	1.08E-01	LOOP, NO SEAL INJECTION	
SEG	SE	1.88E-03	LOOP, NO CCW	
SEH	SE	5.16E-05	LOOP, CCW TO RCPs, CCP=F	
SEW1	SEW	7.50E-07	MEAN - FREQ. - SEIS G LEVEL 1	
SEW2	SEW	7.34E-05	MEAN - FREQ. - SEIS G LEVEL 2	
SEW3	SEW	2.11E-03	MEAN - FREQ. - SEIS G LEVEL 3	
SEW4	SEW	2.63E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SEWY	SEW	0.00E+00	FOR NON-SEISMIC EVENTS	
SEY	SE	0.00E+00	GS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SEZ	SE	1.00E+00	GF	
SFGS0	GENST	0.00E+00	Used to Zero Out Fraction of Initiator Frequency	
SFMS0	STATE	0.00E+00	INITIATOR NA TO MAINTENANCE STATE	
SFMS01	STATE	1.00E+00	MAINTENANCE STATE 1	
SFMS02	STATE	1.00E+00	MAINTENANCE STATE 2	
SFMS03	STATE	1.00E+00	MAINTENANCE STATE 3	
SGIA	SGI	2.90E-05	SGI - TT=F OR SLB, ALL SUPPORT	
SGIB	SGI	9.55E-04	SGI - TT=F DC+ESFAS A=F	
SGIC	SGI	9.98E-04	SGI - TT=F DC+ESFAS B=F	
SGID	SGI	2.07E-05	SGI - ISOLATE A SG, ALL SUPPORT	
SGIE	SGI	5.46E-04	SGI - ISOLATE A SG, DC+ESFAS A =F	
SGIF	SGI	5.33E-04	SGI - ISOLATE A SG, DC+ESFAS B=F	
SGIG	SGI	2.13E-05	SGI - ISOLATE B SG, ALL SUPPORT	
SGIH	SGI	5.55E-04	SGI - ISOLATE B SG, DC+ESFAS A=F	
SGII	SGI	5.47E-04	SGI - ISOLATE B SG, DC+ESFAS B=F	
SGIJ	SGI	2.13E-05	SGI - ISOLATE C SG, ALL SUPPORT	
SGIK	SGI	5.53E-04	SGI - ISOLATE C SG, DC+ESFAS A=F	
SGIL	SGI	5.35E-04	SGI - ISOLATE C SG, DC+ESFAS B=F	
SGIM	SGI	2.13E-05	SGI - ISOLATE D SG, ALL SUPPORT	
SGIN	SGI	5.39E-04	SGI - ISOLATE D SG, DC+ESFAS A=F	
SGIO	SGI	5.35E-04	SGI - ISOLATE D SG, DC+ESFAS B=F	
SGIY	SGI	0.00E+00	GS	
SGIZ	SGI	1.00E+00	GF	
SI38AA	SI38A	1.55E-04	SI38 PATH A	SIPA
SI38AY	SI38A	0.00E+00	GS	
SI38AZ	SI38A	1.00E+00	GF	
SI38BA	SI38B	1.56E-04	SI38 PATH B - SI38A=S	SIPB

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SI38BB	SI38B	1.94E-04	SI38 PATH B - SI38A=F	SIPAB
SI38BC	SI38B	1.56E-04	SI38 PATH B - SI38A=B	SIPB
SI38BY	SI38B	0.00E+00	GS	
SI38BZ	SI38B	1.00E+00	GF	
SI38CA	SI38C	1.55E-04	SI38 PATH C - SI38A=S, SI38B=S	SIPC
SI38CB	SI38C	1.96E-04	SI38 PATH C - SI38A=S, SI38B=F	SIPBC
SI38CC	SI38C	1.94E-04	SI38 PATH C - SI38A=F, SI38B=S	SIPAC
SI38CD	SI38C	2.29E-04	SI38 PATH C - SI38A=F, SI38B=F	SIPALL
SI38CE	SI38C	1.55E-04	SI38 PATH C - SI38A=B, SI38B=S	SIPC
SI38CF	SI38C	1.96E-04	SI38 PATH C - SI38A=B, SI38B=F	SIPBC
SI38CG	SI38C	1.55E-04	SI38 PATH C - SI38A=S, SI38B=B	SIPC
SI38CH	SI38C	1.94E-04	SI38 PATH C - SI38A=F, SI38B=B	SIPAC
SI38CI	SI38C	1.55E-04	SI38 PATH C - SI38A=B, SI38B=B	SIPC
SI38CY	SI38C	0.00E+00	GS	
SI38CZ	SI38C	1.00E+00	GF	
SICA	SICOM	1.38E-03	SI COMMON TRAIN A FAILS	
SICAB	SICOM	6.50E-06	SI COMMON TRAINS A, B	
SICABC	SICOM	2.15E-06	SI COMMON TRAINS A, B, C	
SICAC	SICOM	6.55E-06	SI COMMON TRAINS A, C FAIL	
SICB	SICOM	1.35E-03	SI COMMON TRAIN B FAILS	
SICBC	SICOM	6.53E-06	SI COMMON TRAINS B, C FAIL	
SICC	SICOM	1.38E-03	SI COMMON TRAIN C FAILS	
SIPA	SI38	1.55E-04	SI38 PATH A	
SIPAB	SI38	3.02E-08	SI38 PATHS A, B	
SIPAC	SI38	3.02E-08	SI38 PATHS A, C	
SIPALL	SI38	6.92E-12	SI38 PATHS A,B,C	
SIPB	SI38	1.56E-04	SI38 PATH B	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SIPBC	SI38	3.06E-08	SI38 PATHS B, C	
SIPC	SI38	1.55E-04	SI38 PATH C	
SIRA	SIREC	1.25E-03	SI RECIRC TRAIN A FAILS	
SIRAB	SIREC	3.15E-05	SI RECIRC TRAINS A AND B FAIL	
SIRABC	SIREC	1.92E-05	SI RECIRC TRAINS A, B, AND C FAIL	
SIRAC	SIREC	3.17E-05	SI RECIRC TRAINS A AND C FAIL	
SIRB	SIREC	1.25E-03	SI RECIRC TRAIN B FAILS	
SIRBC	SIREC	3.13E-05	SI RECIRC TRAINS B AND C FAIL	
SIRC	SIREC	1.22E-03	SI RECIRC TRAIN C FAILS	
SIV1	SIV	4.16E-05	MEAN - FREQ. - SEIS G LEVEL 1	
SIV2	SIV	1.75E-03	MEAN - FREQ. - SEIS G LEVEL 2	
SIV3	SIV	1.94E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SIV4	SIV	1.19E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SIVY	SIV	0.00E+00	FOR NON-SEISMIC EVENTS	
SIXA	SICOM	1.53E-03	SI COMMON TRAIN A FAILS - LLOCA	
SIXAB	SICOM	7.08E-06	SI COMMON TRAINS A, B FAIL - LLOCA	
SIXABC	SICOM	2.13E-06	SI COMMON TRAINS A, B, C FAIL - LLOCA	
SIXAC	SICOM	7.03E-06	SI COMMON TRAINS A, C FAIL - LLOCA	
SIXB	SICOM	1.53E-03	SI COMMON TRAIN B FAILS - LLOCA	
SIXBC	SICOM	6.99E-06	SI COMMON TRAINS B, C FAIL - LLOCA	
SIXC	SICOM	1.53E-03	SI COMMON TRAIN C FAILS - LLOCA	
SLA	SL	9.24E-03	FAIL TO ISOLATE SG A - STM REL, MSI=S	
SLB	SL	9.23E-03	FAIL TO ISOLATE SG B - STM REL, MSI=S	
SLC	SL	9.14E-03	FAIL TO ISOLATE SG C - STM REL, MSI=S	
SLD	SL	9.80E-03	FAIL TO ISOLATE SG D - STM REL, MSI=S	
SLE	SL	1.09E-01	FAIL TO ISOLATE SG A - WTR REL, MSI=S	
SLF	SL	1.08E-01	FAIL TO ISOLATE SG B - WTR REL, MSI=S	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SLG	SL	1.10E-01	FAIL TO ISOLATE SG C - WTR REL, MSI=S	
SLH	SL	1.08E-01	FAIL TO ISOLATE SG D - WTR REL, MSI=S	
SLI	SL	9.22E-03	FAIL TO ISOLATE SG A - STM REL, MSI=B	
SLIA	SL	9.69E-03	FAIL TO ISOLATE SG A - STM REL, MSI=B, DA=F	
SLIB	SL	9.64E-03	FAIL TO ISOLATE SG A - STM REL, MSI=B, DB=F	
SLJ	SL	9.18E-03	FAIL TO ISOLATE SG B - STM REL, MSI=B	
SLJA	SL	9.58E-03	FAIL TO ISOLATE SG B - STM REL, MSI=B, DA=F	
SLJB	SL	9.66E-03	FAIL TO ISOLATE SG B - STM REL, MSI=B, DB=F	
SLK	SL	9.20E-03	FAIL TO ISOLATE SG C - STM REL, MSI=B	
SLKA	SL	9.66E-03	FAIL TO ISOLATE SG C - STM REL, MSI=B, DA=F	
SLKB	SL	9.77E-03	FAIL TO ISOLATE SG C - STM REL, MSI=B, DB=F	
SLL	SL	9.81E-03	FAIL TO ISOLATE SG D - STM REL, MSI=B	
SLLA	SL	1.01E-02	FAIL TO ISOLATE SG D - STM REL, MSI=B, DA=F	
SLLB	SL	1.02E-02	FAIL TO ISOLATE SG D - STM REL, MSI=B, DB=F	
SLM	SL	1.07E-01	FAIL TO ISOLATE SG A - WTR REL, MSI=B	
SLMA	SL	1.09E-01	FAIL TO ISOLATE SG A - WTR REL, MSI=B, DA=F	
SLMB	SL	1.10E-01	FAIL TO ISOLATE SG A - WTR REL, MSI=B, DB=F	
SLN	SL	1.07E-01	FAIL TO ISOLATE SG B - WTR REL, MSI=B	
SLNA	SL	1.08E-01	FAIL TO ISOLATE SG B - WTR REL, MSI=B, DA=F	
SLNB	SL	1.08E-01	FAIL TO ISOLATE SG B - WTR REL, MSI=B, DB=F	
SLO	SL	1.07E-01	FAIL TO ISOLATE SG C - WTR REL, MSI=B	
SLOA	SL	1.12E-01	FAIL TO ISOLATE SG C - WTR REL, MSI=B, DA=F	
SLOB	SL	1.10E-01	FAIL TO ISOLATE SG C - WTR REL, MSI=B, DB=F	
SLP	SL	1.11E-01	FAIL TO ISOLATE SG D - WTR REL, MSI=B	
SLPA	SL	1.08E-01	FAIL TO ISOLATE SG D - WTR REL MSI=B, DA=F	
SLPB	SL	1.09E-01	FAIL TO ISOLATE SG D - WTR REL, MSI=B, DB=F	
SLY	SL	0.00E+00	GS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SLZ	SL	1.00E+00	GF	
SOG1	SOG	1.47E-02	MEAN - FREQ. - SEIS G LEVEL 1	
SOG2	SOG	1.91E-01	MEAN - FREQ. - SEIS G LEVEL 2	
SOG3	SOG	5.36E-01	MEAN - FREQ. - SEIS G LEVEL 3	
SOG4	SOG	8.81E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SOGY	SOG	0.00E+00	FOR NON-SEISMIC EVENTS	
SPA	SP	1.33E-07	1 OF 2 NORMAL SPRAY VALVES OR AUX SPRAY VALVE ACTUATES	
SPB	SP	2.49E-05	1 OF 2 NORMAL SPRAY VALVES ACTUATES	
SPC	SP	5.35E-03	AUXILIARY SPRAY VALVE ACTUATES	
SPRA	SPR	4.29E-04	SSPS TRAIN R - ONE SIGNAL	SSC
SPRB	SPR	4.28E-04	TRAIN R - TWO SIGNALS	SSE
SPRC	SPR	4.52E-04	TRAIN R - ONE SIGNAL, ONE PS-A	SSK
SPRD	SPR	4.43E-04	TRAIN R - TWO SIGNALS, ONE PS-A	SSM
SPRY	SPR	0.00E+00	GS	
SPRZ	SPR	1.00E+00	GF	
SPSA	SPS	4.29E-04	SSPS TRAIN S - ONE SIGNAL SSR=S	SSD
SPSB	SPS	1.68E-03	TRAIN S - ONE SIGNAL, SSR=F	SSA
SPSC	SPS	4.29E-04	TRAIN S - ONE SIGNAL, SSR=B	SSD
SPSD	SPS	4.30E-04	TRAIN S - TWO SIGNALS, SSR=S	SSF
SPSE	SPS	4.54E-09	TRAIN S - TWO SIGNALS, SSR=F	SSB
SPSF	SPS	4.30E-04	TRAIN S - TWO SIGNALS, SSR=B	SSF
SPSG	SPS	4.29E-04	TRAIN S - ONE SIGNAL, 1 PS-A, SSR=S	SSD
SPSH	SPS	1.58E-03	TRAIN S - ONE SIGNAL, 1 PS-A, SSR=F	SSG
SPSI	SPS	4.48E-04	TRAIN S - ONE SIGNAL, 1 PS-C, SSR=S	SSL
SPSJ	SPS	1.69E-03	TRAIN S - ONE SIGNAL, 1 PS-C, SSR=F	SSH
SPSK	SPS	4.49E-04	TRAIN S - ONE SIGNAL, 1 PS-C, SSR=B	SSL
SPSL	SPS	4.30E-04	TRAIN S - TWO SIGNALS, 1 PS-A, SSR=S	SSF

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SPSM	SPS	2.98E-06	TRAIN S - TWO SIGNALS, 1 PS-A, SSR=F	SSI
SPSN	SPS	4.50E-04	TRAIN S - TWO SIGNALS, 1 PS-C, SSR=S	SSN
SPSO	SPS	3.01E-06	TRAIN S - TWO SIGNALS, 1 PS-C, SSR=F	SSJ
SPSP	SPS	4.50E-04	TRAIN S - TWO SIGNALS, 1 PS-C, SSR=B	SSN
SPSY	SPS	0.00E+00	GS	
SPSZ	SPS	1.00E+00	GF	
SPY	SP	0.00E+00	GS	
SPZ	SP	1.00E+00	GF	
SSA	SSPS	7.19E-07	BOTH TRAINS - ONE SIGNAL	
SSB	SSPS	1.94E-12	BOTH TRAINS - TWO SIGNALS	
SSC	SSPS	4.29E-04	SSPS TRAIN R - ONE SIGNAL	
SSD	SSPS	4.29E-04	SSPS TRAIN S - ONE SIGNAL	
SSE	SSPS	4.28E-04	SSPS TRAIN R - TWO SIGNALS	
SSF	SSPS	4.30E-04	SSPS TRAIN S - TWO SIGNALS	
SSG	SSPS	7.16E-07	BOTH TRAINS - CHANNEL I=F, 1 SIGNAL	
SSH	SSPS	7.26E-07	BOTH TRAINS - CHANNEL IV=F, 1 SIGNAL	
SSI	SSPS	1.32E-09	BOTH TRAINS - CHANNEL I=F, 2 SIGNALS	
SSJ	SSPS	1.29E-09	BOTH TRAINS - CHANNEL IV=F, 2 SIGNALS	
SSK	SSPS	4.52E-04	SSPS TRAIN R - CHANNEL I=F, 1 SIGNAL	
SSL	SSPS	4.49E-04	SSPS TRAIN S - CHANNEL IV=F, 1 SIGNAL	
SSM	SSPS	4.43E-04	SSPS TRAIN R - CHANNEL I=F, 2 SIGNAL	
SSN	SSPS	4.50E-04	SSPS TRAIN S - CHANNEL IV=F, 2 SIGNAL	
SSS1	SSS	8.32E-05	MEAN - FREQ. - SEIS G LEVEL 1	
SSS2	SSS	3.50E-03	MEAN - FREQ. - SEIS G LEVEL 2	
SSS3	SSS	3.88E-02	MEAN - FREQ. - SEIS G LEVEL 3	
SSS4	SSS	2.38E-01	MEAN - FREQ. - SEIS G LEVEL 4	
SSSY	SSS	0.00E+00	FOR NON-SEISMIC EVENTS	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
SULL1	**SUMP**	**3.40E-03**	**SUMP PLUGGING STATE 1, LARGE LOCA**	
SULL22	**SUMP**	**6.19E-03**	**SUMP PLUGGING STATE 22, LARGE LOCA**	
SULL26	**SUMP**	**1.02E-02**	**SUMP PLUGGING STATE 26, LARGE LOCA**	
SULL43	**SUMP**	**1.93E-02**	**SUMP PLUGGING STATE 43, LARGE LOCA**	
SULL9	**SUMP**	**7.22E-03**	**SUMP PLUGGING STATE 9, LARGE LOCA**	
SUML1	**SUMP**	**0.00E+00**	**SUMP PLUGGING STATE 1 MEDIUM LOCA**	
SUML22	**SUMP**	**0.00E+00**	**SUMP PLUGGING STATE 22, MEDIUM LOCA**	
SUML26	**SUMP**	**0.00E+00**	**SUMP PLUGGING STATE 26, MEDIUM LOCA**	
SUML43	**SUMP**	**0.00E+00**	**SUMP PLUGGING STATE 43, MEDIUM LOCA**	
SUML9	**SUMP**	**0.00E+00**	**SUMP PLUGGING STATE 9, MEDIUM LOCA**	
SUMPY	**SUMP**	**0.00E+00**	**no description entered**	
SUMPZ	**SUMP**	**1.00E+00**	**no description entered**	
SXAA	SXA	3.99E-05	UNIT 1 STANDBY TRANSFORMER, ALL SUPPORT	
SXAY	SXA	0.00E+00	GS	
SXAZ	SXA	1.00E+00	GF	
SXBA	SXB	3.93E-05	UNIT 2 STANDBY TRANSFORMER, ALL SUPPORT	
SXBY	SXB	0.00E+00	GS	
SXBZ	SXB	1.00E+00	GF	
TIMEA	GENST	9.03E-02	Fraction of Time Unit Assumed Shutdown	
TIMEG	GENST	7.50E-03	Planned Maint Train D - TDAFW, SGPORV	
TMEBAB	GENST	2.66E-01	No Planned Maint, Trains A, B Running	
TMEBBC	GENST	2.66E-01	No Planned Maint, Trains B, C Running	
TMEBCA	GENST	2.67E-01	No Planned Maint, Trains C, A Running	
TMECAB	GENST	1.53E-02	Planned Maint Train C - Case 1, EW, CC, DG, CH, RH, RCFC, CVA	
TMECBC	GENST	1.53E-02	Planned Maint Train A - Case 1, EW, CC, DG, CH, RH, RCFC, CVB	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
TMECCA	GENST	1.53E-02	Planned Maint Train B - Case 1, EW, CC, DG, CH, RH, RCFC	
TMEDAB	GENST	4.80E-03	Planned Maint Train C - Case 2, CH, HE(EAB), HE(CR)	
TMEDBC	GENST	4.80E-03	Planned Maint Train A - Case 2, CH, HE(EAB), HE(CR)	
TMEDCA	GENST	4.80E-03	Planned Maint Train B - Case 2, CH, HE(EAB), HE(CR)	
TMEEAB	GENST	7.50E-03	Planned Maint Train C - Case 3, LH, HH, CS, SICOM	
TMEEBC	GENST	7.50E-03	Planned Maint Train A - Case 3, LH, HH, CS, SICOM	
TMEECA	GENST	7.50E-03	Planned Maint Train B - Case 3, LH, HH, CS, SICOM	
TMEFAB	GENST	7.50E-03	Planned Maint Train C - MDAFW, SGPORV	
TMEFBC	GENST	7.50E-03	Planned Maint Train A - MDAFW, SGPORV	
TMEFCA	GENST	7.50E-03	Planned Maint Train B - MDAFW, SGPORV	
TTA	TT	3.20E-04	TURBINE TRIP FAILS	
TTB	TT	9.40E-03	TT FAILS - ESFAS A=F	
TTC	TT	9.47E-03	TT FAILS - ESFAS B=F	
TTY	TT	0.00E+00	GS	
TTZ	TT	1.00E+00	GF	
UAA	UA	9.68E-04	UNIT AUX. TRANSFORMER - ALL SUPPORT	
UAY	UA	0.00E+00	GS	
UAZ	UA	1.00E+00	GF	
VIA	VI	1.10E-04	VESSEL INTEGRITY DURING PTS	
VIZ	VI	1.00E+00	GF	
WA1	WA	2.90E-04	ECW TRAIN A (WA) - RUN	
WA2	WA	1.37E-03	WA RESTART (LOOP)	
WA3	WA	2.62E-03	WA START	

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WAA	WA	2.86E-04	WA RUN	ECW101
WAB	WA	1.36E-03	WA R/S	ECW104
WAC	WA	2.59E-03	WA START	ECW107
WAY	WA	0.00E+00	GS	
WAZ	WA	1.00E+00	GF	
WB1	WB	2.85E-04	WB RUN	
WB2	WB	1.38E-03	WB RESTART (LOOP)	
WB3	WB	2.60E-03	WB START	
WBA	WB	2.87E-04	ECW B - WA RUN, WB RUN	ECW102
WBB	WB	1.22E-03	WA=F, WB RUN	ECW201
WBC	WB	1.36E-03	WA RUN, WB R/S	ECW105
WBD	WB	2.24E-03	WA=F, WB R/S	ECW202
WBE	WB	2.87E-04	WA R/S, WB RUN	ECW102
WBF	WB	4.75E-04	WA=F, WB RUN	ECW203
WBG	WB	1.35E-03	WA R/S, WB R/S (LOOP)	ECW105
WBH	WB	1.00E-02	WA=F, WB R/S	ECW204
WBI	WB	2.59E-03	WA RUN, WB START	ECW108
WBJ	WB	3.54E-03	WA=F, WB START	ECW205
WBK	WB	2.58E-03	WA R/S, WB START	ECW108
WBL	WB	1.11E-02	WA=F, WB START	ECW206
WBM	WB	2.87E-04	WA START, WB RUN	ECW102
WBN	WB	3.92E-04	WA=F, WB RUN	ECW207
WBO	WB	1.35E-03	WA START, WB R/S	ECW105
WBP	WB	5.84E-03	WA=F, WB R/S	ECW208
WBQ	WB	2.87E-04	WA=B, WB RUN	ECW102
WBR	WB	1.36E-03	WA=B, WB R/S	ECW105
WBS	WB	2.59E-03	WA=B, WB START	ECW108

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WBY	WB	0.00E+00	GS	
WBZ	WB	1.00E+00	GF	
WC1	WC	2.84E-04	WC RUN	
WC2	WC	1.37E-03	WC RESTART (LOOP)	
WC3	WC	2.59E-03	WC START	
WCA	WC	2.58E-03	ECW C - WA RUN, WB RUN, WC START	ECW109
WCAA	WC	2.86E-04	WA R/S, WB START, WC RUN	ECW103
WCAB	WC	3.77E-04	WA=S, WB=F, WC RUN	ECW223
WCAC	WC	4.74E-04	WA=F, WB=S, WC RUN	ECW211
WCAD	WC	2.21E-03	WA=F, WB=F, WC RUN	ECW307
WCAE	WC	1.34E-03	WA R/S, WB START, WC R/S	ECW106
WCAF	WC	4.39E-03	WA=S, WB=F, WC R/S	ECW224
WCAG	WC	7.42E-03	WA=F, WB=S, WC R/S	ECW212
WCAH	WC	2.17E-01	WA=F, WB=F, WC R/S	ECW308
WCAI	WC	2.86E-04	WA START, WB RUN, WC RUN	ECW103
WCAJ	WC	1.11E-03	WA=S, WB=F, WC RUN	ECW217
WCAK	WC	3.83E-04	WA=F, WB=S, WC RUN	ECW215
WCAL	WC	2.86E-02	WA=F, WB=F, WC RUN	ECW309
WCAM	WC	1.34E-03	WA START, WB RUN, WC R/S	ECW106
WCAN	WC	2.18E-03	WA=S, WB=F, WC R/S	ECW218
WCAO	WC	5.73E-03	WA=F, WB=S, WC R/S	ECW216
WCAP	WC	3.29E-02	WA=F, WB=F, WC R/S	ECW310
WCAQ	WC	2.86E-04	WA START, WB R/S, WC RUN	ECW103
WCAR	WC	4.57E-04	WA=S, WB=F, WC RUN	ECW219
WCAS	WC	3.84E-04	WA=F, WB=S, WC RUN	ECW215
WCAT	WC	2.18E-03	WA=F, WB=F, WC RUN	ECW311
WCAU	WC	1.33E-03	WA START, WB R/S, WC R/S	ECW106

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WCAV	WC	7.34E-03	WA=S, WB=F, WC R/S	ECW220
WCAW	WC	4.47E-03	WA=F, WB=S, WC R/S	ECW216
WCAX	WC	2.22E-01	WA=F, WB=F, WC R/S	ECW312
WCB	WC	3.42E-03	WA=S, WB=F, WC START	ECW221
WCBA	WC	2.86E-04	WA RUN, WB=B, WC RUN	ECW103
WCBB	WC	1.20E-03	WA=F, WB=B, WC RUN	ECW209
WCBC	WC	1.35E-03	WA RUN, WB=B, WC R/S	ECW106
WCBD	WC	2.32E-03	WA=F, WB=B, WC R/S	ECW210
WCBE	WC	2.86E-04	WA R/S, WB=B, WC RUN	ECW103
WCBF	WC	4.94E-04	WA=F, WB=B, WC RUN	ECW211
WCBG	WC	1.34E-03	WA R/S, WB=B, WC R/S	ECW106
WCBH	WC	9.76E-03	WA=F, WB=B, WC R/S	ECW212
WCBI	WC	2.58E-03	WA RUN, WB=B, WC START	ECW109
WCBJ	WC	3.56E-03	WA=F, WB=B, WC START	ECW213
WCBK	WC	2.57E-03	WA R/S, WB=B, WC START	ECW109
WCBL	WC	1.08E-02	WA=F, WB=B, WC START	ECW214
WCBM	WC	2.86E-04	WA START, WB=B, WC RUN	ECW103
WCBN	WC	3.94E-04	WA=F, WB=B, WC RUN	ECW215
WCBO	WC	1.34E-03	WA START, WB=B, WC R/S	ECW106
WCBP	WC	5.74E-03	WA=F, WB=B, WC R/S	ECW216
WCBQ	WC	2.86E-04	WA=B, WB RUN, WC RUN	ECW103
WCBR	WC	1.21E-03	WA=B, WB=F, WC RUN	ECW217
WCBS	WC	1.35E-03	WA=B, WB RUN, WC R/S	ECW106
WCBT	WC	2.28E-03	WA=B, WB=F, WC R/S	ECW218
WCBU	WC	2.86E-04	WA=B, WB R/S, WC RUN	ECW103
WCBV	WC	4.76E-04	WA=B, WB=F, WC RUN	ECW219
WCBW	WC	1.34E-03	WA=B, WB R/S, WC R/S	ECW106

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WCBX	WC	9.72E-03	WA=B, WB=F, WC R/S	ECW220
WCC	WC	3.47E-03	WA=F, WB=S, WC START	ECW213
WCCA	WC	2.58E-03	WA=B, WB RUN, WC START	ECW109
WCCB	WC	3.52E-03	WA=B, WB=F, WC START	ECW221
WCCC	WC	2.57E-03	WA=B, WB R/S, WC START	ECW109
WCCD	WC	1.06E-02	WA=B, WB=F, WC START	ECW222
WCCE	WC	2.86E-04	WA=B, WB START, WC RUN	ECW103
WCCF	WC	3.88E-04	WA=B, WB=F, WC RUN	ECW223
WCCG	WC	1.34E-03	WA=B, WB START, WC R/S	ECW106
WCCH	WC	5.63E-03	WA=B, WB=F, WC R/S	ECW224
WCCI	WC	2.87E-04	WA=B, WB=B, WC RUN	ECW103
WCCJ	WC	1.35E-03	WA=B, WB=B, WC R/S	ECW106
WCCK	WC	2.58E-03	WA=B, WB=B, WC START	ECW109
WCD	WC	8.27E-02	WA=F, WB=F, WC START	ECW301
WCE	WC	2.57E-03	WA RUN, WB R/S, WC START	ECW109
WCF	WC	1.05E-02	WA=S, WB=F, WC START	ECW222
WCG	WC	3.46E-03	WA=F, WB=S, WC START	ECW213
WCH	WC	5.12E-02	WA=F, WB=F, WC START	ECW302
WCI	WC	2.57E-03	WA R/S, WB RUN, WC START	ECW109
WCJ	WC	3.41E-03	WA=S, WB=F, WC START	ECW221
WCK	WC	1.08E-02	WA=F, WB=S, WC START	ECW214
WCL	WC	5.31E-02	WA=F, WB=F, WC START	ECW303
WCM	WC	2.56E-03	WA R/S, WB R/S, WC START	ECW109
WCN	WC	8.25E-03	WA=S, WB=F, WC START	ECW222
WCO	WC	8.47E-03	WA=F, WB=S, WC START	ECW214
WCP	WC	2.39E-01	WA=F, WB=F, WC START	ECW304
WCQ	WC	2.86E-04	WA RUN, WB START, WC RUN	ECW103

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WCR	WC	3.76E-04	WA=S, WB=F, WC RUN	ECW223
WCS	WC	1.10E-03	WA=F, WB=S, WC RUN	ECW209
WCT	WC	2.93E-02	WA=F, WB=F, WC RUN	ECW305
WCU	WC	1.34E-03	WA RUN, WB START, WC R/S	ECW106
WCV	WC	5.62E-03	WA=S, WB=F, WC R/S	ECW224
WCW	WC	2.21E-03	WA=F, WB=S, WC R/S	ECW210
WCX	WC	3.40E-02	WA=F, WB=F, WC R/S	ECW306
WCY	WC	0.00E+00	GS	
WCZ	WC	1.00E+00	GF	
WI1A	WI	3.60E-03	PUMP A DISCHARGES TO SPRAY HEADER	
WI1B	WI	3.47E-03	PUMP B DISCHARGES TO SPRAY HEADER	
WI1C	WI	3.62E-03	PUMP C DISCHARGES TO SPRAY HEADER	
WI2AB	WI	1.18E-04	PUMPS A AND B DISCHARGE TO SPRAY HEADERS	
WI2AC	WI	1.17E-04	PUMPS A AND C DISCHARGE TO SPRAY HEADERS	
WI2BC	WI	1.18E-04	PUMPS B AND C DISCHARGE TO SPRAY HEADERS	
WI3	WI	3.38E-05	CS INJECTION (CSI) - ALL SUPPORT	
WIA1	WI	3.44E-05	CSI - ONE SSPS (R)	
WIA2	WI	3.41E-05	CSI - ONE SSPS (S)	
WIC3	WI	9.64E-01	THREE PUMPS - CSR FAILS (CSR3)	WI3
WICA	WI	8.20E-01	PUMP A, CSR FAILS (CS1A)	WI1A
WICAB	WI	9.41E-01	2 PUMPS (A, B), CSR FAILS (CS2AB)	WI2AB
WICAC	WI	9.05E-01	2 PUMPS (A, C), CSR FAILS (CS2AC)	WI2AC
WICB	WI	8.23E-01	PUMP B, CSR FAILS (CS1B)	WI1B
WICBC	WI	9.27E-01	2 PUMPS (B, C), CSR FAILS (CS2BC)	WI2BC
WICC	WI	8.24E-01	PUMP C, CSR FAILS (CS1C)	WI1C

Table B.3-1 Master Frequency File Used for Point Estimate Event Tree Quantification (Continued)

SF Name	Top Event	SF Value	Split Fraction Description	ISF
WIY	WI	0.00E+00	GS	
WIZ	WI	1.00E+00	GF	
X2A	X2	1.00E-01	NO HPME AT VESSEL BREACH	
X2B	X2	1.00E+00	HPME AT VESSEL BREACH	
XRA	XR	0.00E+00	NO LATE HYDROGEN BURN OCCURS	
XRG	XR	1.00E+00	NO RECIRC COOLING & RCFCS FAILED OR DESTROYED BY LATE BURN	
XTM0	UET	0.00E+00	NON UET SEQUENCES	
XTMA	UET	2.19E-01	UET1 BRANCH	
XTMB	UET	3.39E-01	UET2 BRANCH	
XTMC	UET	4.74E-01	UET3 BRANCH	
XTMD	UET	2.66E-01	UET4 BRANCH	
XTME	UET	3.83E-01	UET5 BRANCH	
XTMF	UET	5.16E-01	UET6 BRANCH	

B.4 LOCA Frequencies

Table B.4-1 displays the LOCA exceedance frequencies as a function of break diameter used in the PRA quantification. The uncertainty was represented by 100 frequency exceedance curves according to a Bounded Johnson distribution fit to the NUREG-1829 uncertainty data at three break sizes. Exceedance frequency values are also provided at 7 inches and 10 inches, but they are artificial. They are included only to allow the RISKMAN software to determine an interval frequency for large LOCAs, i.e., for greater than 6-inch diameter breaks where the upper size limit has an effective exceedance frequency of approximately zero. For example, the medium LOCA mean interval frequency is 3.1E-4 minus 5.2E-6, or 3.05E-4 per year.

When performing the Monte Carlo uncertainty propagation, whose results are presented in Tables 4-4 and 4-5, a single exceedance curve was chosen each sample and the medium and large LOCA frequencies for that sample were obtained by subtraction using the same percentile for the exceedance curve.

Table B.4-1 LOCA Exceedance Frequencies (per year)

		Break Sizes (diameter inches)				
Curve	**Curve Weights**	**0.5"**	**2"**	**6"**	**7"**	**10"**
1	1.00E-03	4.78E-05	2.41E-06	3.88E-08	1.00E-13	1.00E-15
2	1.00E-03	4.87E-05	2.47E-06	3.97E-08	1.00E-13	1.00E-15
3	1.00E-03	4.95E-05	2.52E-06	4.05E-08	1.00E-13	1.00E-15
4	1.00E-03	5.03E-05	2.57E-06	4.13E-08	1.00E-13	1.00E-15
5	1.00E-03	5.09E-05	2.61E-06	4.20E-08	1.00E-13	1.00E-15
6	1.00E-03	5.16E-05	2.66E-06	4.27E-08	1.00E-13	1.00E-15
7	1.00E-03	5.22E-05	2.70E-06	4.34E-08	1.00E-13	1.00E-15
8	1.00E-03	5.29E-05	2.74E-06	4.41E-08	1.00E-13	1.00E-15
9	1.00E-03	5.35E-05	2.79E-06	4.48E-08	1.00E-13	1.00E-15
10	1.00E-03	5.40E-05	2.83E-06	4.55E-08	1.00E-13	1.00E-15
11	2.00E-03	5.52E-05	2.91E-06	4.68E-08	1.00E-13	1.00E-15
12	2.00E-03	5.63E-05	2.99E-06	4.82E-08	1.00E-13	1.00E-15
13	2.00E-03	5.74E-05	3.08E-06	4.95E-08	1.00E-13	1.00E-15
14	2.00E-03	5.85E-05	3.16E-06	5.08E-08	1.00E-13	1.00E-15
15	2.00E-03	5.96E-05	3.24E-06	5.22E-08	1.00E-13	1.00E-15
16	2.00E-03	6.07E-05	3.33E-06	5.35E-08	1.00E-13	1.00E-15
17	2.00E-03	6.17E-05	3.41E-06	5.49E-08	1.00E-13	1.00E-15
18	2.00E-03	6.28E-05	3.50E-06	5.63E-08	1.00E-13	1.00E-15
19	2.00E-03	6.39E-05	3.58E-06	5.77E-08	1.00E-13	1.00E-15
20	2.00E-03	6.49E-05	3.67E-06	5.90E-08	1.00E-13	1.00E-15
21	4.00E-03	6.71E-05	3.84E-06	6.19E-08	1.00E-13	1.00E-15

Table B.4-1 LOCA Exceedance Frequencies (per year) (Continued)

		Break Sizes (diameter inches)				
Curve	Curve Weights	0.5"	2"	6"	7"	10"
22	4.00E-03	6.92E-05	4.02E-06	6.48E-08	1.00E-13	1.00E-15
23	4.00E-03	7.14E-05	4.20E-06	6.77E-08	1.00E-13	1.00E-15
24	4.00E-03	7.36E-05	4.39E-06	7.07E-08	1.00E-13	1.00E-15
25	4.00E-03	7.57E-05	4.57E-06	7.38E-08	1.00E-13	1.00E-15
26	1.00E-02	8.13E-05	5.06E-06	8.17E-08	1.00E-13	1.00E-15
27	1.00E-02	8.71E-05	5.58E-06	9.01E-08	1.00E-13	1.00E-15
28	1.00E-02	9.30E-05	6.12E-06	9.89E-08	1.00E-13	1.00E-15
29	1.00E-02	9.91E-05	6.69E-06	1.08E-07	1.00E-13	1.00E-15
30	1.00E-02	1.05E-04	7.29E-06	1.18E-07	1.00E-13	1.00E-15
31	2.00E-02	1.19E-04	8.59E-06	1.39E-07	1.00E-13	1.00E-15
32	2.00E-02	1.33E-04	1.00E-05	1.63E-07	1.00E-13	1.00E-15
33	2.00E-02	1.48E-04	1.16E-05	1.88E-07	1.00E-13	1.00E-15
34	2.00E-02	1.65E-04	1.33E-05	2.17E-07	1.00E-13	1.00E-15
35	2.00E-02	1.83E-04	1.52E-05	2.48E-07	1.00E-13	1.00E-15
36	2.00E-02	2.02E-04	1.73E-05	2.83E-07	1.00E-13	1.00E-15
37	2.00E-02	2.22E-04	1.97E-05	3.21E-07	1.00E-13	1.00E-15
38	2.00E-02	2.45E-04	2.22E-05	3.62E-07	1.00E-13	1.00E-15
39	2.00E-02	2.68E-04	2.50E-05	4.08E-07	1.00E-13	1.00E-15
40	2.00E-02	2.94E-04	2.80E-05	4.58E-07	1.00E-13	1.00E-15
41	2.00E-02	3.22E-04	3.13E-05	5.13E-07	1.00E-13	1.00E-15
42	2.00E-02	3.52E-04	3.50E-05	5.74E-07	1.00E-13	1.00E-15
43	2.00E-02	3.84E-04	3.90E-05	6.41E-07	1.00E-13	1.00E-15
44	2.00E-02	4.19E-04	4.35E-05	7.14E-07	1.00E-13	1.00E-15
45	2.00E-02	4.57E-04	4.83E-05	7.94E-07	1.00E-13	1.00E-15
46	2.00E-02	4.99E-04	5.37E-05	8.83E-07	1.00E-13	1.00E-15
47	2.00E-02	5.43E-04	5.96E-05	9.81E-07	1.00E-13	1.00E-15
48	2.00E-02	5.92E-04	6.61E-05	1.09E-06	1.00E-13	1.00E-15
49	2.00E-02	6.44E-04	7.33E-05	1.21E-06	1.00E-13	1.00E-15
50	2.00E-02	7.02E-04	8.13E-05	1.34E-06	1.00E-13	1.00E-15
51	2.00E-02	7.64E-04	9.01E-05	1.49E-06	1.00E-13	1.00E-15
52	2.00E-02	8.33E-04	9.99E-05	1.65E-06	1.00E-13	1.00E-15
53	2.00E-02	9.08E-04	1.11E-04	1.83E-06	1.00E-13	1.00E-15
54	2.00E-02	9.90E-04	1.23E-04	2.04E-06	1.00E-13	1.00E-15
55	2.00E-02	1.08E-03	1.37E-04	2.26E-06	1.00E-13	1.00E-15
56	2.00E-02	1.18E-03	1.52E-04	2.52E-06	1.00E-13	1.00E-15
57	2.00E-02	1.29E-03	1.69E-04	2.81E-06	1.00E-13	1.00E-15

Table B.4-1 LOCA Exceedance Frequencies (per year) (Continued)

		Break Sizes (diameter inches)				
Curve	Curve Weights	0.5"	2"	6"	7"	10"
58	2.00E-02	1.42E-03	1.89E-04	3.13E-06	1.00E-13	1.00E-15
59	2.00E-02	1.55E-03	2.11E-04	3.50E-06	1.00E-13	1.00E-15
60	2.00E-02	1.71E-03	2.36E-04	3.93E-06	1.00E-13	1.00E-15
61	2.00E-02	1.88E-03	2.65E-04	4.41E-06	1.00E-13	1.00E-15
62	2.00E-02	2.07E-03	2.98E-04	4.97E-06	1.00E-13	1.00E-15
63	2.00E-02	2.30E-03	3.37E-04	5.61E-06	1.00E-13	1.00E-15
64	2.00E-02	2.55E-03	3.82E-04	6.37E-06	1.00E-13	1.00E-15
65	2.00E-02	2.84E-03	4.34E-04	7.26E-06	1.00E-13	1.00E-15
66	2.00E-02	3.18E-03	4.97E-04	8.31E-06	1.00E-13	1.00E-15
67	2.00E-02	3.57E-03	5.72E-04	9.57E-06	1.00E-13	1.00E-15
68	2.00E-02	4.04E-03	6.62E-04	1.11E-05	1.00E-13	1.00E-15
69	2.00E-02	4.60E-03	7.73E-04	1.30E-05	1.00E-13	1.00E-15
70	2.00E-02	5.28E-03	9.12E-04	1.53E-05	1.00E-13	1.00E-15
71	1.00E-02	5.69E-03	9.95E-04	1.67E-05	1.00E-13	1.00E-15
72	1.00E-02	6.14E-03	1.09E-03	1.83E-05	1.00E-13	1.00E-15
73	1.00E-02	6.65E-03	1.20E-03	2.01E-05	1.00E-13	1.00E-15
74	1.00E-02	7.23E-03	1.32E-03	2.22E-05	1.00E-13	1.00E-15
75	1.00E-02	7.91E-03	1.46E-03	2.46E-05	1.00E-13	1.00E-15
76	4.00E-03	8.21E-03	1.52E-03	2.57E-05	1.00E-13	1.00E-15
77	4.00E-03	8.53E-03	1.59E-03	2.69E-05	1.00E-13	1.00E-15
78	4.00E-03	8.88E-03	1.67E-03	2.81E-05	1.00E-13	1.00E-15
79	4.00E-03	9.25E-03	1.74E-03	2.94E-05	1.00E-13	1.00E-15
80	4.00E-03	9.66E-03	1.83E-03	3.09E-05	1.00E-13	1.00E-15
81	2.00E-03	9.87E-03	1.87E-03	3.16E-05	1.00E-13	1.00E-15
82	2.00E-03	1.01E-02	1.92E-03	3.24E-05	1.00E-13	1.00E-15
83	2.00E-03	1.03E-02	1.97E-03	3.32E-05	1.00E-13	1.00E-15
84	2.00E-03	1.06E-02	2.02E-03	3.41E-05	1.00E-13	1.00E-15
85	2.00E-03	1.08E-02	2.07E-03	3.50E-05	1.00E-13	1.00E-15
86	2.00E-03	1.11E-02	2.13E-03	3.59E-05	1.00E-13	1.00E-15
87	2.00E-03	1.14E-02	2.19E-03	3.69E-05	1.00E-13	1.00E-15
88	2.00E-03	1.17E-02	2.25E-03	3.80E-05	1.00E-13	1.00E-15
89	2.00E-03	1.21E-02	2.31E-03	3.91E-05	1.00E-13	1.00E-15
90	2.00E-03	1.24E-02	2.38E-03	4.02E-05	1.00E-13	1.00E-15
91	1.00E-03	1.26E-02	2.42E-03	4.09E-05	1.00E-13	1.00E-15
92	1.00E-03	1.28E-02	2.46E-03	4.15E-05	1.00E-13	1.00E-15
93	1.00E-03	1.31E-02	2.50E-03	4.22E-05	1.00E-13	1.00E-15

Table B.4-1 LOCA Exceedance Frequencies (per year) (Continued)

		Break Sizes (diameter inches)				
Curve	**Curve Weights**	**0.5"**	**2"**	**6"**	**7"**	**10"**
94	1.00E-03	1.33E-02	2.54E-03	4.29E-05	1.00E-13	1.00E-15
95	1.00E-03	1.35E-02	2.58E-03	4.36E-05	1.00E-13	1.00E-15
96	1.00E-03	1.38E-02	2.63E-03	4.44E-05	1.00E-13	1.00E-15
97	1.00E-03	1.41E-02	2.68E-03	4.53E-05	1.00E-13	1.00E-15
98	1.00E-03	1.45E-02	2.74E-03	4.62E-05	1.00E-13	1.00E-15
99	1.00E-03	1.49E-02	2.80E-03	4.73E-05	1.00E-13	1.00E-15
100	1.00E-03	1.59E-02	2.92E-03	4.93E-05	1.00E-13	1.00E-15
MEAN	**1.00E+00**	**1.90E-03**	**3.10E-04**	**5.20E-06**	**0.00E+00**	**0.00E+00**