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PRA Technology and Regulatory Perspectives (P-111)
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Volume 2

P-111 INTEGRATED WORKSHOP #1

PLANNING AND PRIORITIZING INSPECTION ACTIVITIES

Objective: The student will learn how to extract risk insights from a PRA and SDP Notebook for use in planning and prioritizing inspection activities.

Method: Students will be given the North Anna SDP Notebook and material from the North Anna IPE Submittal to be used as an illustration of PRA information for carrying out this workshop. Only portions of that submittal useful for performing the workshop will be provided to the students in order to avoid ineffectual time looking through a large volume of material. Completion of this workshop should be expected to take approximately ½ day and will be given at the end of the P-111 course after all course modules have been presented.

Materials:
1) North Anna SDP Notebook
2) Summary of Major Findings from the IPE
3) Functional failure summary information from the IPE
4) List of Initiating Events from the IPE
5) Success Criteria information from the IPE
6) Event tree information from the IPE
7) Plant design and Safety Injection System information from the IPE
8) Core damage (and dominant cut sets) results information from the IPE
9) Risk importance information from the IPE
10) List of basic events and descriptions
11) Information regarding one Human Error modeled in the IPE

Instructions: By using the material provided and answering the questions in this workshop, arrive at an inspection plan to investigate aspects of the plant design and operation based on the insights gained from the IPE while performing this workshop.

Questions:

(Questions 1 – 6 illustrate how an inspector might begin to investigate "what is dominating risk at this plant." Getting "acquainted" with the dominant results and basic terminology, at least at a high level, is an important first step in gaining risk insights from a PRA. Part of this is "learning" what initiators, functional failures, systems, etc. are important to the results.)

1. Based on a review of the major findings for the IPE,
   a) What is the total plant core damage frequency (CDF) from internal events?
   b) What percentage of this total comes from LOCA-type initiators? (Note: it may be helpful to look at the initiating event list to know which designators are LOCAs – treat "R" (such as in RX sequences) as a LOCA but neglect "V" (such as in VX sequences) since this is a special class of LOCA that is not being considered here).
   c) As a class, are LOCAs among the more dominant contributing initiators to CDF?

2. Determine the following:
   a) What are the respective percent contributions to the total CDF from the following LOCA initiators: A, S1, S2?
   b) Which one of these initiator types contributes the most and what is the corresponding contribution?

3. From the summary of results for the PRA (see Section 3.4.1.2 and Table 3.4.1-8),
   a) Which functional failure (i.e., what group of functional failures) contributes most to the CDF?
   b) What is the percentage contribution?

4. Based on information in Table 3.4.1-3 in the "Core Damage Results" portion of the material provided,
   a) What are the functional failure designation and the sequence designation for the core damage sequence that contributes the most to CDF?
   b) What is the percentage contribution of this one sequence to the total CDF?
   c) What is the corresponding CDF value?
   d) Using the event tree that depicts the sequence identified in 4.a above, and the event tree designator table that describes the nomenclature, describe in general terms what initiator has occurred, what has failed in the sequence, and what is successful in the sequence?
   e) Locate this sequence on the small LOCA event tree in the SDP Notebook. Estimate the frequency of the sequence using the small LOCA worksheet table in the SDP Notebook. Is this value larger or smaller than the value for this sequence in the PRA? Explain why this should be so.

5. Using the same table as above (Table 3.4.1-3), and with help from the designators shown on the Functional Failure Table 3.4.1-8,
   a) List all the sequences (by functional failure designation and by sequence designation) with the same initiator as that for the sequence in question 4.a and identify which of

those are "injection-type" failure sequences. Identify these sequences in the SDP Notebook.

b) List all the sequences with the same initiator as the sequence in question 4.a and identify which of those are "recirculation-type failure sequences. Identify these sequences in the SDP Notebook.

6. Based on the information from question 5,
   a) What is the total percentage contribution to CDF from sequences involving this same initiator and injection failures?
   b) What is the total percentage contribution to CDF from sequences involving this same initiator and recirculation failures?
   c) For this same initiator, which contributes most, injection or recirculation failures?

(Questions 7 – 12 illustrate how an inspector might further investigate more detailed aspects of certain accident sequences and/or systems found generally to be important in the PRA. Questions 7 - 12 illustrate using the PRA to obtain more detailed information than can be obtained from the SDP Notebook.)

7. By reviewing the success criteria table for the S2 initiator, and using the event tree designator table to understand the nomenclature,
   a) How many charging pumps must fail in order to fail event D1 in the S2-LOCA event tree? Is this consistent with the success criterion in the SDP Notebook?
   b) How many low head safety injection pumps must fail in order to fail event D3 in the S2-LOCA event tree? Is this consistent with the success criterion in the SDP Notebook?
   c) How many accumulators must fail in order to fail event D2 in the S2-LOCA event tree? How does the SDP Notebook model accumulator injection for small LOCA?
   d) How many auxiliary feedwater pumps must fail in order to fail event L in the S2-LOCA event tree? Is this consistent with the success criterion in the SDP Notebook?

8. Using the basic event/description list and by reviewing the dominant cut sets for the S2P35 sequence,
   a) What single component failure, along with the S2 initiator, causes this core damage sequence? (Note: ignore the C-Y02 event; "C" stands for complement and is actually the success of the "Y" event in the S2 event tree).
   b) Is the single component failure an "active" or "passive" failure?
   c) Why does this single failure cause failure of both D1 and D3? (Hint; look at simplified schematics of systems involved).
   d) What percentage of the total sequence frequency does this one cut set contribute?
   e) What one single common cause failure, along with S2, causes this core damage sequence?
   f) What percentage of the total sequence frequency does this one cut set contribute?
   g) What percentage of the sequence frequency do these two cut sets contribute together?
   h) For certain system start/run configurations, note that check valve 254 failing open is assumed to cause "short-circuiting" of the entire charging system (i.e., flow recirculates back to pump suctions rather than into the reactor). What percentage of

the <u>sequence frequency</u> is made up of cut sets that contain the basic event representing failure of check valve 254? How does this valve failure fail the affected system?

i) Looking at the assumptions used in modeling failure of high-head safety injection, does the system modeling with respect to check valve 254 appear reasonable?

9. To get a feeling for the overall importance of some of the basic events from the previous two questions, not just to these S2 sequences, but to total CDF from all sequences, let's examine the risk importance tables.
   a) Is there a significant difference between the importance of the single component failure and the common cause failure you found in question 8.a and 8.e above using Fussell-Veseley importance?
   b) What about from the perspective of risk achievement worth (RAW)?
   c) Would the components represented by these events be classified by the PRA as high or low risk significance for purposes of the Maintenance Rule, using the criteria in NUMARC 93-01?
   d) Looking at both Fussell-Veseley and RAW values, qualitatively how does the check valve 254 failure (see 8.h above) compare in importance with the single component and common cause failures?

10. Often, the assumptions in the analysis are just as, or more important, than some of the PRA modeling. In the cut sets that have been reviewed, plugging of the common valve at outlet of the RWST, 1-QS-38, has shown up but the human error of inadvertently leaving the valve closed after a maintenance activity requiring it to be closed has not appeared among the dominant cut sets. Safety Injection Fault Tree Modeling assumptions # 15 and #46 provide rationale for this. Do these assumptions seem reasonable?

11. This question illustrates one way in which PRA "quality" can be examined. Looking again at the cut sets for sequence S2P35, does it appear that the success criterion for low-head safety injection has been modeled correctly in generating these cut sets?

12. Use the information you have gleaned from the IPE and SDP Notebook to construct an outline of your inspection plan. Include in the outline the items you intend to examine and be prepared to defend your choices.

P-111 INTEGRATED WORKSHOP #2

RISK SIGNIFICANCE OF FINDINGS AND EVENTS

Objective: The student will learn how PRA information can be used to provide insight into the risk significance of specific inspection findings or operational events. This includes Phase 2 analysis using the Significance Determination Process (SDP).

Method: Students will be given the North Anna SDP Notebook and material from the North Anna IPE Submittal to be used as an illustration of PRA information for carrying out this workshop. Only portions of the submittal useful for performing the workshop will be provided to the students in order to avoid ineffectual time looking through a large volume of material. Completion of this workshop should be expected to take approximately ½ day and will be given at the end of the P-111 course after all course modules have been presented.

Materials:
1) Example of an operational event and related inspection finding
2) North Anna SDP Notebook
3) Summary of Major Findings from the IPE
4) Functional failure summary information from the IPE
5) List of Initiating Events from the IPE
6) Success Criteria information from the IPE
7) Event tree information from the IPE
8) Plant design and Safety Injection System information from the IPE
9) Core damage (and dominant cut sets) results information from the IPE
10) Risk importance information from the IPE
11) List of basic events and descriptions

Instructions: By using the material provided and answering the questions in this workshop, arrive at a tentative conclusion regarding the risk-significance of the operational event and related inspection finding based on the SDP and on the PRA information provided. The conclusion ought to be considered "tentative" because in a real situation, there may be other information not provided, which could alter the conclusion reached.

Example Operational Event / Inspection Finding:

[Note: This example is based on an actual operational event and inspection finding at a power plant similar to North Anna. The facts related to the actual event have been altered somewhat for purposes of the class workshop. Nevertheless, similarity between this fictitious event and the actual event provides "realism" toward meeting the objective of this workshop.

During a test of the auxiliary feedwater system (AFW) with the plant at power (Mode 1), an operator noticed that the manual discharge valve for the turbine-driven pump, valve 1-FW-278 (refer to the simplified AFW flow diagram in Module F), is locked closed. It is required to be locked open when the plant is at power. This misalignment has existed for 48 days and violates the Technical Specification Limiting Condition of Operation of 72 hours. With the system in this condition, no flow would be available from the turbine-driven AFW pump to any of the steam generators. Upon review of the event, the NRC determined that the misalignment occurred during performance of an AFW valve operability test. The misalignment was discovered when an operator noticed the valve stem position and questioned whether the valve was in the correct position.

Questions:

(Questions 1 – 5 examine how the SDP evaluates the risk significance of the finding.)

1. Use the SDP Phase 1 screening worksheet to evaluate this finding. Explain in detail why Phase 2 analysis is or is not necessary.

2. Assume that Phase 2 analysis is required and use the SDP Worksheets in the North Anna SDP Notebook to evaluate the risk significance of this condition.

3. What is the overall "color" for this finding?

4. Which accident sequence dominates this result?

5. List any assumptions you made in doing the Phase 2 analysis and be prepared to defend these assumptions before a mock Significance Evaluation Review Panel (SERP).

(Question 6 –10 explore how the PRA results could be used to evaluate the risk significance of this finding.)

6. Looking in the PRA,
   a) Is the equipment of interest and the function(s) that equipment performs "captured" in the PRA for the North Anna IPE?
   b) If so, where in the materials provided did you find the relevant information?

7. Based on the modeling in the PRA, what types of failures (e.g., independent, common cause, human error, hardware failure, support system failures...) or other reasons for unavailability (e.g., test or maintenance outage) did the PRA include in considering the inoperability of the turbine-driven AFW train?

8. Which event tree sequences correspond to the dominant sequence you found in the Phase 2 SDP above? Note: Level 2 information may be included in the Level 1 event trees; any sequences that lead to core uncovery can be considered core damage sequences for this question.

9. Using the dominant sequence cut sets, along with the table of basic event probabilities, estimate the change in CDF for this sequence. With what "color" does this change in CDF correspond? Note: if you found more than one PRA sequence that corresponded with the dominant SDP sequence, use the sequence with the highest frequency to answer this question.

10. Use the importance measure information to estimate the overall impact of this condition on CDF. How does this compare with what you calculated in the question above?

P-111 INTEGRATED WORKSHOP #3

SDP EVALUATION OF FIRE PROTECTION FINDINGS

Objective: The student will learn how to use Appendix F to IMC 0609 to perform Phase 1 and Phase 2 evaluation of fire protection findings.

Method: Students will be given material from the North Anna SDP Notebook to be used for carrying out this workshop. Completion of this workshop should be expected to take approximately ½ day and will be given at the end of the P-111 course after all course modules have been presented.

Materials:
1) Example of an operational event and related inspection finding
2) IMC 0609
3) North Anna SDP Notebook

Instructions: By using the material provided and answering the questions in this workshop, arrive at a tentative conclusion regarding the risk-significance of the operational event and related inspection finding based solely on the information provided. The conclusion ought to be considered "tentative" because in a real situation, there may be other information not provided, which could alter the conclusion reached.

Example Operational Event / Inspection Finding:

[Note: This example is based on an actual operational event and inspection finding at a power plant other than North Anna. The facts related to the actual event have been altered somewhat for purposes of the class workshop. Nevertheless, similarity between this fictitious event and the actual event provides "realism" toward meeting the objective of this workshop.

Inadequate CO_2 Flooding Capacity in Emergency Switchgear Room

The 4160 Vac Emergency Switchgear Room contains both divisions of emergency ac power. The two divisions are separated from one another by a radiant energy shield wall. There are safe shutdown cables located in the room overhead. One train of these cables is protected by a one-hour fire barrier. One train in the affected area is recoverable by operator action if these cables are not damaged by the fire. The room is protected by a automatically actuated CO_2 flooding system, which was designed in accordance with Standard 12 of the National Fire Protection Association. This standard requires that, for a deep-seated fire, the system maintain 50% CO_2 concentration in the room for at least 20 minutes. According to the licensee's FSAR, the system should be capable of 2 full discharges into the room, equating to about 10 tons of CO_2. According to the licensee's IPEEE, the frequency of large switchgear room fires is about 0.01/yr.

Findings:

- The licensee has reported that the CO_2 flooding system does not meet the FSAR design requirements. The tanks hold 10 tons of CO_2, but the weekly surveillance only requires that the tanks be 50% full.

- The one-hour fire barrier protecting the SSD cable train in the room overhead was inspected by the NRC and found to be degraded, such that in several locations the actual rating would be less than ten minutes.

- A fire brigade drill was observed by the NRC and the brigade performed satisfactorily.

Questions – Phase 1 Screening

1. Which fire protection defense-in-depth elements are affected by the findings?

2. Which Figure from Appendix F is appropriate for Step 2?

3. Explain why the findings are screened from further analysis or if Phase 2 analysis is appropriate.

Questions - Phase 2 Analysis

1. Describe a credible fire scenario for analysis. Which event tree in the SDP Notebook will be most appropriate for analysis?

2. Decide upon and be ready to defend qualitative degradation ratings for the CO_2 flooding system, the one-hour fire barrier, and fire brigade effectiveness. Does dependency need to be addressed?

3. Calculate the fire mitigation frequency (FMF).

4. Find the initiating event likelihood rating.

5. Using the appropriate sequence results from the North Anna SDP Notebook, find the integrated risk significance (color) of these findings. Is Phase 3 analysis required?

SUMMARY OF MAJOR FINDINGS FROM NORTH ANNA IPE

supported by a comprehensive set of analysis files, which detail the assumptions and information sources used at each stage of model development.

A formal Quality Assurance Plan was developed for the project to ensure the appropriate level of review and documentation. The work products were reviewed at each stage, by project team members. North Anna station personnel reviewed key documents. In addition, an independent review was performed to ensure consistency within the overall methodology. All comments received have been addressed and retained within the appropriate analysis files.

1.4 SUMMARY OF MAJOR FINDINGS

1.4.1 Results of Core Damage Frequency for Internal Events

Core damage is defined as failure of decay heat removal such that the maximum fuel temperature will exceed the licensing basis temperature of 2200°F or the core exit thermocouples will reach 1200°F and long-term cooling cannot be established. Although these criteria are slightly conservative, the increase in the time to the onset of significant core damage following failure of decay heat removal compared with the time to 2200°F is not significant in terms of system recovery or actions by the operators. In a number of sequences, the time it takes to achieve this temperature limit is based on actions taken by the operators when the core exit thermocouples indicate 1200°F. Each event tree was extended to include the containment systems and where appropriate the recovery of cooling injection after core damage or vessel failure in order to accurately define the plant damage states which were the basis for the containment accident progression and source term analysis.

The internal events portion of the PRA identified 61 core damage sequences with an annual frequency of greater than 1.0E-7, which contributed 96% of the overall core damage frequency. An additional 161 sequences with a point estimate frequency of greater than 1.0E-9/year contributed the remaining 4% of the overall core damage frequency. The accident grouping by initiating event class is shown in Table 1-1 and Figure 1-1.

The internal events core damage model gave a point estimate frequency of 6.8E-5 per reactor-year. The combined frequency of the 161 sequences below the 1.0E-7 cutoff is less than 2.9E-6. An uncertainty analysis was performed to evaluate the uncertainty on core damage frequency resulting from the uncertainties on the parameter values of the core damage model. The cumulative distribution function for the core damage frequency is shown in Figure 1-2.

Some significant parameters of the core damage frequency distribution function are as follows:

Mean	1.66E-4
Standard Deviation	1.03E-3
95th Percentile	3.41E-4
Median	7.41E-5
5th Percentile	2.74E-5

The difference between the mean value, obtained from the uncertainty analysis, and the point estimate, results from the correlation of the samples of those basic event probabilities that are based on the same parameter value distribution. This is the so-called state of knowledge correlation (Apostolakis and Kaplan, 1981). Several of the cut sets that are affected have point estimate frequencies in the 1.0E-8 range. The parameter values that contribute to these cut sets are generally based on generic estimates. The reason they contribute significantly to the difference is that the representation of the uncertainty on the parameters results in a large variance on the parameter value. This is in many respects somewhat arbitrary; for example, the choice of the lognormal distribution was based on accepted industry practice; the use of large error factors is a way of increasing the mean value with respect to a given median value [e.g., air-operated valves (AOVs)], but it also increases the variance. Thus, the difference between the point estimate and mean value is potentially exaggerated by the way in which the uncertainty characterization of parameter estimates was established.

On review of the cut sets, it did not appear that the overall characterization of the safety of the plant, in terms of the contributors and their relative importance, would be significantly altered by using the uncertainty analysis for the estimation of core damage frequency. Therefore, the point estimate results were used in the remainder of the analysis. In further support of this approach, it should be noted that the point estimate values chosen for the parameters were either realistic (when sufficient data were available) or conservative.

An event importance analysis was performed on the overall core damage model. In this analysis the relative importance of each basic event was calculated with respect to three different measures: Fussell-Vesely, risk reduction worth, and risk achievement worth. The results are shown in Table 1-2.

The Fussell-Vesely importance is a measure of the contribution of the given component to the overall core damage frequency by comparing the sum of cut sets in which that basic event occurs with the total sum of all cut sets. The risk reduction worth shows the reduction in the core damage frequency that would be achieved if the component were perfect or its failure probability were zero.

Three of the top four highest ranking events for risk reduction are the Loss of Offsite Power initiating event (IE-T1), the small LOCA initiating event (IE-S2), and the steam generator tube rupture event (IE-T7). (Note the complement events indicated by "C-xxx" and the 1EE-BAT-i-2HR Battery failure in 2 hours after SBO are not true events and should not be considered in the interpretation of results.) This is consistent with the core damage profile where T1 accounts for 29.2% of CDF (this includes the station blackout contribution), S2 accounts for 14.8% of CDF, and T7 accounts for 10.3% of CDF. In Table 1-2, the Fussell-Vesely importance values for these initiators are precisely these percentages. Having an initiating event group as the top risk reduction item indicates the risk from these initiators is spread over many components and involves several aspects of accident mitigation. Alternatively, it can be said that there are no single component improvements or changes that would have a dominant impact on accident mitigation for all these initiating events. The frequencies for the T1, S2, and T7 initiators are generic industry values as opposed to plant specific data. The S1 LOCA and T8 loss of Emergency Switchgear Room cooling initiating events are the fifth and sixth most important risk reduction events having F-V values of .098 and .097, respectively.

The most important component for risk reduction is the 1H Emergency Diesel Generator. This component is the most important single component. The seventh, eighth and eleventh events (or numbers 9, 13 and 17 in the listing) represent different fault modes of EDG 1H. As such, they can be combined to yield one F-V measure of unavailability for EDG 1H which is .23 (the sum of the three F-V values). This is due to 1) the relatively high fault probabilities for the EDG 1H compared to other components and 2) the higher Loss of Offsite Power (T1, T1A and T1Tr) and partial loss of switchyard feeder power (T9A and T9ATr) contribution to the total CDF (35% for all 5 events, T1, T1A, T1Tr, T9A and T9ATr).

The second most important component for risk reduction is the turbine driven Auxiliary Feedwater pump. The ninth, 16th, 24th and 46th events (or numbers 15, 23, 32 and 57 in the listing) represent different fault modes of the turbine driven Auxiliary Feedwater pump. As such they can be combined to yield one F-V measure for unavailability of the turbine driven pump. If the four values are added, the resultant F-V for the turbine driven AFW pump is .18. This is due to 1) the relatively high fault probabilities for the turbine driven pump compared to other components (high fault probabilities for turbine driven pump is typical) and 2) the increased reliance on the turbine driven Auxiliary Feedwater pump for initiators such as T9A, T9B, T5A, T5B, and T7, where one motor driven pump is unavailable due to the initiator, or in the case of T7, is aligned to the affected generator. Having the turbine driven pump as a significant component for risk reduction indicates the risk profile is dominated by loss of steam generator heat removal following the initiating event.

The third most important event and the most important operator action (number five in the listing) is failure of operator action to initiate High Head Safety Injection. This human action appears in T1 and T1A sequences involving loss of AFW and in several Hv transfer sequences (e.g., event trees T1Tr, T2Tr, T2ATr, etc.) involving restoration of Emergency Power before core damage, but where HHSI is required to prevent a RC Pump Seal LOCA. Although the human action to manually initiate HHSI is important, the split between Loss of Offsite Power and other transient initiators indicates that two human action models would be more appropriate, yielding the same combined importance but with an apportionment between the two transient types.

The next most important operator action is the 10th event (number 16 in the listing), recovery actions for loss of Unit 1 ESGR cooling using Unit 2 ESGR chilled air. Initiating events for transients with MFW available and large LOCA are listed next. The 20th listed event is failure of operator action to rapidly depressurize the Steam Generators during a medium break LOCA.

The event listed 22 represents unavailability of Emergency Diesel Generator 1J. It can be combined with events 25 and 41, which represent other failure modes of EDG 1J. Adding these three events together yields an overall F-V importance value of .13 for EDG 1J. This places it fifth in true ranking, behind the S2 initiator. The asymmetrical dependence between the 1J and 1H diesel is due to the greater dependence of ESGR cooling components upon the 1H bus (2 chillers) than on the 1J bus (1 chiller).

The events ranked in order of risk achievement worth are shown in Table 1-3. Risk achievement worth must be viewed with an understanding of how it is calculated. The risk achievement worth for an event represents the increase in core damage frequency if that event's probability is 1.0. This can be interpreted as guaranteeing that the failure will occur. The two top events for risk achievement are modeled to lead straight to core damage. These are Reactor Vessel rupture and Interfacing System LOCA initiating events. Also, they have very low probabilities in the base case CDF profile. Thus, if their probabilities are increased to 1.0, the resultant increase in CDF is very high.

The third most important event in risk achievement worth is mechanical binding of the control rods. This has a high risk achievement worth because, it leads directly to core damage when combined with any initiator and it has a very low probability in the base case.

The next event (#4) involves common cause failure of the Service Water Reservoir screens, which fails both Unit 1 ESGR cooling, and its recovery, Unit 2 ESGR cooling. It has a high risk achievement worth because it affects all of the Hv Transfer event trees. The next two events, 1QSMV--PG-1Q38, and 1SICKV-CC-838689, cause common mode failure of the HHSI and LHSI systems. The QS term is plugging of the manual isolation valve on the discharge of the RWST and the SI term is common cause failure of check valves 83, 86, and 89 which are located in the SI injection lines into the cold legs.

The next several events involve faults of a 4160 V or 480 V bus. Both 4160 V buses, the 480 V buses, and several MCC's are represented. These events appear in virtually all the sequences at lower frequencies. Note that the 1H buses characteristically have a higher risk achievement worth than comparable 1J buses, again due to the greater dependence of ESGR cooling components upon the 1H buses.

1.4.2 Core Damage Frequency from Internal Flooding

The core damage frequency from internal flooding is 3.6E-6/year which is approximately 5% of the overall core damage frequency. The dominant contribution is from service water floods in the Auxiliary Building.

It can be seen that the base case results show that core damage from internal flooding is not a vulnerability at North Anna. This is the result of identifying a number of minor modifications during the course of the study, as potential flooding vulnerabilities were identified. The required plant modifications included in the IPE model are as follows:

1. Back flow prevention devices are fitted in the charging pump cubicles' floor drains in order to prevent floods in the Auxiliary Building and Quench Spray Pump House spreading to the charging cubicles.

2. A flood barrier is erected in the pipe tunnel between the Quench Spray Pump House and the Auxiliary Building to prevent the spreading of floods from one to the other.

3. The Chiller Room doors are modified to prevent flooding of the Instrument Rack Room and Emergency Switchgear Room following a flood in the Chiller Room.

1.4.3 Containment Building Performance

The North Anna Containment Building structures and systems are robust with respect to the challenges presented by severe accidents. Because of the high assessed strength of the Containment structure, both early as well as late over-pressure failure of the Containment is very unlikely. The North Anna Containment Building is operated in a subatmospheric mode; consequently, the probability of loss of isolation is extremely remote since any significant preexisting leakage would be easily detected. The major threat of early, large radionuclide leakage at North Anna results from core damage Containment bypass sequences, particularly SGTRs. Figure 1-3 shows a breakdown of the predicted North Anna Containment Building performance for severe accidents. Table 1-4 compares the North Anna IPE, the Surry IPE and NUREG-1150 results. In general, the results from the three studies are quite similar. The differences that exist stem mostly from the difference in contributions from the different initiators. Section 7.2 discusses this in more detail.

1.4.4 Comparison of Results

The major purpose of this study, was to ensure that the PRA model was developed and understood by the Virginia Power staff and represented the as-built-and-as-operated condition of North Anna Units 1 and 2 at the time of the performance of the PRA. The guidance for performing the IPE indicated that heavy reliance could be placed on the results of the previous studies performed for similar plants. Therefore, the work performed for the Surry IPE was used as the starting point for the North Anna Analysis.

All the systems at North Anna were analyzed and new fault trees developed for each one. There are differences in the support system (electric power, cooling water) design which resulted in the identification of different initiating events. The results from the North Anna IPE are compared with the Surry IPE and the NRC PRA of Surry reported in NUREG/CR-4550.

1.4.4.1 Comparison of Core Damage Frequencies

The comparison of core damage frequencies is shown in Table 1-5. It can be seen that the results for Surry (Virginia Power, 1991a) and North Anna IPEs are very similar and somewhat higher than those from the NRC study of Surry. However, investigations of the design requirement for room cooling, the capability of removing heat from the Containment Building, and the requirements for RHR following an SGTR resulted in the introduction of new sequences associated with loss of Emergency Switchgear Room cooling, consequential loss of ESGR cooling after other initiators, loss of Containment heat removal (Surry only), and a revised frequency for core damage sequences following an SGTR.

Whereas in the NUREG/CR-4550 study the LOOP leading to station blackout was the dominant contributor to core damage, it can now be seen from Figure 1-2 that, although loss of offsite power is still a high contributor, LOCA, SGTR, and transients are all significant contributors. It should be noted that the increase in the loss of feedwater initiating event contribution to core damage frequency is entirely due to the dependency on Emergency Switchgear Room cooling and not on poor performance of the front-line decay heat removal systems.

The relative reduction in the station blackout core damage frequency from NUREG/CR-4550 is the result of three changes. First, the IPEs credited successful Turbine-Driven Auxiliary Feedwater Pump (AFWP) operation after battery depletion. Thus, although the battery depletion time was similar to that in NUREG/CR-4550, AFW was potentially available until Emergency Condensate Storage Tank (ECST) depletion. An extension of the time to core uncovery is probable for the case in which the AFW pumps are running at the time of battery depletion. (Operators have indicated that they are not instructed by procedure to trip the pumps at that time and, thus, that they would not do so.) Second, the RC Pump seal LOCA model used for the IPE predicted an average core uncovery time due to seal failure of about 9 hours, rather than the 3.5 hours used in NUREG/CR-4550. The IPE seal LOCA model is based on Westinghouse seal performance analysis. Third, the common-cause failure probabilities for diesel generators was lower than that used in the NUREG. A rigorous analysis of industry data was performed to generate as realistic a value as possible for the potential for common-cause failures of the diesel generators.

Finally, the ATWS sequence frequencies are somewhat lower as the result of more accurate analysis of the pressure relief requirements at the various stages of core burnup. Although the results for North Anna and Surry are approximately the same there are differences in the design which individually would have been expected to give different results for the two stations. The joint Westinghouse Owners Group/Westinghouse program for the ATWS rule administration described in WCAP-11992 (Westinghouse, 1988) identified a more rigorous method for determining the probabilities of core damage based on evaluating the pressure relief requirement during core burnup, following an anticipated trip without scram. It also discussed the impact of fitting the AMSAC modification. The AMSAC modification has been installed at North Anna but was not installed at Surry at the time of the IPE. The calculated unfavorable exposure time (UET) for North Anna, Unit 1 was 27.7% compared with zero for Surry. The most likely reason for the higher UET is a combination of the higher nominal inlet temperatures at hot full power at North Anna and larger power defects from the higher power North Anna cores. Thus the reduction in core damage frequency from the fitting of the AMSAC modifications is offset by an increase due to the unfavorable exposure time, when the pressure relief is inadequate.

1.4.4.2 Fission Product Release

There are several factors that would tend to produce small releases at North Anna: the Containment Building is strong; there is a high degree of redundancy in the sprays; as the plant is subatmospheric, there is a very low probability of its being in a non-isolated state; and the piping arrangement in the Safeguards Building is such that most interfacing LOCAs (V) will vent releases under water. The cavity is not connected to the sump directly at floor level but rather through a somewhat elevated vent path. This means that it is difficult to get water into the cavity other than by operation of the Quench/Recirculation Sprays or in vessel injection (following reactor vessel failure). This has advantages and disadvantages; a wet cavity means debris cooling, but it also can impose a large heat load on the Containment.

The sprays play several roles, all of which are important with regard to source terms: they can "wash out" airborne radionuclides in the Containment, they provide the major pathway for the introduction of water into the cavity and onto the debris, and they are the vehicle for Containment heat removal.

The MAAP-derived release fractions (calculated for 11 of the 24 source term categories) confirm what is already known from other work (NUREG-1150, for example) the Containment Building bypass sequences (interfacing LOCA [V] and SGTR) have the greatest release potential. This is because of the relative scarcity of mitigating features in the release pathways. Following a SGTR, the Steam Generator with the broken tube is likely to be dry when core damage and fission product release occurs. The SGTR sequence is also significant on a frequency basis (see Section 4.7.4).

The calculated release fractions generally agree in magnitude with values reported for NUREG-0956 and NUREG-1150. A comparison of the IPE values and those reported in NUREG-1150 is shown in Figures 1-4 and 1-5. Sensitivity studies demonstrated that the sprays are important in minimizing releases and that different modeling assumptions regarding tellurium release from the fuel can affect its release fraction significantly. While no direct analyses of uncertainty were performed, the extensive NUREG-1150 work has indicated that in most cases two orders of magnitude is not unreasonable uncertainty for many of the release fractions for any given source term category (STC).

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NRC (U.S. Nuclear Regulatory Commission), Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants. NUREG-1150, Volume 1, Washington, D.C., 1989b.

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TABLE 1-1
ACCIDENT GROUPING BY INITIATING EVENT CLASS

Initiating Event Type	Point Estimate Frequency (per year)	Percentage of Total
Internal Events:		
LOCA (A, S1, S2, RX)	2.1E-5	31
Loss of Offsite Power (T1, T1A, T1TR)	2.0E-5	29
Transient (T2, T2A, T3, T4, T5A T5B, T6, T8, T9A, T9B, T2TR, T2ATR, T3TR, T9ATR, T9BTR)	1.8E-5	27
Steam Generator Tube Rupture (T7)	7.0E-6	10
Interfacing System LOCA (VX)	1.6E-6	2
ATWS (TH, TL)	4.2E-7	1
Total Internal Events	6.8E-5	100
Internal Flooding:		
Auxiliary Building	2.6E-6	72
Air Conditioning Chiller Room	9.7E-7	27
Turbine Building	0	0
Total Internal Flooding	3.6E-6	100
Combined CDF:		
Total Internal Events	6.8E-5	95
Total Internal Flooding	3.6E-6	5
	7.1E-5	100

TABLE 1-5
OVERALL COMPARISON OF RESULTS OF THE NORTH ANNA IPE WITH THE SURRY IPE AND NUREG/CR-4550 (SURRY) RESULTS

Initiating Event[2]	North Anna IPE	Surry IPE	Surry[1] NUREG/CR -4550
	Core Damage Frequency		
Loss of Coolant Accident			
Small LOCA	1.0E-5	1.1E-5	1.1E-6
Medium LOCA	6.6E-6	5.3E-6	3.1E-6
Large LOCA	4.1E-6	4.6E-6	2.0E-6
Interfacing System LOCA	1.6E-6	1.6E-6	1.2E-6
Loss of Offsite Power			
Loss of Offsite Power	1.2E-5	7.1E-6	<1.5E-7
Station Blackout	8.0E-6	8.1E-6	2.1E-5
Transients			
Loss of ESGR Cooling	6.6E-6	1.8E-5	N/A
Other Transients	6.1E-6	4.8E-6	N/A
Loss of 4160 V Bus 1H	3.7E-6	-	N/A
Loss of Feedwater	1.0E-6	4.7E-7	1.7E-6
Loss of 4160 V Bus 1J	6.5E-7	-	N/A
Loss of DC Bus 1-I	1.1E-7	6.8E-7	1.4E-7
Loss of DC Bus 1-III	1.1E-7	6.8E-7	1.4E-7
Steam Generator Tube Rupture	7.0E-6	1.0E-5	1.9E-6
ATWS	4.2E-7	3.2E-7	1.4E-6
Total of Internal Events	6.8E-5	7.4E-5	3.4E-5
Internal Flooding	3.6E-6	5.1E-5	-

NOTE 1: From NUREG/CR-4550 Vol. 3 Rev. 1 Table 4.10-5.

NOTE 2: For North Anna, Hv transfer event tree (namely, consequential loss and coincidential loss of ESGR cooling) contributions to core damage frequency have been summed with those of the parent tree for comparison to Surry.

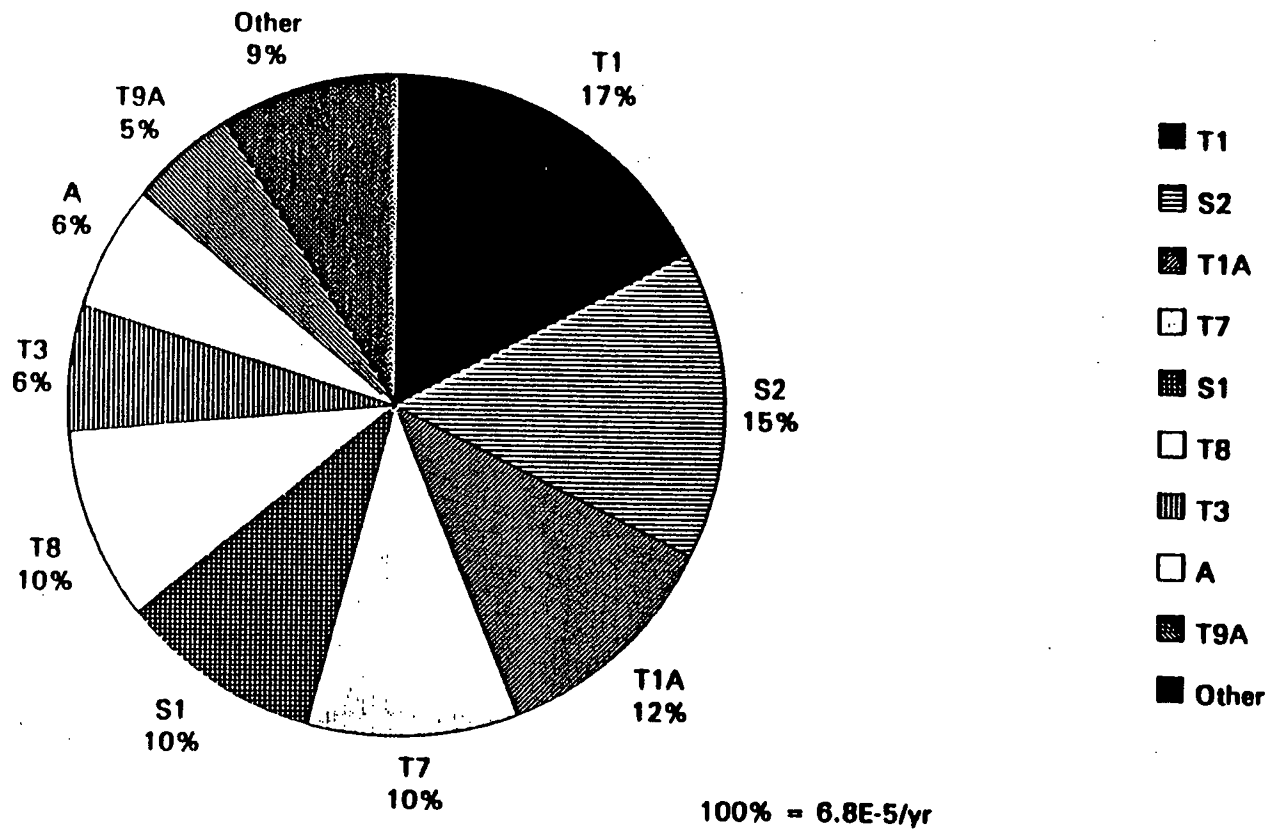


Figure 1-1
Contribution of Initiators to Core Damage Frequency

FUNCTIONAL FAILURE SUMMARY INFORMATION FROM NORTH ANNA IPE

The next several events involve faults of a 4160 V or 480 V bus. Both 4160 V buses, the 480 V buses, and several MCC's are represented. These events appear in virtually all the sequences at lower frequencies. Note that the 1H buses characteristically have a higher risk achievement worth than comparable 1J buses, again due to the greater dependence of ESGR cooling components upon the 1H buses.

3.4.1.2 Functional Failures Leading to Core Damage

In order to evaluate the relative contribution of the failure of various systems or functions, other than the initiating events, to the overall core damage frequency it is possible to group the core damage sequences by functional failure. The percentage contribution for the following functional failures are shown in Table 3.4.1-8.

- Failure of Emergency Switchgear Room cooling (T8, Hv)
- High Head/Low Head Recirculation (H1, H2)
- Recovery of offsite power (B)
- Auxiliary Feedwater (L, Lt)
- RC Pump Seal LOCA (T4, Slc)
- Operator cooldown and depressurization (O, Y)
- Failure of Safety Injection (D1, D2, D3)
- Failure of Bleed and Feed (P)

The sum of these events is greater than 100% as a number of the sequences contribute to more than one category of functional failure. For example some sequences consist of failure of Auxiliary Feedwater and failure of feed and bleed.

Failure of Safety Injection (HHSI-D1, Accumulators-D2 or LHSI-D3) contributes 42% to the core damage frequency and is dominated by D1. These sequences fall into three major groups: 1) failure of required injection during a LOCA (e.g., S2D1D3, S1D1Y or AD2), 2) failure during transient after AFW (L) fault (e.g., T1LD1 or T2LD1), and 3) failure in Hv Transfer event (e.g. T1Tr) following failure of operator cooldown (O) but following recovery of ESGR cooling (e.g., T1TrOD1, T3TrOD1 and T2ATrOD1).

Failure of operator cooldown and depressurization contributes 36% and involves three basic groups. For medium and small LOCAs and SGTR, when HHSI (D1) is available, O represents normal operator cooldown. If HHSI is not available, Y represents operator cooldown without HHSI. In these cases, failure to cooldown will prevent the use of Low Head Safety Injection pumps to maintain Reactor Coolant System inventory. Finally, for events with imminent loss of emergency power (T6, T8, and the initiators with consequential loss of ESGR cooling sequences, T1Hv, T2Hv, etc.), operator cooldown O is needed to avoid RC pump seal LOCA since RC pump seal cooling will also be lost with loss of emergency power.

Loss of Emergency Switchgear Room cooling contributes to 34% of the core damage frequency, through the T8 initiator and through the consequential loss and coincidental loss of ESGR cooling for several initiators. These latter events are the initial event in the T1Tr, T2Tr, T2ATr, T3Tr, T9ATr and T9BTr event trees. Since loss of ESGR cooling results in a loss of emergency power, core damage will occur through an RC pump seal LOCA if there is no cooldown, or through loss of core heat removal capability when the turbine driven AFW pump eventually fails (including SG overfill).

Sequences involving loss of Auxiliary Feedwater contribute 24% to the overall core damage frequency. One of the reasons for this is that six of the top seven initiating events require the operation of Auxiliary Feedwater following the initiator.

Failure of recirculation contributes 13% and failure of bleed and feed following loss of Auxiliary Feedwater contributes 1%.

As station blackout is only a 10% contributor to the overall core damage frequency, failure to recover offsite power only contributes 10%. The contribution from seal LOCAs is less than 1%.

3.4.1.3 Dominant Accident Sequences

The top 22 dominant accident sequences (core damage frequency greater than 1.0E-6/yr) are discussed in detail in this section. A complete list of the sequences and a list of the dominant cut sets for those sequences with frequency greater than 1.0E-7/yr are given in Appendix B. The sequences discussed in this section contribute approximately 75% of the core damage frequency and the sequences in the Appendix with frequency greater than 1.0E-7/yr contribute 96% of the core damage frequency.

Sequence S2D1D3

Frequency: 5.15E-6 Contribution: 7.6%

This sequence is initiated by a small break LOCA. The high head safety injection system fails to provide coolant make-up to the reactor. As blowdown through the break continues, the subcooling decreases and the core starts to heatup and eventually uncover. When the core outlet thermocouples reach 1200F, the operators are directed into functional restoration procedure 1-FR-C.1, which will direct the operators to perform core cooling recovery. In this sequence, the LHSI pumps fail to provide adequate flow to re-establish core cooling. All containment systems function during the core damage process, resulting in plant damage state #21. Dominant contributors to this sequence involve plugging of the RWST discharge isolation valve (1QSMV--PG-10S38) and common cause failure of the check valves on the cold legs SI injection lines

TABLE 3.4.1-8
CONTRIBUTION TO CORE DAMAGE FREQUENCY OF FUNCTIONAL FAILURES

Function	Contribution to CDF
Failure of Injection (D1,D2,D3)	42%
Failure to Cooldown and Depressurize (O,Y)	36%
Failure of Emergency Switchgear Room Cooling (T8,HV)	34%
Failure of Auxiliary Feedwater (L,Lt)	24%
Failure of Recirculation (H1,H2)	13%
Failure to Recover Offsite Power (B)	12%
Failure of Feed and Bleed (P)	1%
Seal LOCA (T4,Slc)	<1

INITIATING EVENT LIST FROM NORTH ANNA IPE

TABLE 3.1.2-1
LIST OF INITIATING EVENT CLASSES

INITIATING EVENT GROUP	DESCRIPTIONS	EVENT TREE
T1	Loss of Offsite Power	T1
T1A**	Station Blackout	T1A
T2	Transients with non-recoverable loss of Main Feedwater	T*
T2A	Transients with recoverable loss of Main Feedwater following FW Isolation	T*
T3	Transients with Main Feedwater initially available	T*
T4	Loss of RCP Seal Injection and Thermal Barrier Cooling	T4
T5A	Non-recoverable Loss of DC Bus 1-I	T*
T5B	Non-recoverable loss of DC Bus 1-III	T*
T6	Loss of Service Water	T6
T7	Steam Generator Tube Rupture	T7
T8	Loss Emergency Switchgear Room Cooling	T8
T9A	Loss of 4160 V Emergency Bus 1H	T*
T9B	Loss of 4160 V Emergency Bus 1J	T*

TABLE 3.1.2-1 (Continued)
LIST OF INITIATING EVENT CLASSES

INITIATING EVENT GROUP	DESCRIPTIONS	EVENT TREE
A	Large LOCA 6" - 20"	A
S1	Medium LOCA 2" - 6"	S1
S2	Small LOCA 3/8" - 2"	S2
V	Interfacing System LOCA	Vx
R	Reactor Vessel Rupture	Rx
TL	Transient with failure to Scram at Power < 40 percent	TL
TH	Transient with failure to Scram at Power > 40 percent	TH

* These event trees are discussed in one section of the report, as they are very similar.

** T1A is not a true initiating event, but is a consequential event from T1.

SUCCESS CRITERIA TABLES
FROM NORTH ANNA IPE

TABLE 3.1.1-15
TRANSIENT SUCCESS CRITERIA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS (Integrity)	Containment Condition
RPS Scram with < 2 rod failure to insert[a]	RCS - Natural Circ.		1/3 MFW pumps[b,f] OR 1/3 AFW pumps to 1/3 SGs[c]	RCS PORV Closure Note 1	Not Required
RPS Scram	1/3 Charging Pumps AND 1 RCS PORV (Feed & Bleed)[e]	Recirc. through 1/3 charging pumps - AND 1/2 Lo Head SI Pumps[d] (Note 3)	Not Required	Note 2	Recirculation through 1/2 IRS OR 1/2 ORS[e]

Notes:

1. Failure of RCS Integrity by failure of RCS PORV to close transfers to S2 event tree.

2. Feed & Bleed operation fails RCS Integrity through continued RCS PORV use.

3. For Transients, RCS depressurization before recirculation is not certain, so only high head safety recirculation is modeled. Also, ORS can be manually aligned to act as a backup for Lo Head Recirc for NAPS Unit 1.

References:

a. WCAP-9691 p. A-11
b. WCAP-9691 p. A-12
c. WCAP-9691 p. A-15
d. WCAP-9744
e. Surry Analysis File 321MAF.1
f. NAPS UFSAR

TABLE 3.1.1-16
LARGE LOCA SUCCESS CRITERIA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
No Automatic Scram Required But Borated Water Injection Required for Long-Term Subcriticality	1/2 Low (a) Head SI Pumps AND 2/3 Accumu-lators	1/2 Low (a) Head SI Pumps In Low Pressure Recirculation Mode AND Changeover to hot leg Recirculation (d)	Not Required	Lost as Result of Initiator	1/2 Quench Spray(b) AND 1/2 Inside Recirc Spray OR 1/2 Outside Recirc Spray(c)

References:
(a) North Anna UFSAR
(b) North Anna Analysis File 321MAF.N.1
(c) MAAP analysis
(d) ORS can be manually aligned to act as a backup for Lo Head Recirc for NAPS Unit 1.

TABLE 3.1.1-17
MEDIUM LOCA SUCCESS CRITERIA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
RPS	1/3 Charging Pumps AND 2/3 Accumulators(a)	1/2 Charging Pumps AND 1/2 Low Head SI Pumps in Recirculation Mode(e)	Not Required	Lost as Result of Initiator	1/2 Outside Recirc Spray OR 1/2 Inside Recirc Spray(c)
RPS	1/3 Charging Pumps	1/3 Charging Pumps AND 1/2 Low Head Safety Injection Pumps in Recirculation Mode(e)	1 AFW Pump to 1/3 SG(f)	Same	Same
RPS	3/3 Accumulators AND 1/2 Low Head SI Pumps(b)	1/2 Low Head SI Pumps In Recirculation Mode (e)	Steam Dump Through 2 SG AOVs with 2 AFW Pumps(d)	Same	Same

References:
(a) WCAP-9601
(b) WCAP-9754
(c) North Anna Analysis File 321MAF.N.1
(d) The AFW arrangement at NAPS requires two steam dump valves and two AFW pumps for success.
(e) ORS can be manually aligned to act as a backup for Lo Head Recirc for NAPS Unit 1.
(f) Beynon, 1988

TABLE 3.1.1-18
SMALL LOCA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
RPS	1/3 Charging Pumps(a)	1/3 Charg- Pumps AND 1/2 Low Head SI Pumps In Recircu- lation Mode(f)	1/3 AFW pumps to 1/3 SG	Lost as Result of Initiator	1/2 Outside Recirc Spray OR 1/2 Inside Recirc Spray(d)
RPS	1/3 Charg- ing Pumps AND 1 RCS PORV(d)	Same	Not Required	Same	Same
RPS	3/3 Accumu- lators AND 1/2 Low Head SI Pumps(c)	1/2 Low Head SI Pumps in Recircu- lation(f)	Steam Dump Through 2 SG ADVs with 2 AFW Pumps(e)	Same	Same

References:
(a) WCAP-9601
(b) WCAP-9744
(c) WCAP-9754
(d) North Anna Analysis File 321MAF.N.1
(e) The AFW arrangement at NAPS requires two steam dump valves and two AFW pumps for success.
(f) ORS can be manually aligned to act as a backup for Lo Head Recirc for NAPS Unit 1.
(g) For very small breaks no Containment heat removal is required.

TABLE 3.1.1-19
SUCCESS CRITERIA FOR ATWS

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
Reactor Power < 40% (a)					
Manual Rod Insertion OR Deenergize MG Set OR Emergency Boration	RCS	RCS	1 of 3 Aux. Feedwater, OR 1 Main Feedwater Pump	RCS PORV Reclosure	None
Reactor Power > 40% (a) Feedwater Available (1 of 2 Trains)					
Manual Rod Insertion OR Deenergize MG SET OR Emergency Boration	Same		Main Feedwater Continued Operation	RCS PORV Reclosure	None

TABLE 3.1.1-19 (Continued)
SUCCESS CRITERIA FOR ATWS

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
Reactor Power > 40%(a) Feedwater Not Available					
Manual Rod Insertion OR Deenergize MG Set OR Emergency Boration	Same		2 Aux. Feed Pumps to 2 SG(c)	AMSAC(b) AND Adequate Pressure Relief with Subsequent Valve Reclosure	None

References:
(a) WCAP-11993
(b) NAPS UFSAR

TABLE 3.1.1-20
STEAM GENERATOR TUBE RUPTURE SUCCESS CRITERIA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
RPS	RCS Natural Circulation, (a,f)		1/3 AFW pumps to 1/2 SG	Achieved by cooldown and depress. & isolation of affected SG	Not Required
RPS	1/3 Charging Pumps	1/2 RHR(g) Pumps	1/3 AFW pumps to 1/2 SG	Containment bypassed (core intact)	Same
RPS	1/3 Charging Pumps AND 1 RCS PORV(d)	Recirc.(f) through 1/3 Charging Pumps AND 1/2 Lo Head SI Pumps(h)	Not Required	Lost as a result of induced LOCA	1/2 Outside Recirc Spray OR 1/2 Inside Recirc Spray

TABLE 3.1.1-20 (Continued)
STEAM GENERATOR TUBE RUPTURE SUCCESS CRITERIA

Reactivity Control	Core Heat Removal Early	Core Heat Removal Late	Secondary Heat Removal	RCS Integrity	Containment Condition
RPS	3/3 Accumulators AND 1/2 Low Head SI Pumps(c)	1/2 RHR Pumps	Steam Dump Through 2 SG ADV with 2 AFW Pump(e)	Containment bypassed (core intact)	Not Required

References:
(a) North Anna Analysis File 321MAF.N.1
(b) WCAP-9744
(c) WCAP-9754
(d) North Anna Analysis File 321MAF.N.1
(e) The AFW arrangement at NAPS requires two steam dump valves and two AFW pumps for success.
(f) With Successful Faulted SG Isolation and No Stuck Open Safety Relief Valve
(g) With failure of Faulted SG Isolation and/or Stuck Open Safety Relief Valve
(h) ORS can be manually aligned to act as a backup for Lo Head Recirc for NAPS Unit 1.

EVENT TREE INFORMATION
FROM NORTH ANNA IPE

TABLE 3.1.2-2
EVENT TREE HEADINGS

Abbreviation	Headings	Description of Event
A	Large LOCA	Initiating Event-large LOCA
B	Offsite Power Recovery	Failure to recover an ESF bus following station black-out by recovering offsite power.
Ch	Containment Heat Removal	Failure of Service Water to an operable Recirculation Spray heat exchanger.
DG	EDG 1H or 1J Available	Failure of at least one diesel generator to start and run following loss of offsite power leading to station blackout.
Dh	Hot Leg Recirculation	Failure of the operator to switch to hot leg recirculation following a large LOCA.
D1	High Pressure Injection	Failure of Charging Pumps to inject in the appropriate mode.
D2	Accumulators Inject	Failure of Accumulators to inject in the appropriate mode.
D3	Low Head SI	Failure of low head SI pumps to inject.
D4	Emergency Boration	Failure to shutdown following ATWS by boron addition.
Fm	Break Size Partition	Percentage of small breaks not causing a CDA Hi Hi signal.
Hv	ESGR Cooling	Failure to provide HVAC to the ESGR using 1/2 AHUs and 1/3 chillers.
H1	Low Head Recirculation	Failure of low head pumps in the recirculation mode.

TABLE 3.1.2-2 (Continued)
EVENT TREE HEADINGS

Abbreviation	Headings	Description of Event
H2	High Head Recirculation	Failure of low head and charging pumps in the high pressure recirculation mode.
K	Reactor Subcritical	Failure of control rods to insert as result of Reactor Protection System failure.
L	Auxiliary Feedwater System Available	Failure of Auxiliary Feedwater System for transients or small or medium LOCAs with reactor trip.
Lt	Turbine-Driven AFW available	Failure of the Turbine-Driven Auxiliary Feedwater Pump to start and run following station blackout.
M	Main Feedwater System Available	Failure of Main Feedwater.
MS1	Manual Scram	Failure of the operator to remove power from the control rod drive mechanisms.
O	Cooldown and Depressurize	Operator fails to cooldown and depressurize the reactor after a small break or in response to a loss of RCP seal cooling.
O2	Late Cooldown	Failure of operator to cooldown and depressurize in response to a ruptured steam generator.
P	Pressurizer PORVs	Failure of the operator to open 1/2 pressurizer PORVs to cause RCS feed and bleed.
Pr	Pressure Relief	Failure of adequate pressure relief following an ATWS event.

TABLE 3.1.2-2 (Continued)
EVENT TREE HEADINGS

Abbreviation	Headings	Description of Event
Q	RCS Boundary Intact	Failure of pressurizer PORV to close after opening during a transient.
Qs	Quench Spray	Failure of 1/2 trains of Quench Spray.
Rc	Room Cooling Restored	Recovery of ESGR cooling or SW (resulting in reactor trip and loss of emergency power) prior to core uncovery and vessel failure, or containment failure.
Rs	Recirculation Sprays Operable	Failure of at least one train of Recirculation Sprays to remove heat from Containment.
Rv	Reactor Vessel Integrity	Consideration of PTS following a rapid RCS cooldown.
RX	Reactor Vessel Rupture	Initiating event is a Reactor Vessel rupture.
SGI	Steam Generator Isolation	Failure to isolate the ruptured Steam Generator.
Slc	No Potential for RCP Seal Failure	Failure to establish seal cooling from operable Unit 2 CC pumps.
S1	Medium LOCA	Initiating event is a medium LOCA (2" to 6").
S2	Small LOCA	Initiating event is a small LOCA (3/8" to 2").
T	Transients	Representative initiating event for general transient event tree.
Tt	Turbine Trip	Turbine fails to trip.

TABLE 3.1.2-2 (Continued)
EVENT TREE HEADINGS

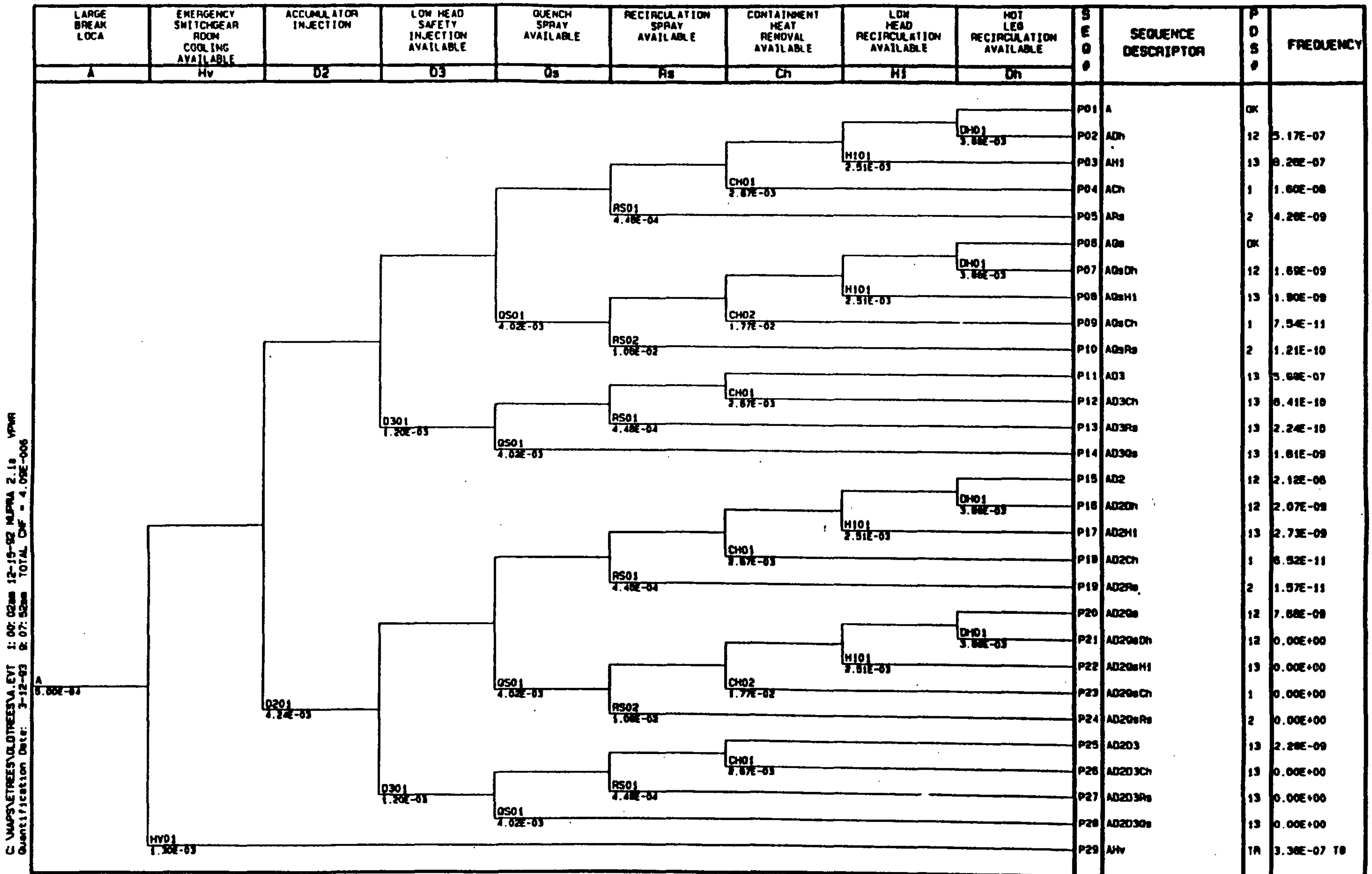
Abbreviation	Headings	Description of Event
T1	Loss of Offsite Power	Initiating event is Loss of of all Offsite Power.
T1A	Station Blackout	Loss of diesel generators 1H and 1J leading to station blackout at Unit 1.
T1Tr	Loss of ESGR Cooling Transfer from T1 Event Tree	Transfer of T1Hv sequence, Loss of Offsite Power with consequential loss of Emergency Switchgear Room Cooling.
T2	Loss of MFW	Initiating event is non-recoverable loss of Main Feed-water.
T2A	Recoverable Loss of MFW	Initiating event is recoverable loss of Main Feedwater following Feedwater isolation.
T2ATr	Loss of ESGR Cooling Transfer from T2A Event Tree	Transfer of T2AHv sequence, recoverable loss of Main Feedwater with coincidental loss of Emergency Switchgear Room Cooling.
T2Tr	Loss of ESGR Cooling Transfer from T2 Event Tree	Transfer of T2Hv sequence, non-recoverable loss of Main Feedwater with coincidental loss of Emergency Switchgear Room Cooling.
T3	Transient with MFW Available	Initiating event is Transient with Main Feedwater available.
T3Tr	Loss of ESGR Cooling Transfer from T3 Event Tree	Transfer of T3Hv sequence, transient with Main Feedwater available, with coincidental loss of Emergency Switchgear Room Cooling.
T4	Loss of RC Pump Seal Cooling	Initiating event is loss of RCP seal injection and thermal barrier cooling.

TABLE 3.1.2-2 (Continued)
EVENT TREE HEADINGS

Abbreviation	Headings	Description of Event
T5A	Loss of DC Bus I	Initiating event is loss of DC Bus 1-I.
T5B	Loss of DC Bus III	Initiating event is loss of DC Bus 1-III.
T6	Loss of Service Water	Service Water is lost from both the reservoir and Lake Anna.
T7	Steam Generator Tube Rupture	Initiating event is a steam generator tube rupture.
T8	Loss of Emergency Switch-gear Room Cooling	Loss of HVAC to the Emergency Switchgear Room.
T9A	Loss of Power from 4160 V Emergency Bus 1H	Loss of feeder power to or failure of 4160 V emergency bus 1H.
T9ATr	Loss of ESGR Cooling Transfer from T9A Event Tree	Transfer of T9AHv sequence, loss of feeder power to or failure of 4160 V Emergency Bus 1H, with consequential loss of Emergency Switchgear Room Cooling.
T9B	Loss of Power from 4160 V Emergency Bus 1J	Loss of feeder power to or failure of 4160V emergency bus 1J.
T9BTr	Loss of ESGR Cooling Transfer from T9B Event Tree	Transfer of T9BHv sequence, loss of feeder power to or failure of 4160 V Emergency Bus 1J, with consequential loss of Emergency Switchgear Room Cooling.
TL	Low power transients (for ATWS)	Initiating event is all transients at power lower than or equal to 40 percent.
TH	High power transients (for ATWS)	Initiating event is all transients at power greater than or equal to 40 percent.

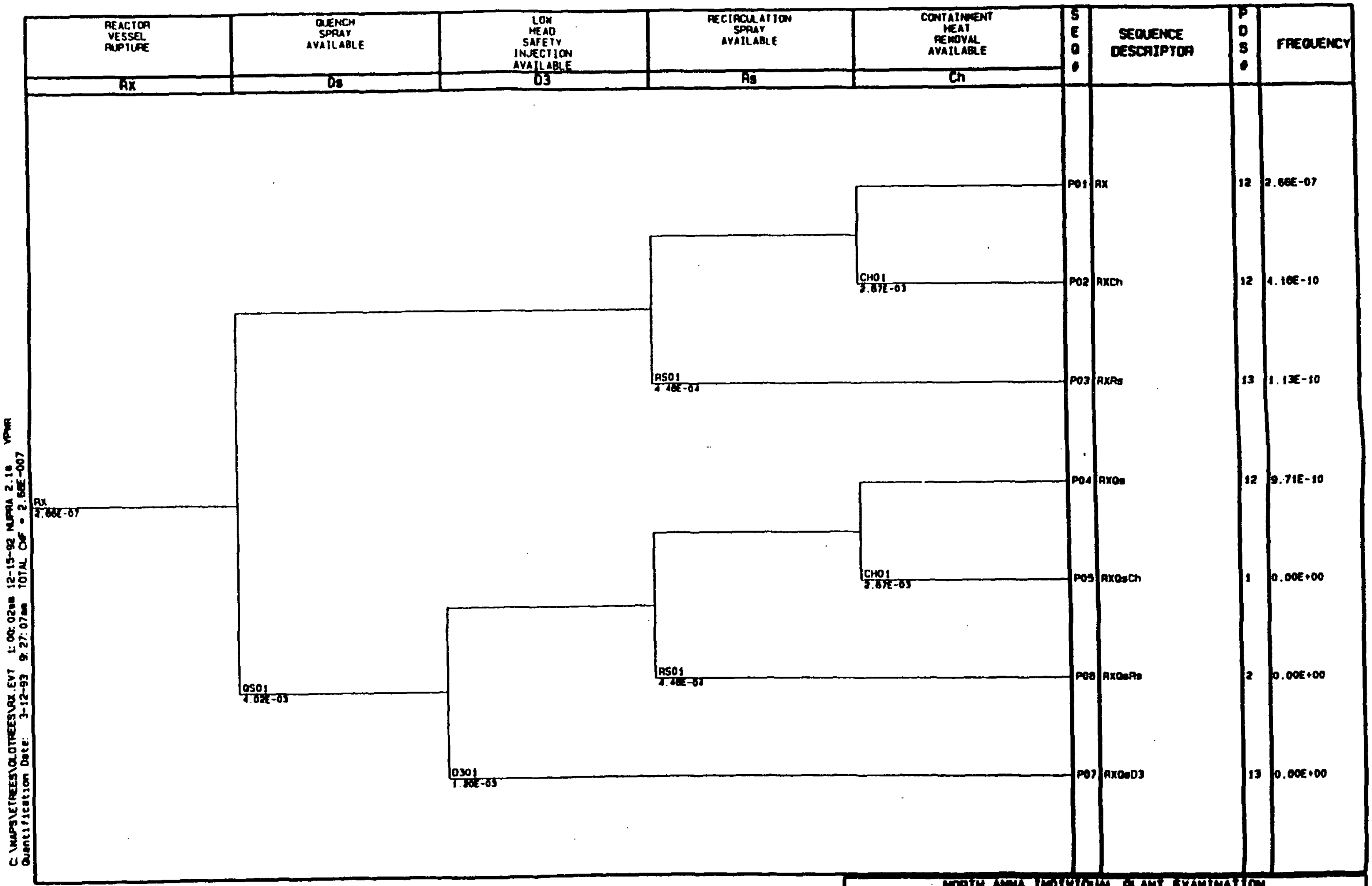
TABLE 3.1.2-2 (Continued)
EVENT TREE HEADINGS

Abbreviation	Headings	Description of Event
VX	Interfacing System LOCA	Initiating event is an Interfacing System LOCA.
Vi	Isolation of LOCA	Failure to isolate interfacing LOCA.
W	RHR Cooling	Failure of 1/2 Residual Heat Removal Trains.
Y	Core Cooling Recovery	Failure of the operator to use steam to rapidly cooldown and depressurize the RCS as directed by 1-FR-C.1 or C.2.



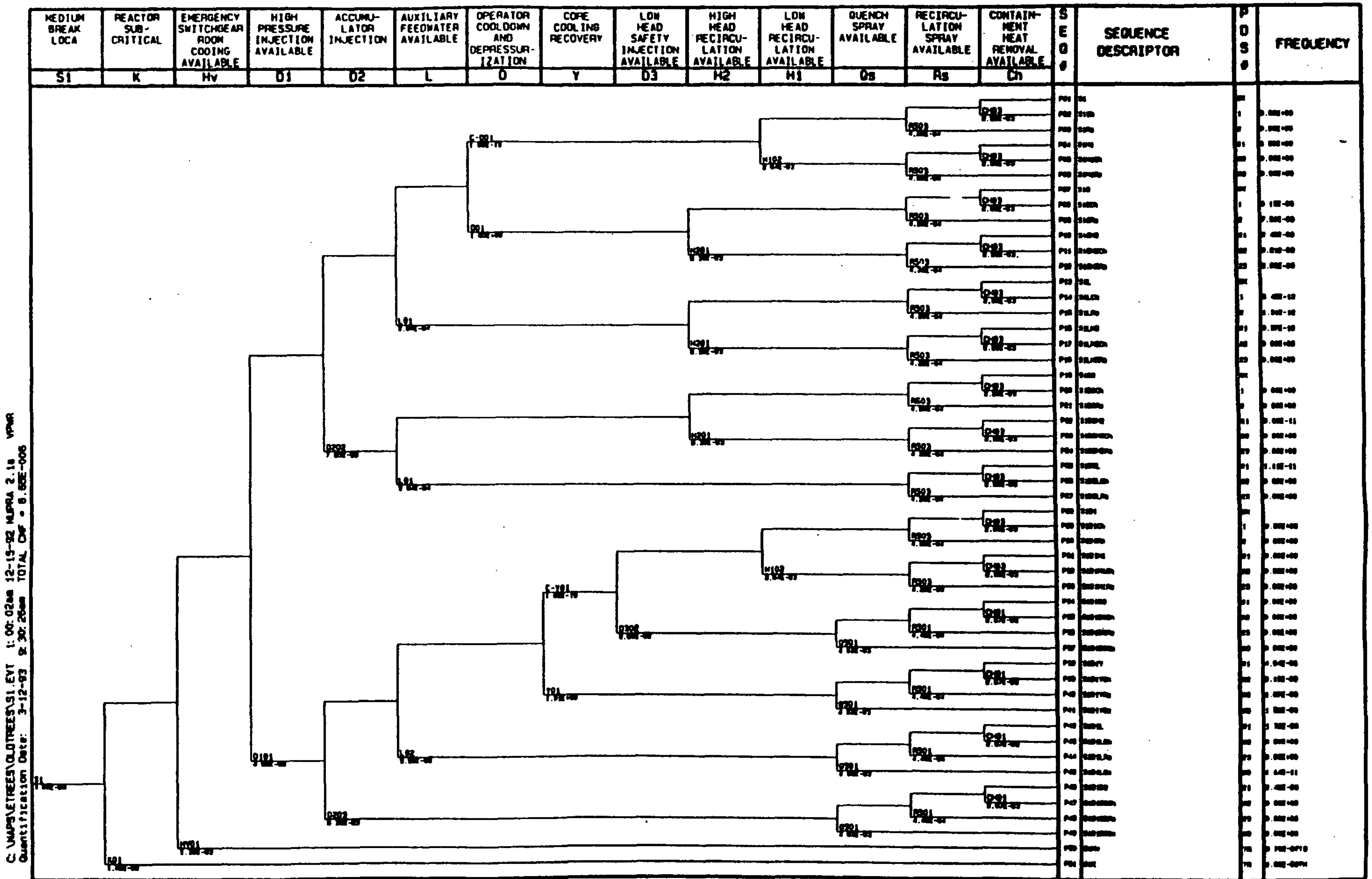
NORTH ANNA INDIVIDUAL PLANT EXAMINATION

A: LARGE BREAK LOSS OF COOLANT ACCIDENT EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

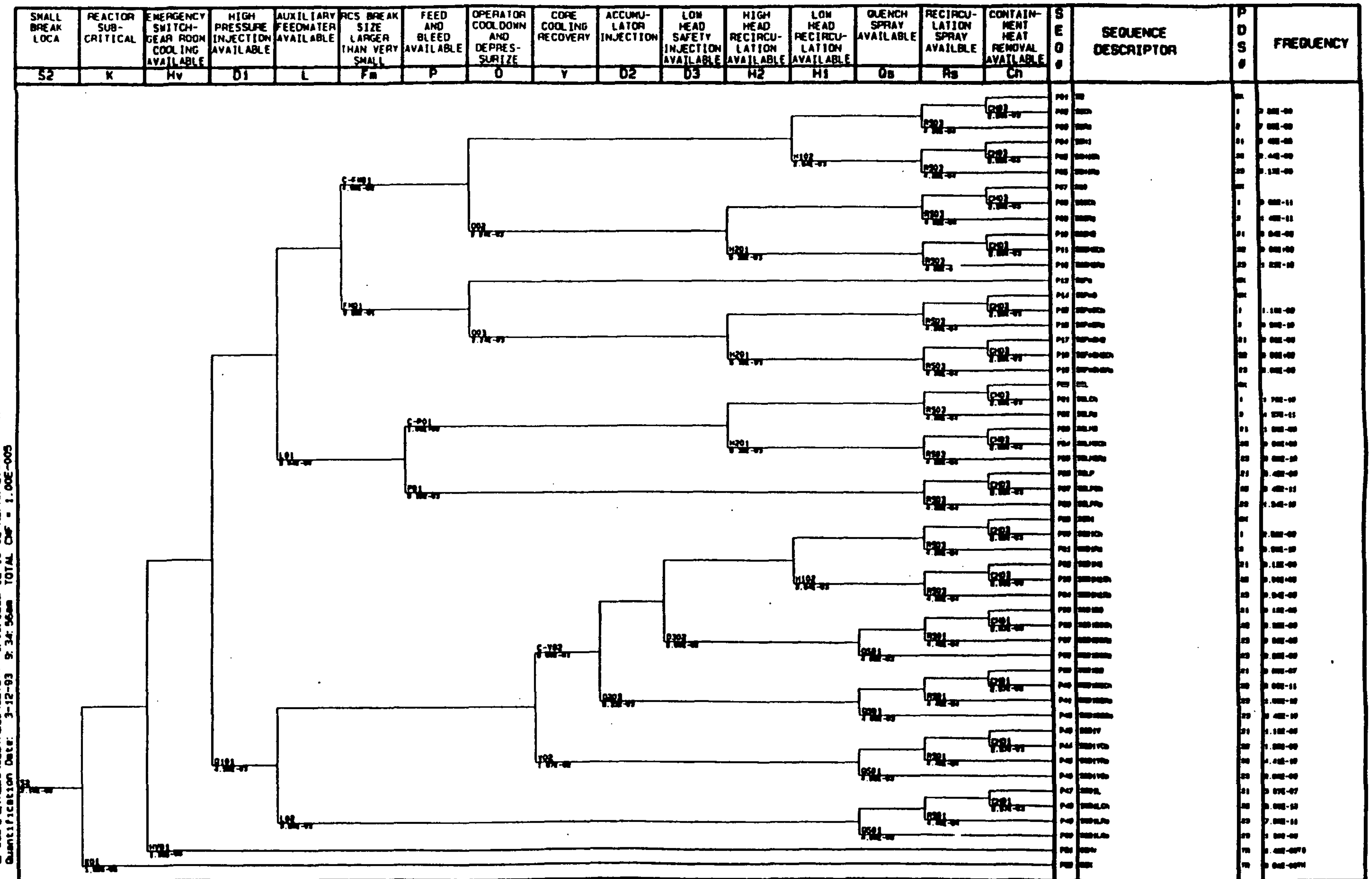
RX: REACTOR VESSEL RUPTURE EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

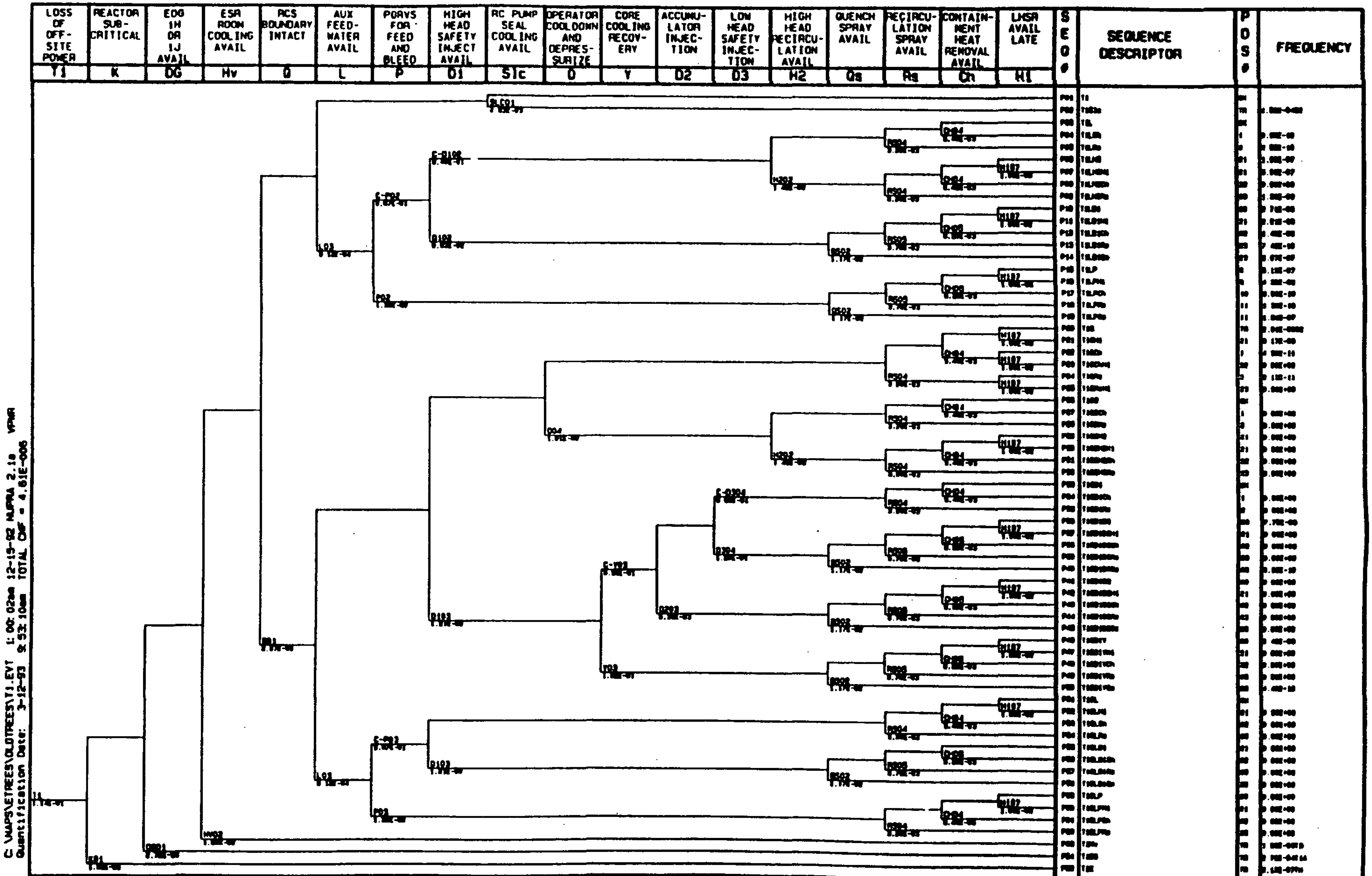
S1: MEDIUM BREAK LOSS OF COOLANT ACCIDENT EVENT TREE

C:\NAPS\ETREES\OLDTREES\S2.EVT 1:00:02am 12-15-92 NUPRA 2.1e VPWR
Quantification Date: 3-12-93 9:34:56am TOTAL CMF = 1.00E-005



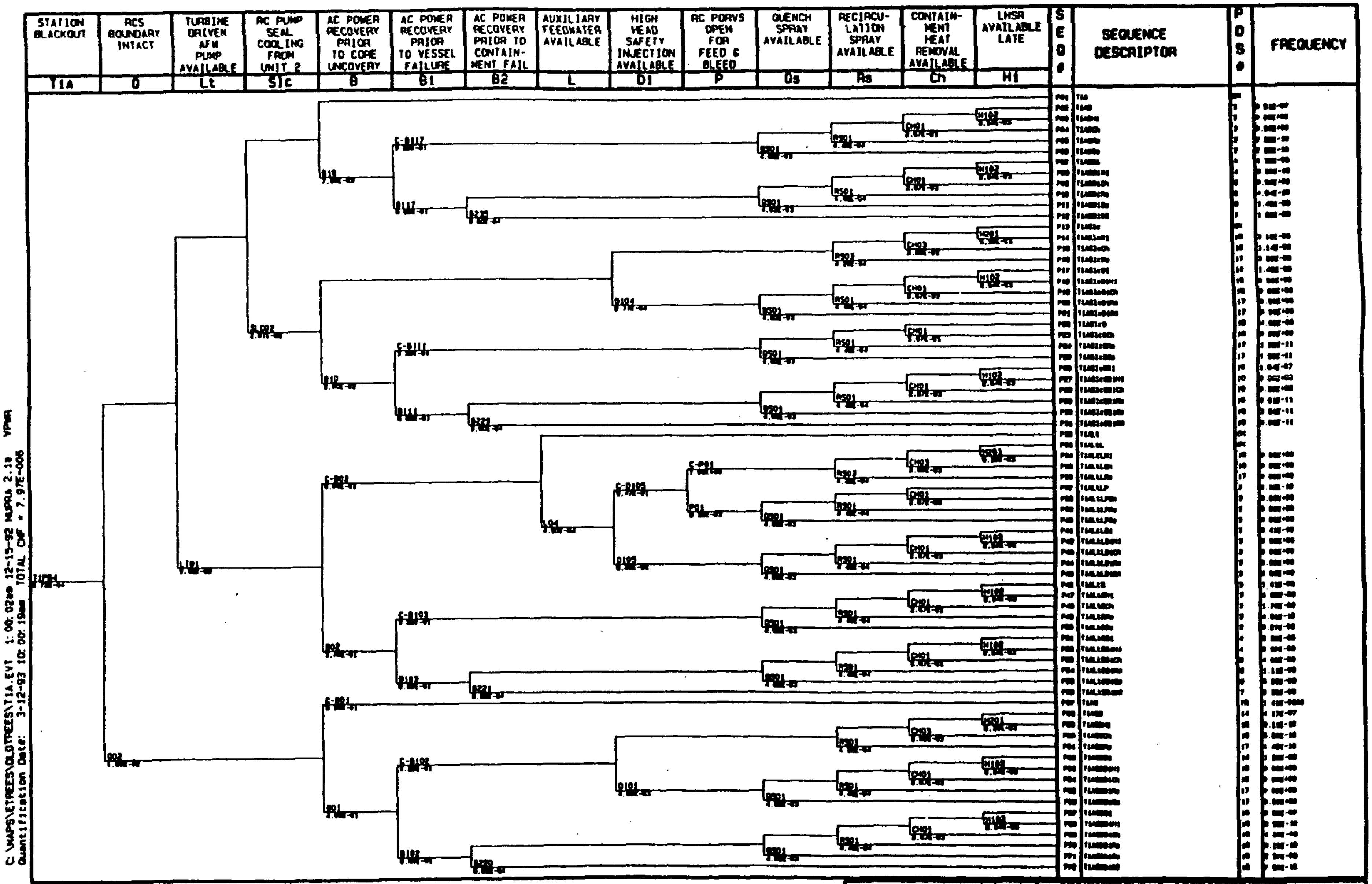
NORTH ANNA INDIVIDUAL PLANT EXAMINATION

S2: SMALL BREAK LOSS OF COOLANT ACCIDENT EVENT TREE



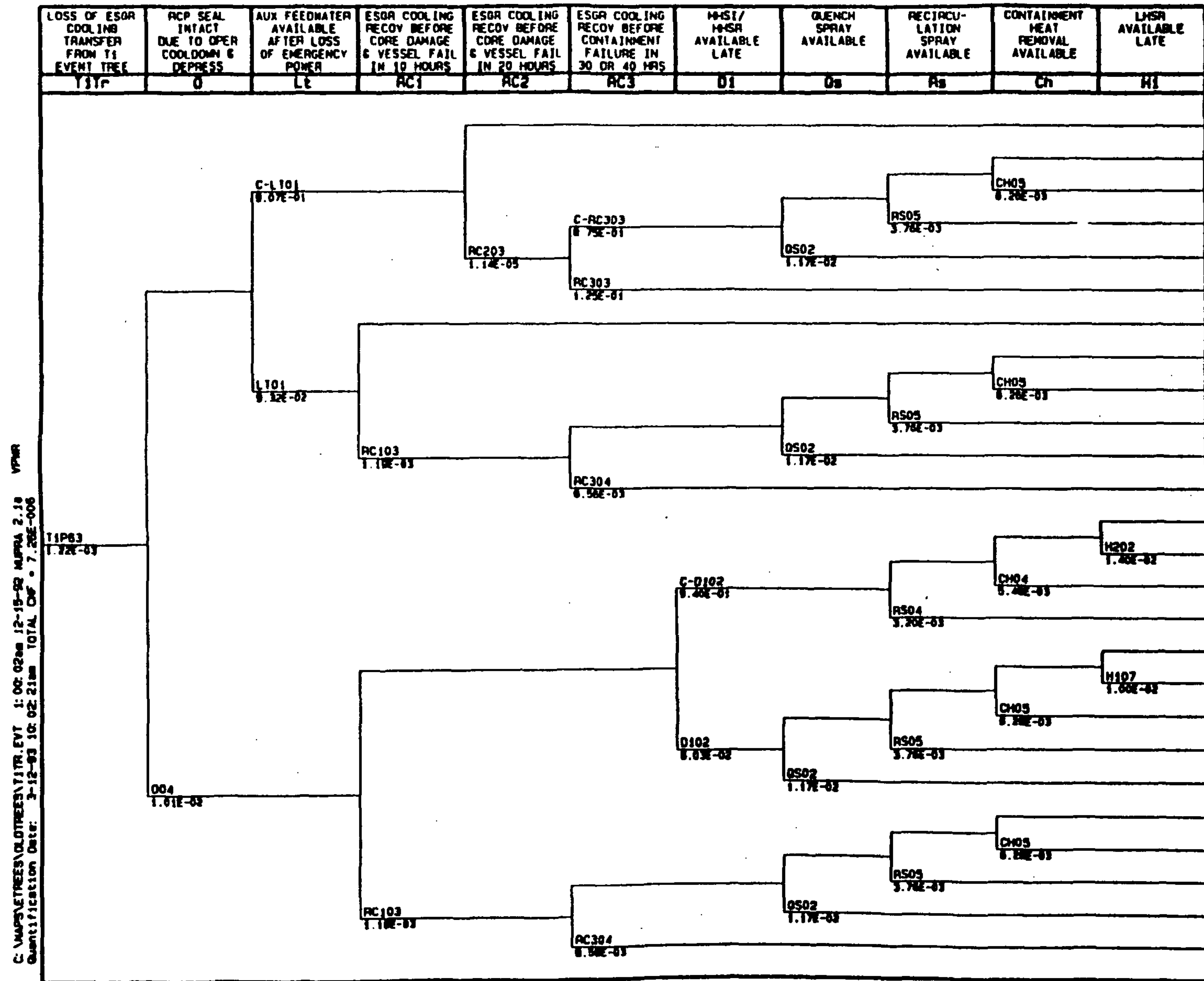
NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T1: LOSS OF OFFSITE POWER EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

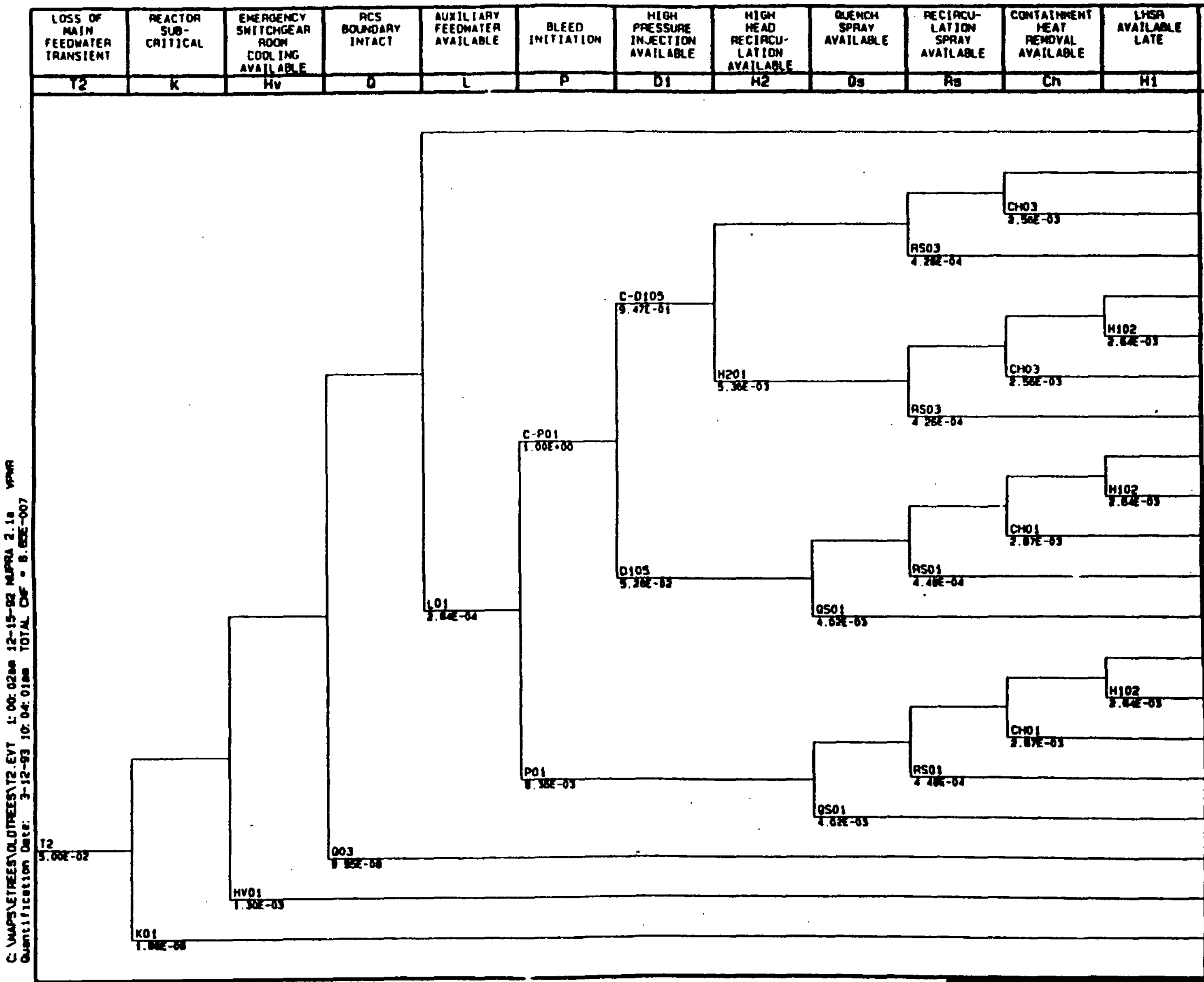
T1A: STATION BLACKOUT EVENT TREE
TRANSFER FROM T1 LOSS OF OFFSITE POWER



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T1Tr	OK	
P02	T1TrRC2	4	0.00E+00
P03	T1TrRC2Ch	5	0.00E+00
P04	T1TrRC2Rs	6	0.00E+00
P05	T1TrRC2Qs	6	0.00E+00
P06	T1TrRC2RC3	7	0.00E+00
P07	T1TrLt	OK	
P08	T1TrLtRC1	4	1.29E-09
P09	T1TrLtRC1Ch	5	6.05E-10
P10	T1TrLtRC1Rs	6	0.00E+00
P11	T1TrLtRC1Qs	6	0.00E+00
P12	T1TrLtRC1RC3	7	0.00E+00
P13	T1TrO	OK	
P14	T1TrOH1	21	1.01E-08
P15	T1TrOCh	22	4.28E-09
P16	T1TrORs	23	1.10E-08
P17	T1TrOD1	20	4.00E-06
P18	T1TrOD1H1	21	3.82E-10
P19	T1TrOD1Ch	22	1.20E-08
P20	T1TrOD1Rs	23	0.00E+00
P21	T1TrOD1Qs	23	2.22E-06
P22	T1TrORC1	18	5.15E-10
P23	T1TrORC1Ch	18	0.00E+00
P24	T1TrORC1Rs	18	0.00E+00
P25	T1TrORC1Qs	18	0.00E+00
P26	T1TrORC1RC3	19	0.00E+00

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

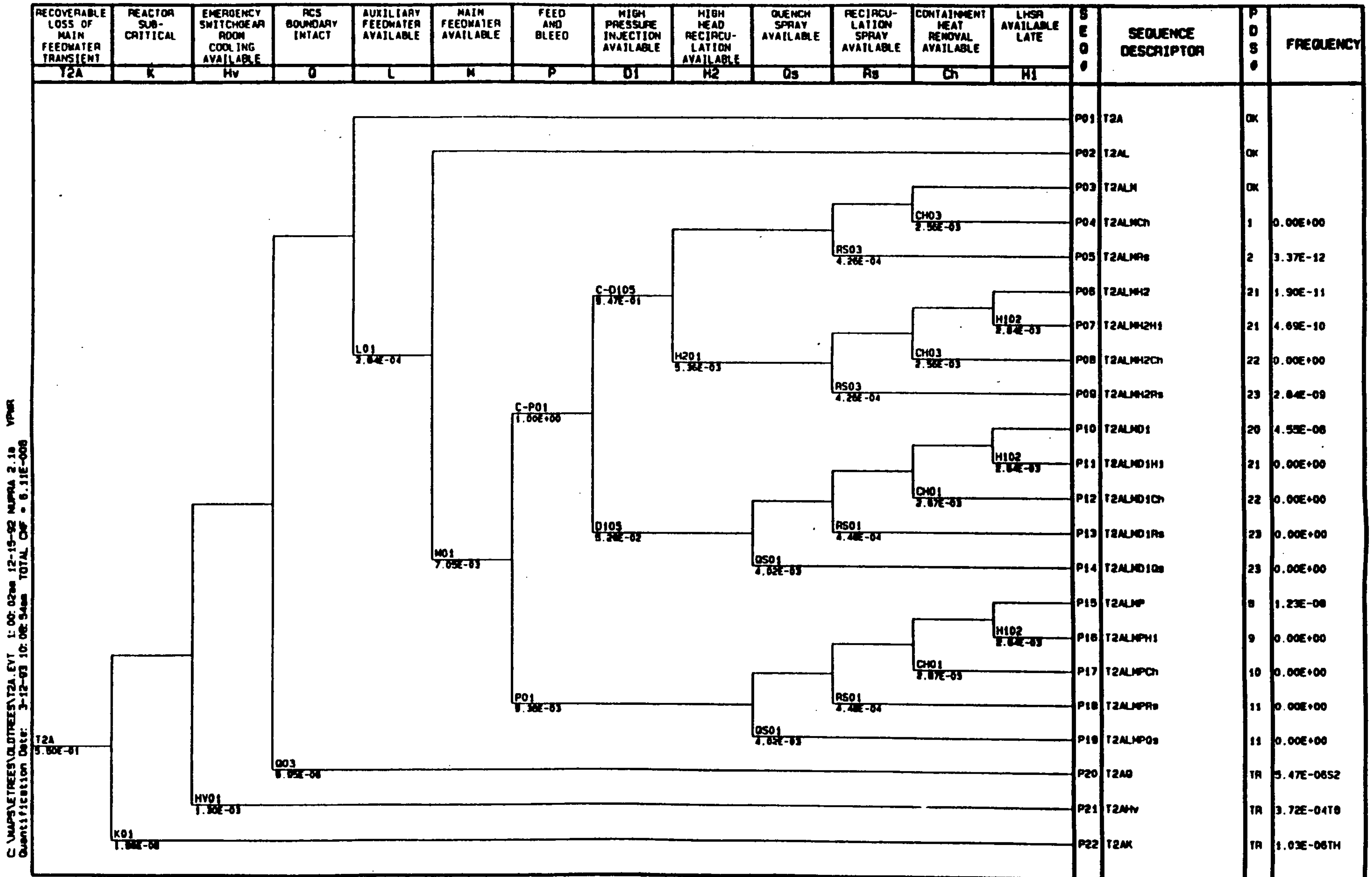
T1Tr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T1 LOSS OF OFFSITE POWER EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T2	OK	
P02	T2L	OK	
P03	T2LCh	1	3.94E-10
P04	T2LRs	2	9.30E-11
P05	T2LH2	21	2.28E-09
P06	T2LH2H1	21	2.43E-08
P07	T2LH2Ch	22	0.00E+00
P08	T2LH2Rs	23	8.24E-10
P09	T2LD1	20	7.22E-07
P10	T2LD1H1	21	2.16E-09
P11	T2LD1Ch	22	8.96E-10
P12	T2LD1Rs	23	2.53E-10
P13	T2LD1Qs	23	1.42E-09
P14	T2LP	8	1.30E-07
P15	T2LPH1	9	1.44E-10
P16	T2LPCh	10	1.54E-10
P17	T2LPRs	11	4.53E-11
P18	T2LPQs	11	3.26E-10
P19	T2Q	TR	4.97E-0752
P20	T2Hv	TR	3.38E-05T8
P21	T2K	TR	9.32E-08TH

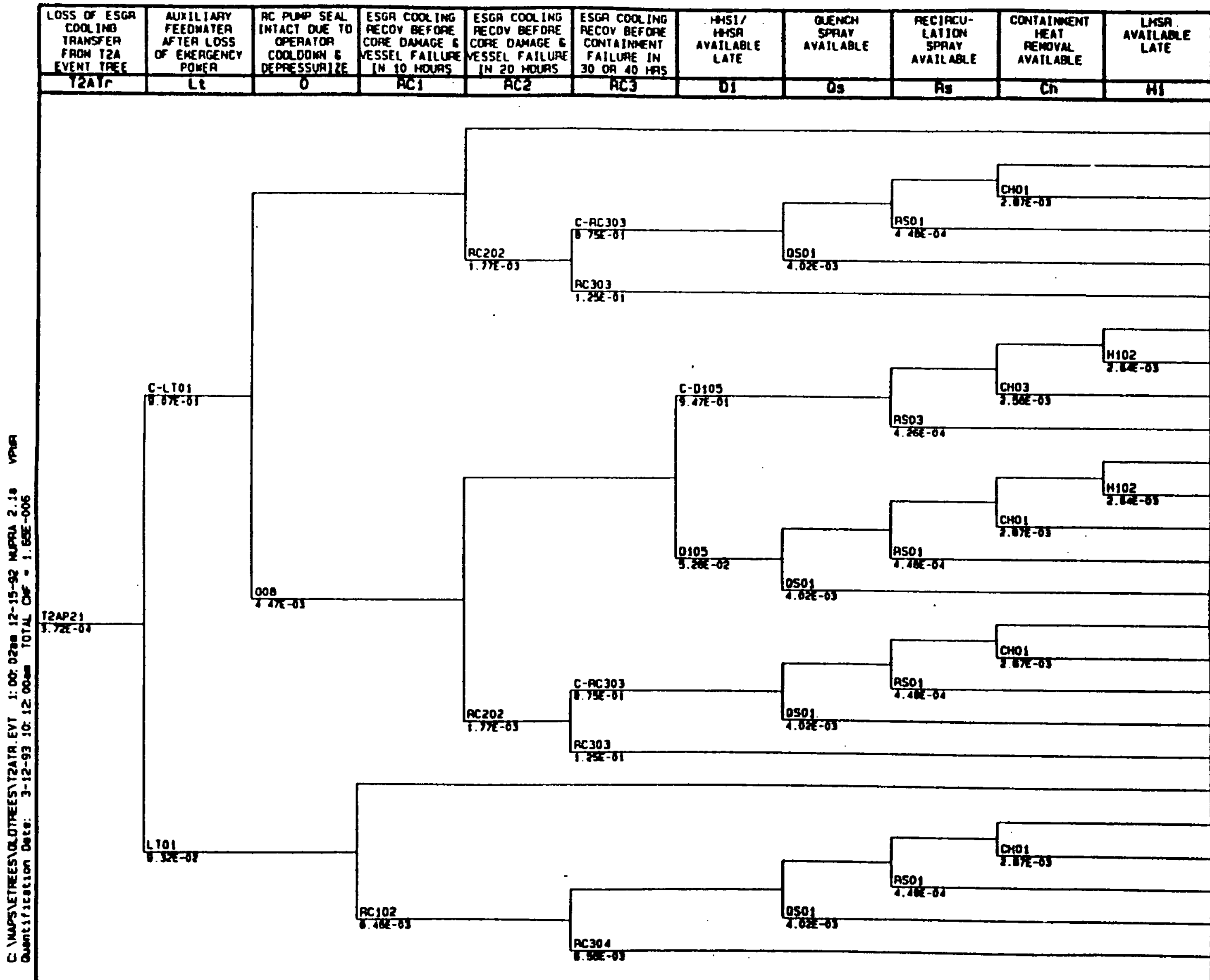
NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T2: LOSS OF MAIN FEEDWATER EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

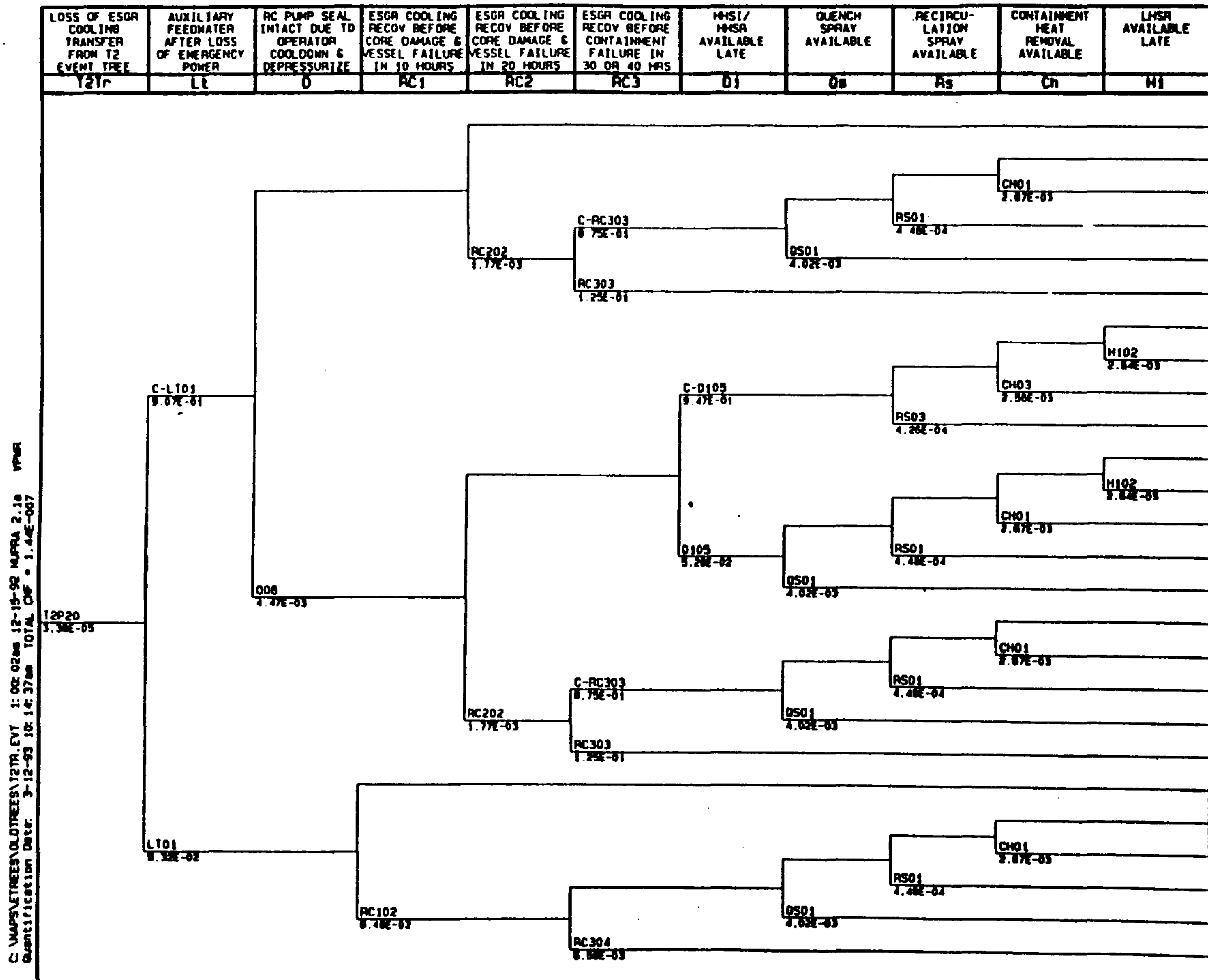
T2A: RECOVERABLE LOSS OF MAIN FEEDWATER EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T2ATr	OK	
P02	T2ATrRC2	4	2.19E-08
P03	T2ATrRC2Ch	5	6.40E-07
P04	T2ATrRC2Rs	6	2.40E-10
P05	T2ATrRC2Qs	8	1.56E-09
P06	T2ATrRC2RC3	7	1.15E-07
P07	T2ATrO	OK	
P08	T2ATrOH1	15	2.71E-08
P09	T2ATrOCh	16	1.92E-08
P10	T2ATrORs	17	5.15E-09
P11	T2ATrOD1	14	6.76E-07
P12	T2ATrOD1H1	15	2.51E-09
P13	T2ATrOD1Ch	16	9.63E-10
P14	T2ATrOD1Rs	17	2.48E-10
P15	T2ATrOD1Qs	17	2.07E-09
P16	T2ATrORC2	18	5.89E-09
P17	T2ATrORC2Ch	18	2.40E-09
P18	T2ATrORC2Rs	18	0.00E+00
P19	T2ATrORC2Qs	18	0.00E+00
P20	T2ATrORC2RC3	19	8.18E-10
P21	T2ATrLt	OK	
P22	T2ATrLtRC1	4	4.75E-08
P23	T2ATrLtRC1Ch	5	7.51E-08
P24	T2ATrLtRC1Rs	6	2.70E-11
P25	T2ATrLtRC1Qs	6	4.08E-11
P26	T2ATrLtRC1RC3	7	3.83E-10

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

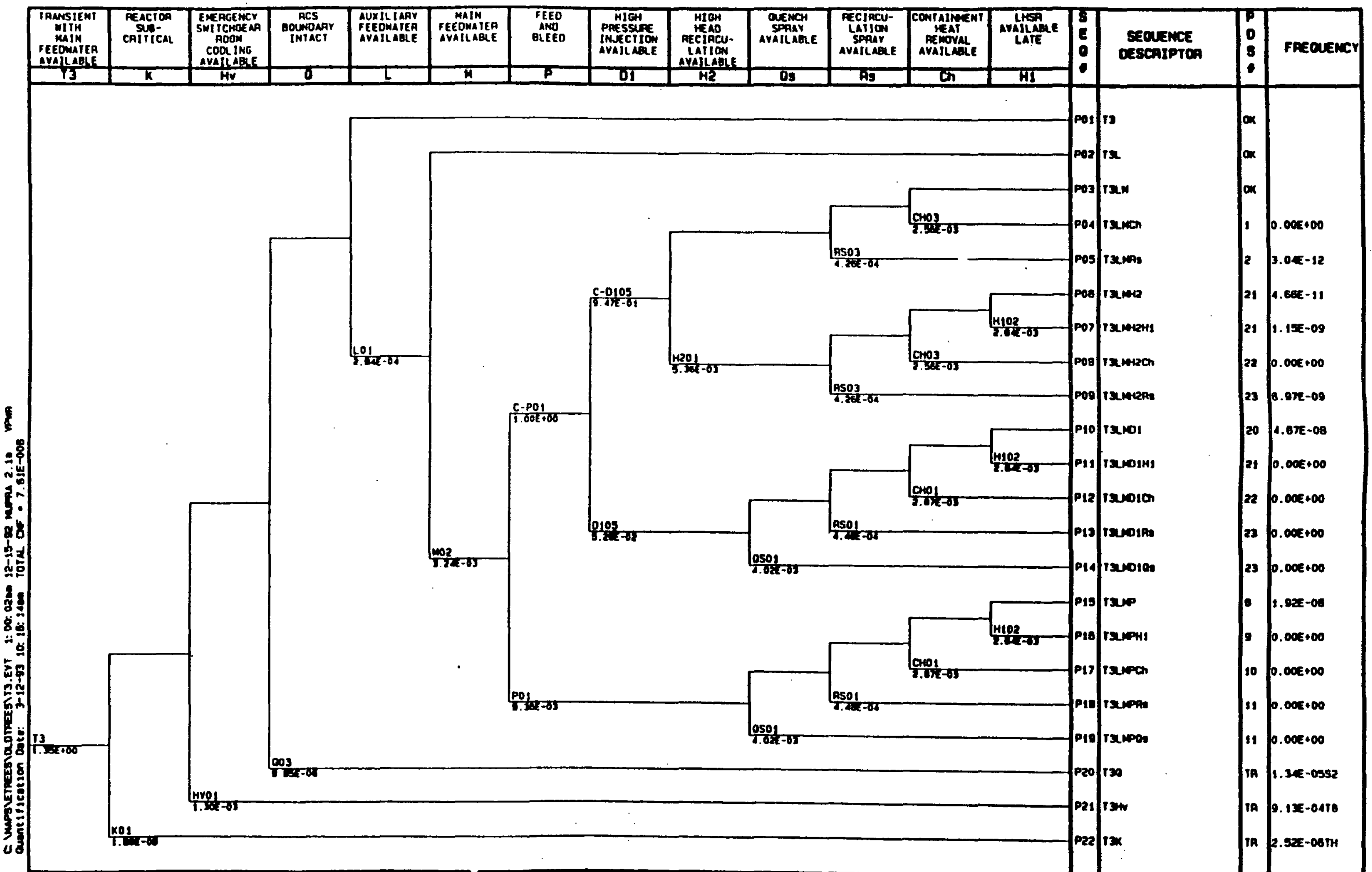
T2ATr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T2A RECOVERABLE LOSS OF MAIN FW EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T2Tr	OK	
P02	T2TrRC2	4	1.29E-08
P03	T2TrRC2Ch	5	5.82E-08
P04	T2TrRC2Rs	6	2.15E-11
P05	T2TrRC2Qs	6	1.42E-10
P06	T2TrRC2RC3	7	8.32E-09
P07	T2TrO	OK	
P08	T2TrOH1	15	2.45E-09
P09	T2TrOCh	16	1.74E-09
P10	T2TrORs	17	4.67E-10
P11	T2TrOD1	14	6.06E-08
P12	T2TrOD1H1	15	2.26E-10
P13	T2TrOD1Ch	16	8.75E-11
P14	T2TrOD1Rs	17	2.10E-11
P15	T2TrOD1Qs	17	1.87E-10
P16	T2TrORC2	18	5.31E-10
P17	T2TrORC2Ch	18	2.17E-10
P18	T2TrORC2Rs	18	0.00E+00
P19	T2TrORC2Qs	18	0.00E+00
P20	T2TrORC2RC3	19	7.43E-11
P21	T2TrLt	OK	
P22	T2TrLtRC1	4	2.91E-09
P23	T2TrLtRC1Ch	5	6.82E-09
P24	T2TrLtRC1Rs	6	0.00E+00
P25	T2TrLtRC1Qs	6	0.00E+00
P26	T2TrLtRC1RC3	7	3.35E-11

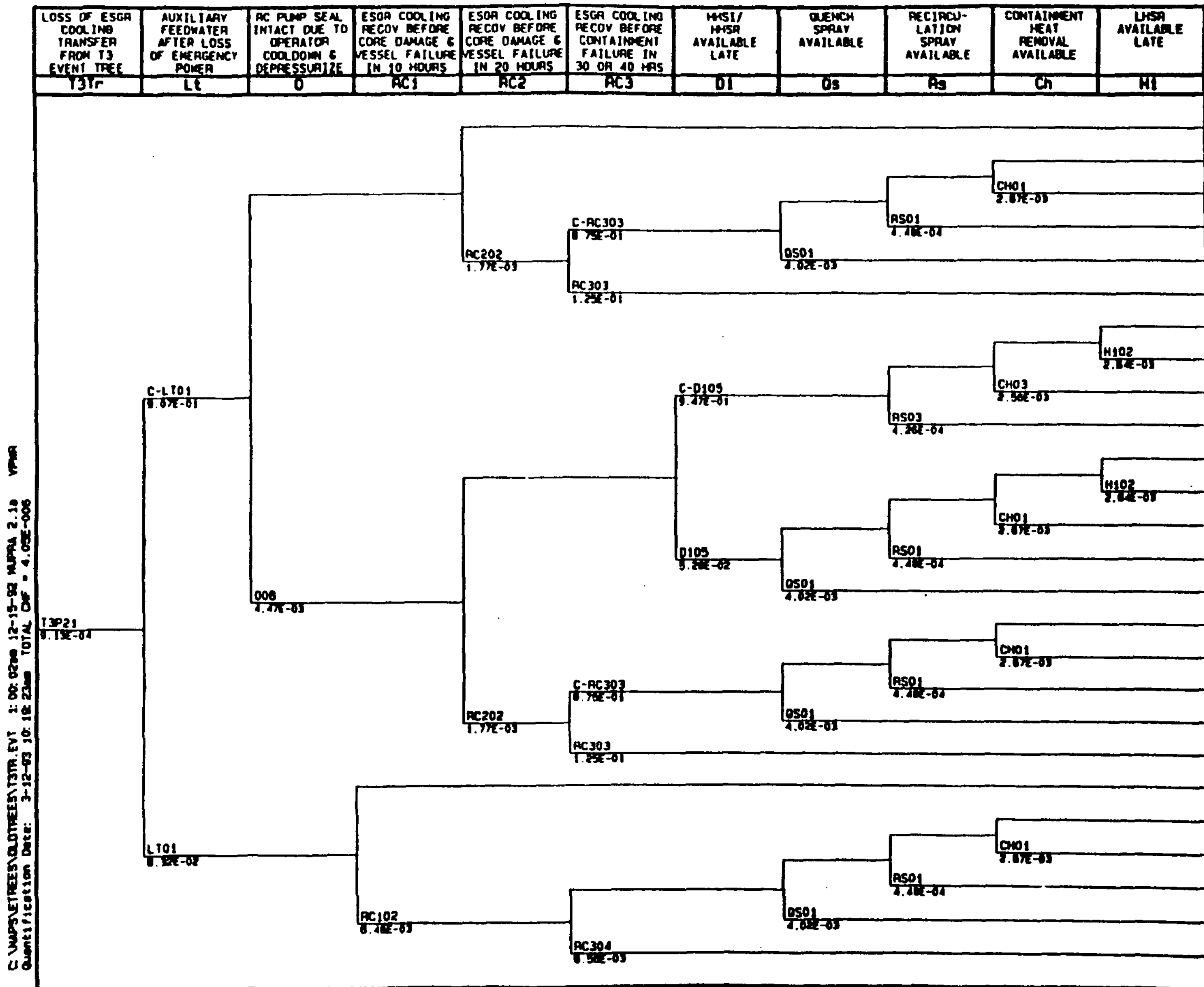
NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T2Tr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T2 LOSS OF MAIN FEEDWATER EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

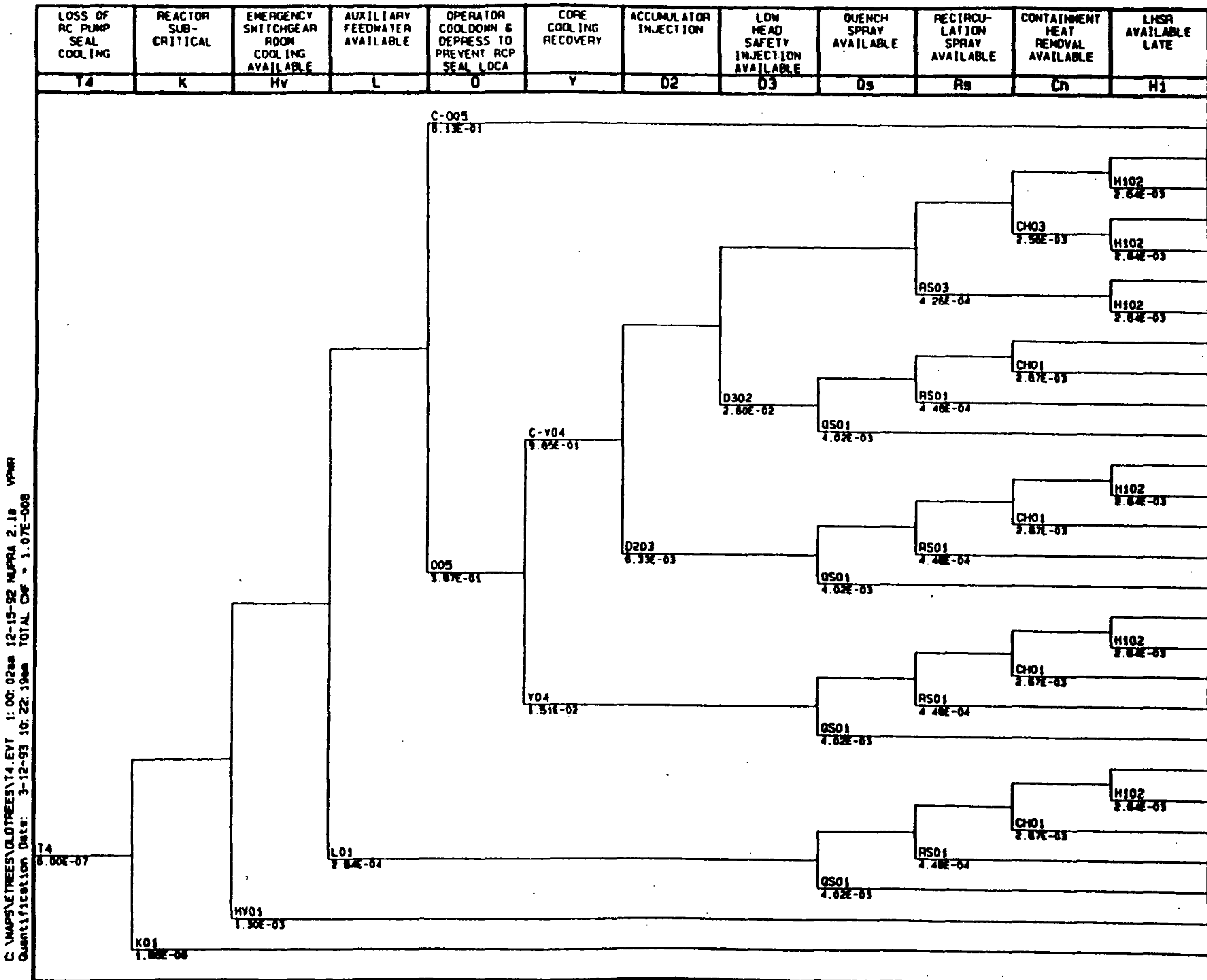
T3: TRANSIENT WITH MAIN FEEDWATER AVAILABLE EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T3Tr	OK	
P02	T3TrRC2	4	5.83E-08
P03	T3TrRC2Ch	5	1.57E-06
P04	T3TrRC2Rs	6	5.89E-10
P05	T3TrRC2Qs	6	3.84E-09
P06	T3TrRC2RC3	7	2.83E-07
P07	T3TrO	OK	
P08	T3TrOH1	15	8.67E-08
P09	T3TrOCh	16	4.70E-08
P10	T3TrORs	17	1.27E-08
P11	T3TrOD1	14	1.67E-08
P12	T3TrOD1H1	15	6.16E-09
P13	T3TrOD1Ch	16	2.36E-09
P14	T3TrOD1Rs	17	8.08E-10
P15	T3TrOD1Qs	17	5.09E-09
P16	T3TrORC2	18	1.44E-08
P17	T3TrORC2Ch	18	5.80E-09
P18	T3TrORC2Rs	18	0.00E+00
P19	T3TrORC2Qs	18	0.00E+00
P20	T3TrORC2RC3	18	1.76E-09
P21	T3TrLt	OK	
P22	T3TrLtRC1	4	1.21E-07
P23	T3TrLtRC1Ch	5	1.84E-07
P24	T3TrLtRC1Rs	6	6.74E-11
P25	T3TrLtRC1Qs	6	1.35E-10
P26	T3TrLtRC1RC3	7	9.86E-10

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

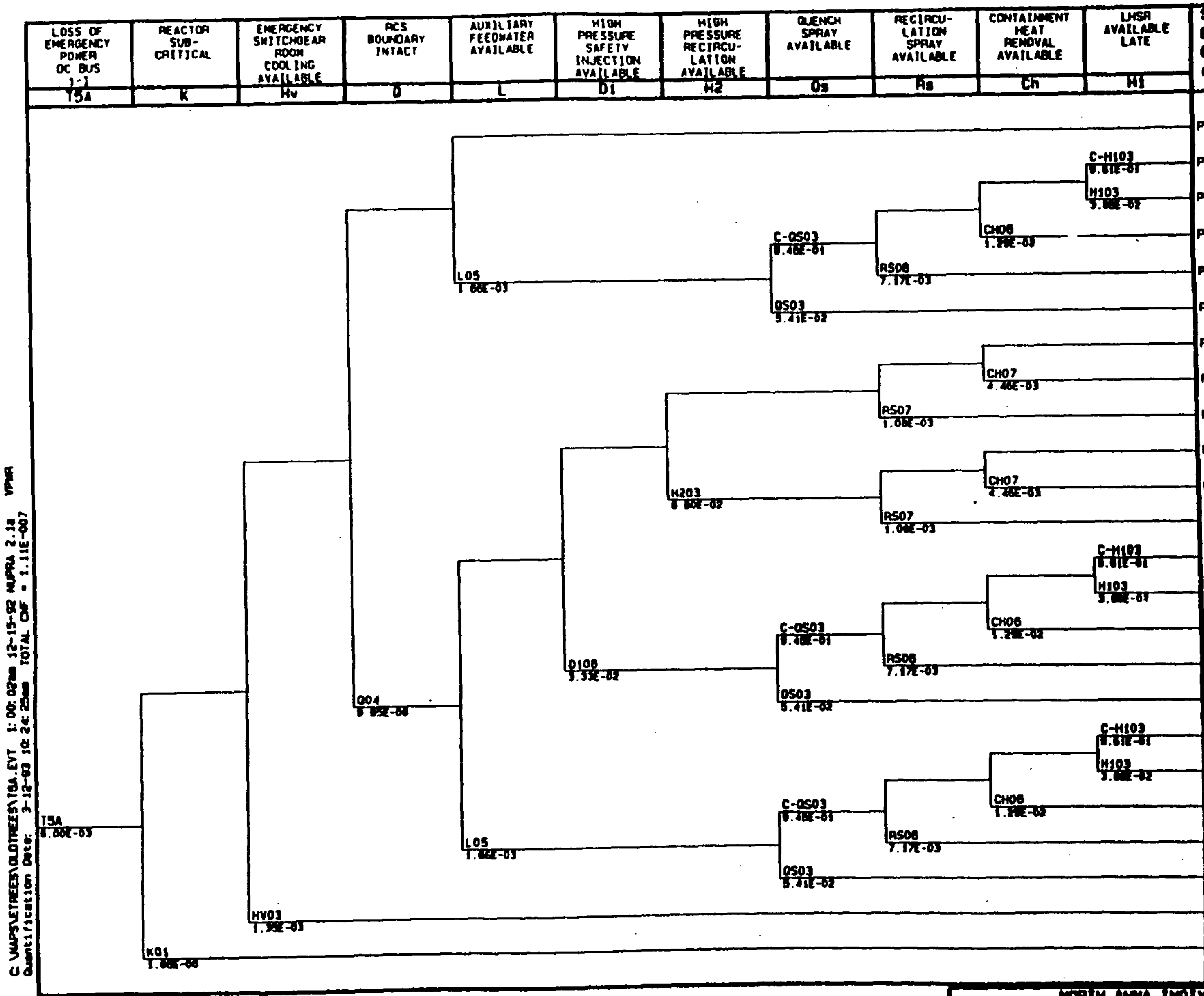
T3Tr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T3 TRANSIENT WITH MFW AVAILABLE EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T4	OK	
P02	T40	OK	
P03	T40H1	21	2.12E-10
P04	T40Ch	1	7.13E-12
P05	T40ChH1	22	0.00E+00
P06	T40Rs	2	1.71E-12
P07	T40RsH1	23	1.14E-11
P08	T40D3	21	5.84E-09
P09	T40D3Ch	22	0.00E+00
P10	T40D3Rs	23	0.00E+00
P11	T40D3Qs	23	0.00E+00
P12	T40D2	20	1.45E-09
P13	T40D2H1	21	0.00E+00
P14	T40D2Ch	22	0.00E+00
P15	T40D2Rs	23	0.00E+00
P16	T40D2Qs	23	0.00E+00
P17	T40Y	20	3.08E-09
P18	T40YH1	21	0.00E+00
P19	T40YCh	22	0.00E+00
P20	T40YRs	23	0.00E+00
P21	T40YQs	23	0.00E+00
P22	T4L	8	1.43E-10
P23	T4LH1	9	0.00E+00
P24	T4LCh	10	0.00E+00
P25	T4LRs	11	0.00E+00
P26	T4LQs	11	0.00E+00
P27	T4Hv	TR	2.82E-10TB
P28	T4K	TR	0.00E+00TM

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

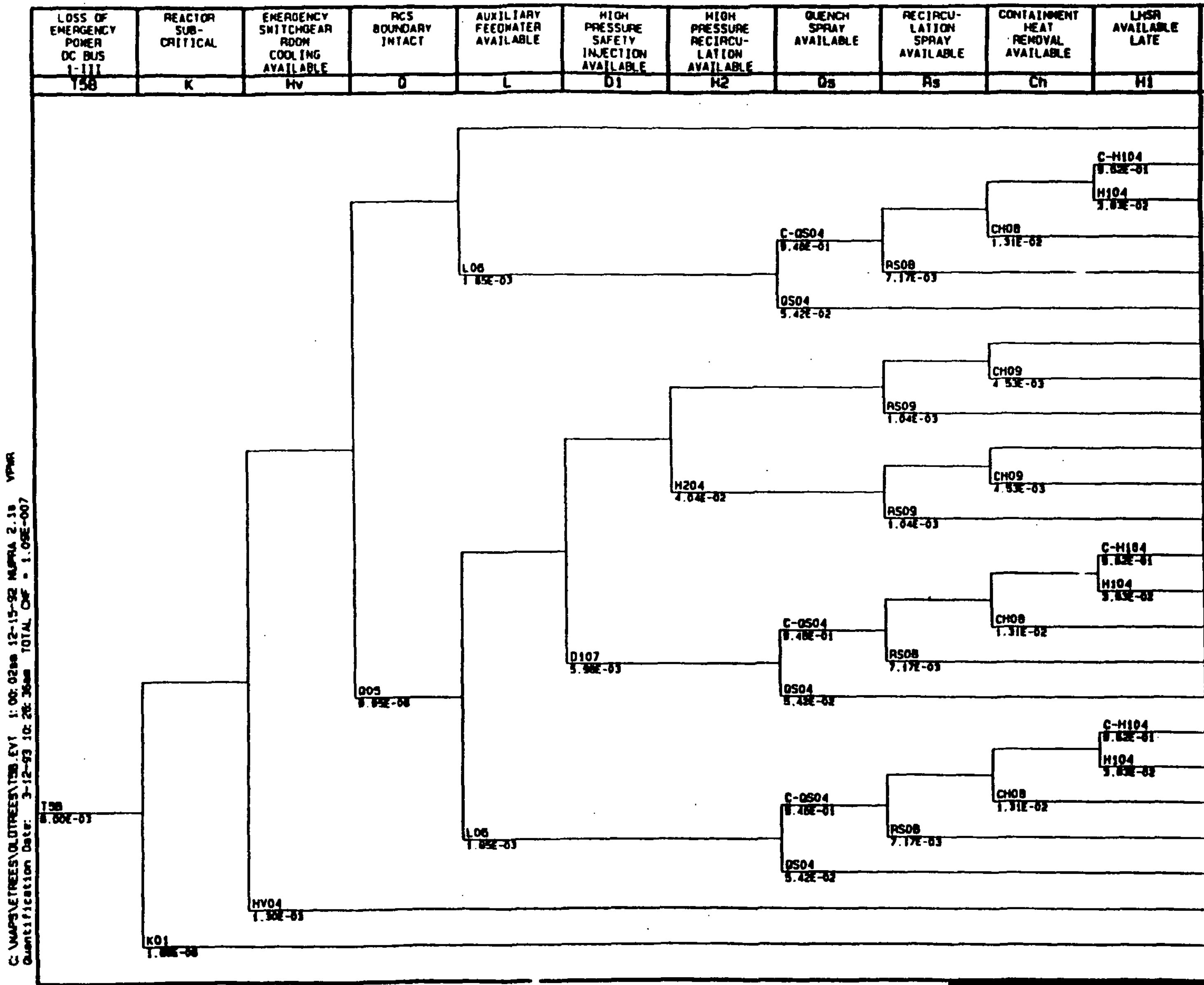
T4: LOSS OF REACTOR COOLANT PUMP SEAL COOLING EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T5A	OK	
P02	T5AL	8	9.30E-08
P03	T5ALH1	9	3.50E-09
P04	T5ALCh	10	2.89E-10
P05	T5ALRs	11	6.05E-11
P06	T5ALOs	11	9.63E-09
P07	T5AQ	TR	5.92E-08S2
P08	T5AQCh	1	0.00E+00
P09	T5AQRs	2	0.00E+00
P10	T5AQH2	21	1.98E-09
P11	T5AQH2Ch	22	1.76E-10
P12	T5AQH2Rs	23	0.00E+00
P13	T5AQD1	20	1.53E-09
P14	T5AQD1H1	21	0.00E+00
P15	T5AQD1Ch	22	0.00E+00
P16	T5AQD1Rs	23	0.00E+00
P17	T5AQD1Os	23	1.42E-10
P18	T5AQL	20	0.00E+00
P19	T5AQLH1	21	0.00E+00
P20	T5AQLCh	22	0.00E+00
P21	T5AQLRs	23	0.00E+00
P22	T5AQLOs	23	0.00E+00
P23	T5AHv	TR	4.30E-06T8
P24	T5AK	TR	1.12E-08TH

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

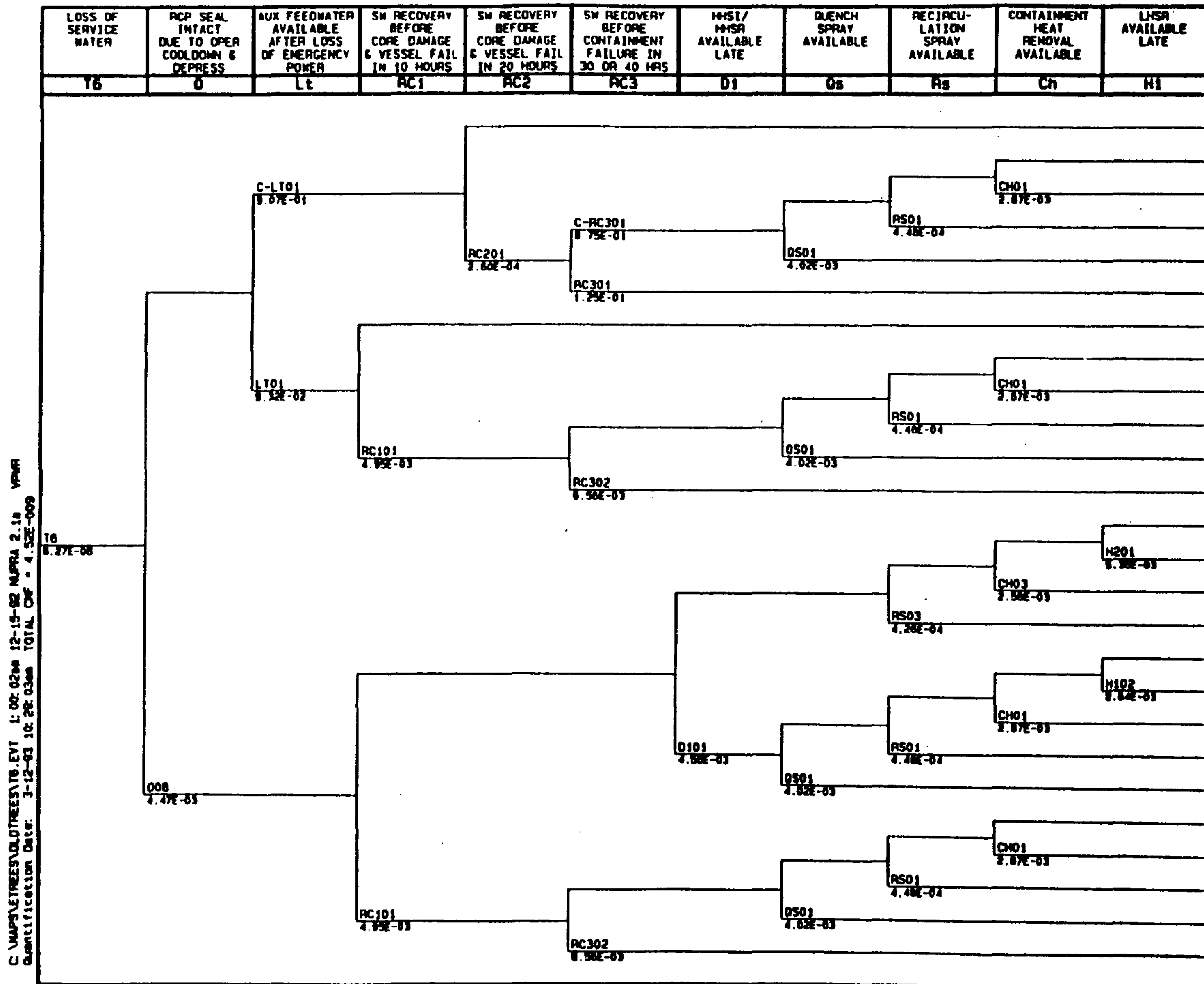
T5A: LOSS OF EMERGENCY POWER DC BUS 1-I EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T5B	OK	
P02	T5BL	8	9.37E-08
P03	T5BLH1	9	3.51E-09
P04	T5BLCh	10	2.89E-10
P05	T5BLRs	11	6.05E-11
P06	T5BLQs	11	9.33E-09
P07	T5BQ	TR	5.92E-08S2
P08	T5BQCh	1	0.00E+00
P09	T5BQRs	2	0.00E+00
P10	T5BQH2	21	2.07E-09
P11	T5BQH2Ch	22	5.77E-11
P12	T5BQH2Rs	23	0.00E+00
P13	T5BQD1	20	1.06E-10
P14	T5BQD1H1	21	0.00E+00
P15	T5BQD1Ch	22	0.00E+00
P16	T5BQD1Rs	23	0.00E+00
P17	T5BQD1Qs	23	7.98E-11
P18	T5BQL	20	0.00E+00
P19	T5BQLH1	21	0.00E+00
P20	T5BQLCh	22	0.00E+00
P21	T5BQLRs	23	0.00E+00
P22	T5BQLQs	23	0.00E+00
P23	T5BHv	TR	4.10E-08TB
P24	T5BK	TR	1.12E-08TH

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

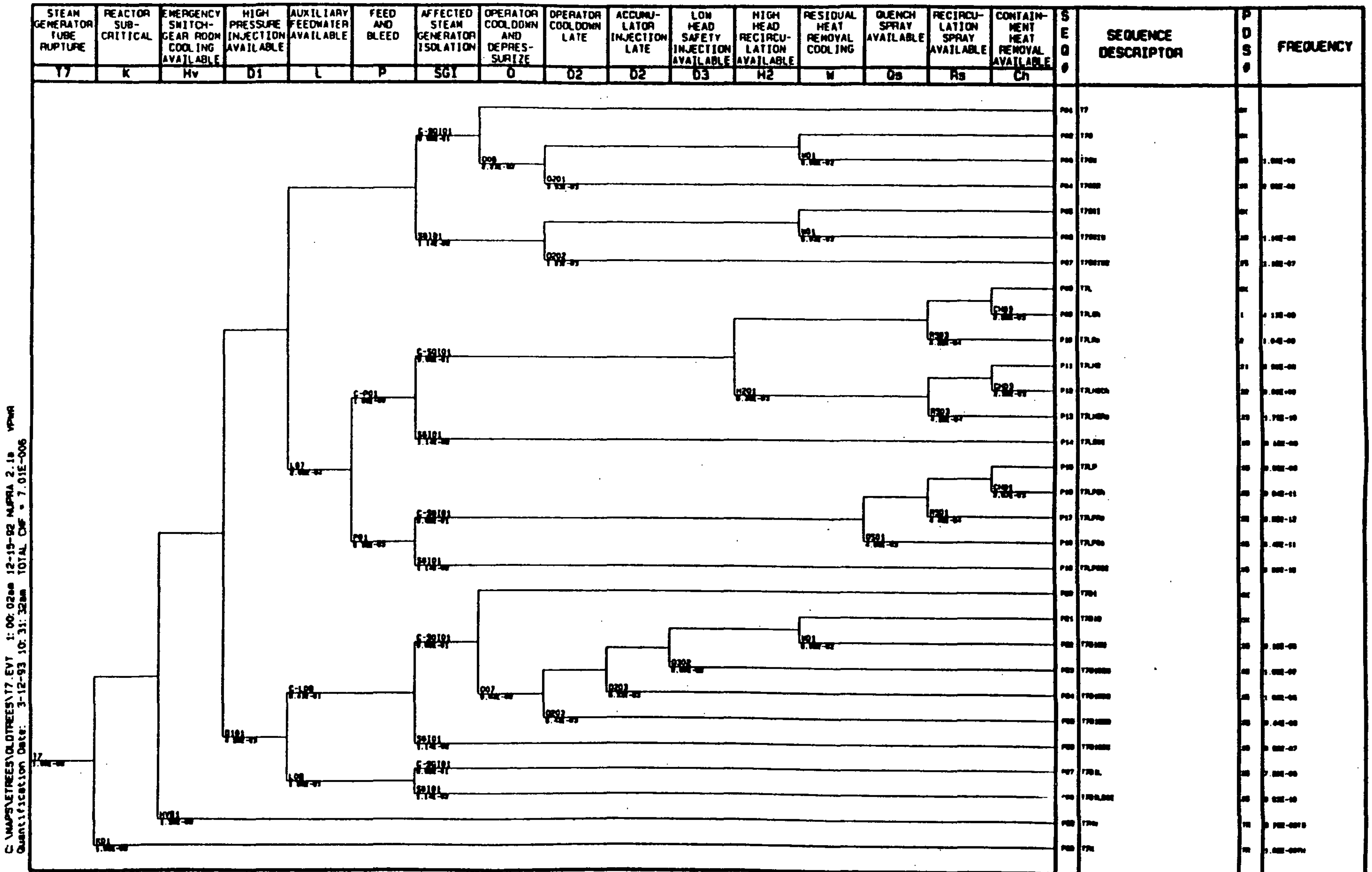
T5B: LOSS OF EMERGENCY POWER DC BUS 1-III EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T6	OK	
P02	T6RC2	4	1.29E-09
P03	T6RC2Ch	5	0.00E+00
P04	T6RC2Rs	6	0.00E+00
P05	T6RC2Qs	6	0.00E+00
P06	T6RC2RC3	7	1.05E-10
P07	T6Lt	OK	
P08	T6LtRC1	4	2.89E-09
P09	T6LtRC1Ch	5	0.00E+00
P10	T6LtRC1Rs	6	0.00E+00
P11	T6LtRC1Qs	6	0.00E+00
P12	T6LtRC1RC3	7	1.17E-11
P13	T6O	OK	
P14	T6OH1	21	0.00E+00
P15	T6OCh	22	0.00E+00
P16	T6ORs	23	8.10E-12
P17	T6OD1	20	2.50E-11
P18	T6OD1H1	21	0.00E+00
P19	T6OD1Ch	22	0.00E+00
P20	T6OD1Rs	23	0.00E+00
P21	T6OD1Qs	23	0.00E+00
P22	T6ORC1	18	1.08E-10
P23	T6ORC1Ch	18	0.00E+00
P24	T6ORC1Rs	18	0.00E+00
P25	T6ORC1Qs	18	0.00E+00
P26	T6ORC1RC3	19	0.00E+00

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

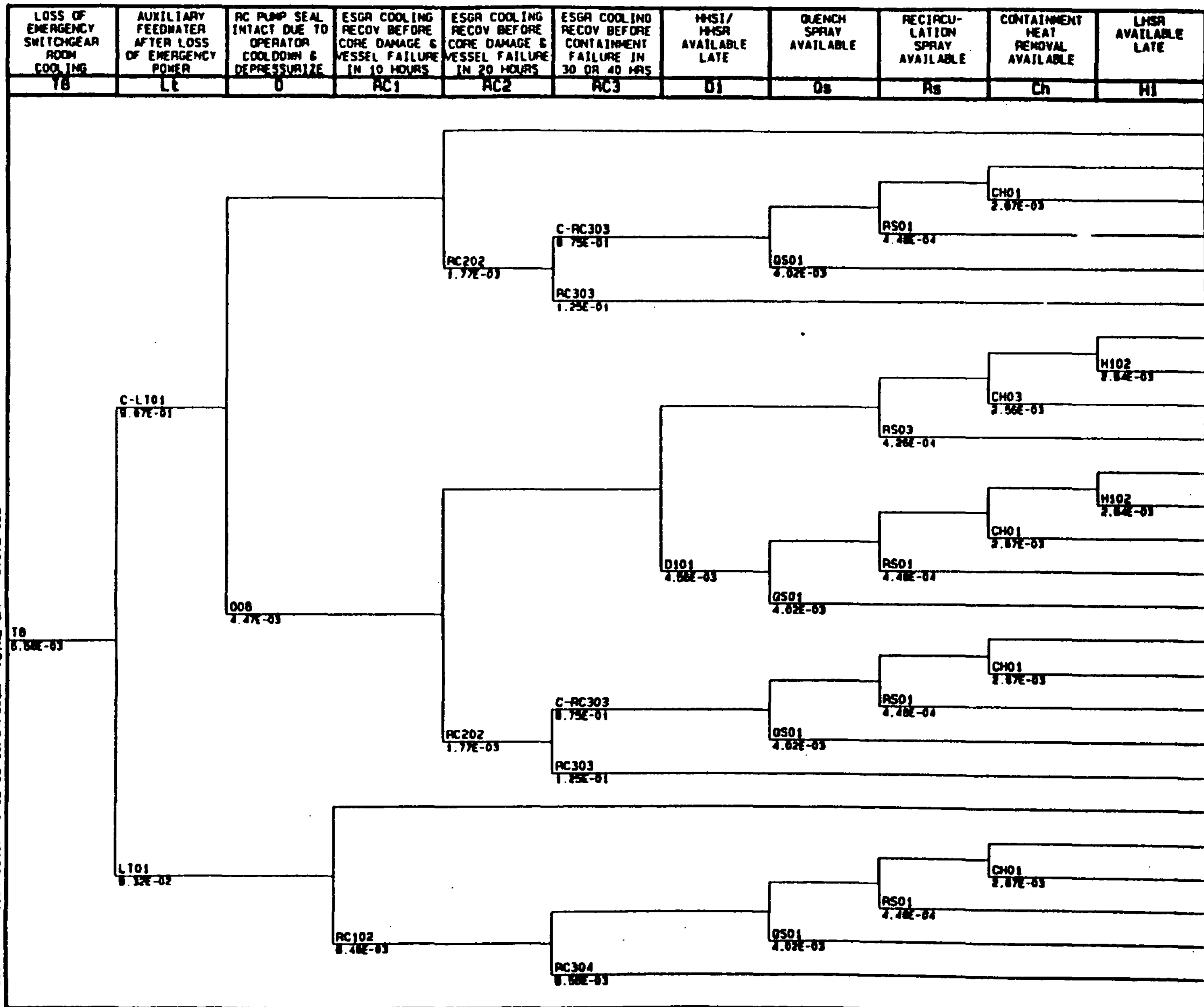
T6: LOSS OF SERVICE WATER EVENT TREE



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T7: STEAM GENERATOR TUBE RUPTURE EVENT TREE

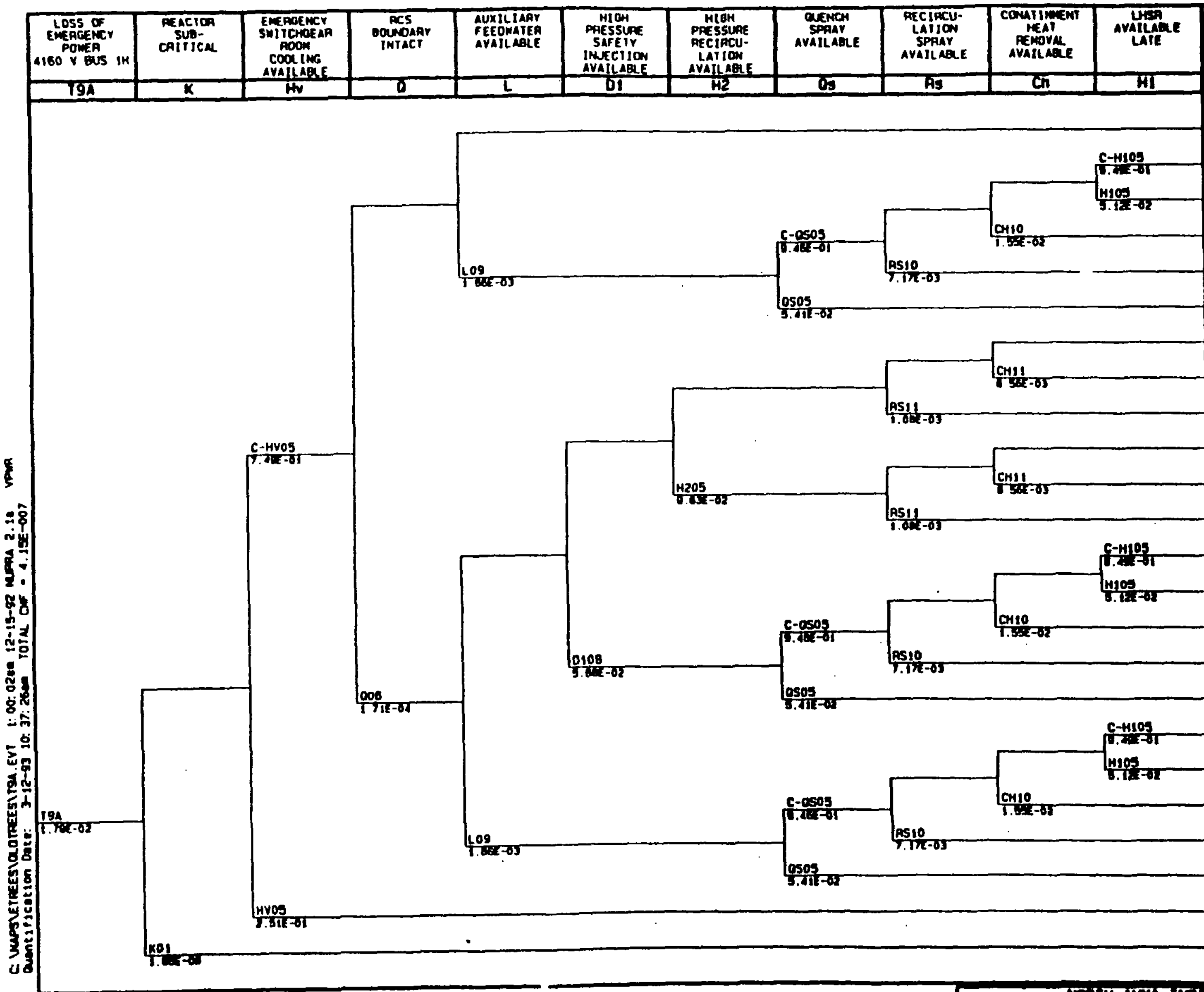
C:\WAPS\ETREES\OLDTREES\T8.EVT 1:00:02am 12-15-92 NURRA 2.1a VPWR
Quantification Date: 3-12-93 10:34:30am TOTAL CMF = 6.57E-006



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T8	OK	
P02	T8RC2	4	2.52E-08
P03	T8RC2Ch	5	1.01E-08
P04	T8RC2Rs	6	9.19E-10
P05	T8RC2Qs	6	8.35E-09
P06	T8RC2RC3	7	6.06E-07
P07	T8D	OK	
P08	T8DH1	15	5.85E-08
P09	T8DCh	16	3.90E-08
P10	T8DRs	17	1.05E-08
P11	T8DD1	14	9.57E-08
P12	T8DD1H1	15	3.21E-09
P13	T8DD1Ch	16	0.00E+00
P14	T8DD1Rs	17	1.52E-11
P15	T8DD1Qs	17	4.93E-11
P16	T8DRC2	18	7.70E-09
P17	T8DRC2Ch	18	2.72E-11
P18	T8DRC2Rs	18	0.00E+00
P19	T8DRC2Qs	18	0.00E+00
P20	T8DRC2RC3	19	8.72E-10
P21	T8Lt	OK	
P22	T8LtRC1	4	3.17E-06
P23	T8LtRC1Ch	5	5.61E-09
P24	T8LtRC1Rs	8	1.29E-09
P25	T8LtRC1Qs	8	1.13E-08
P26	T8LtRC1RC3	7	2.02E-08

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

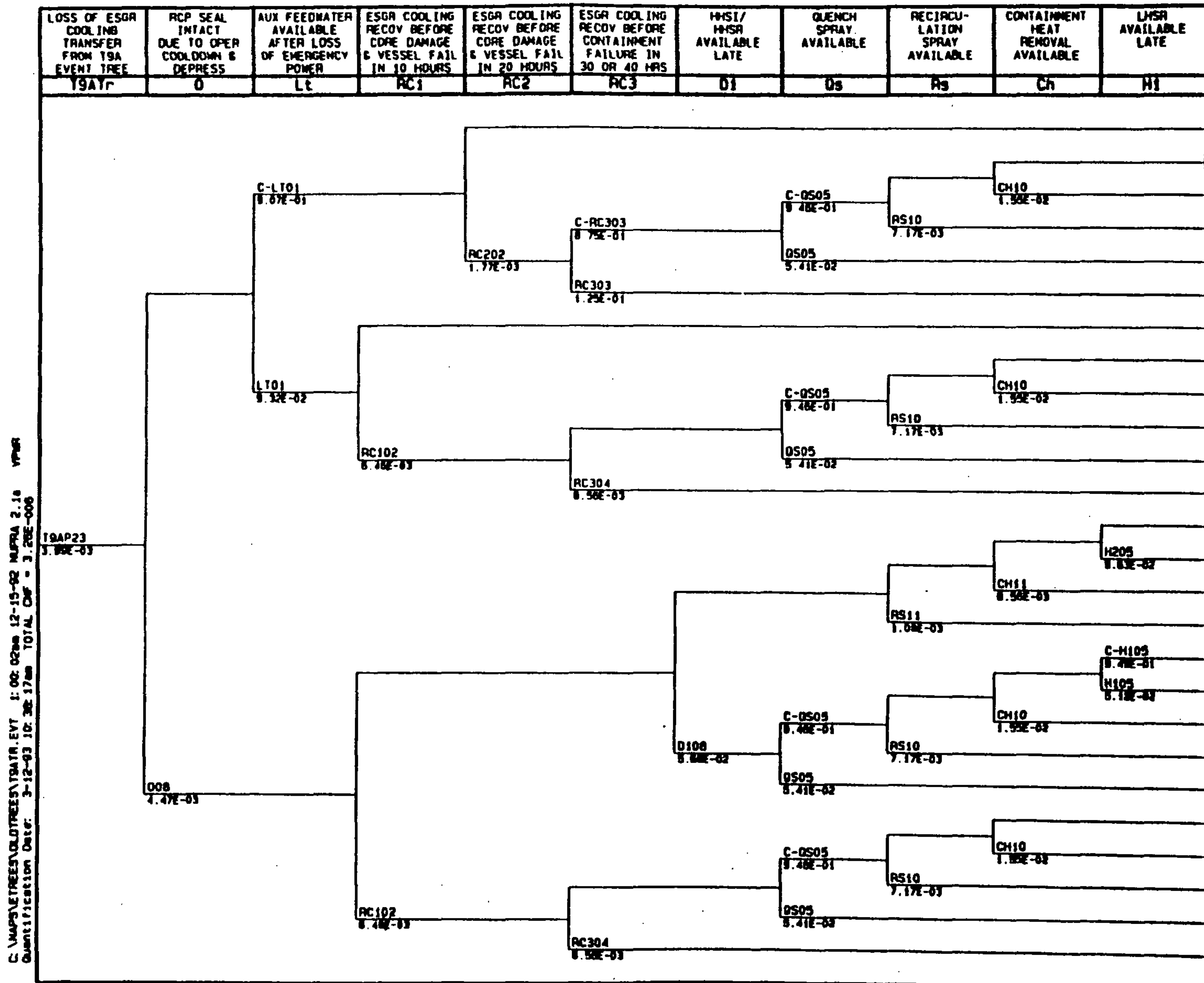
T8: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	POS #	FREQUENCY
P01	T9A	OK	
P02	T9AL	8	1.72E-07
P03	T9ALH1	9	1.72E-09
P04	T9ALCh	10	0.00E+00
P05	T9ALRs	11	0.00E+00
P06	T9ALQs	11	6.25E-09
P07	T9AQ	TR	2.29E-0892
P08	T9AQCh	1	0.00E+00
P09	T9AQRs	2	0.00E+00
P10	T9AQH2	21	1.31E-07
P11	T9AQH2Ch	22	0.00E+00
P12	T9AQH2Rs	23	0.00E+00
P13	T9AQD1	20	1.02E-07
P14	T9AQD1H1	21	4.30E-10
P15	T9AQD1Ch	22	0.00E+00
P16	T9AQD1Rs	23	0.00E+00
P17	T9AQD1Qs	23	1.90E-09
P18	T9AQL	20	0.00E+00
P19	T9AQLH1	21	0.00E+00
P20	T9AQLCh	22	0.00E+00
P21	T9AQLRs	23	0.00E+00
P22	T9AQLQs	23	0.00E+00
P23	T9AHv	TR	4.00E-03T8
P24	T9AK	TR	3.18E-08TH

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

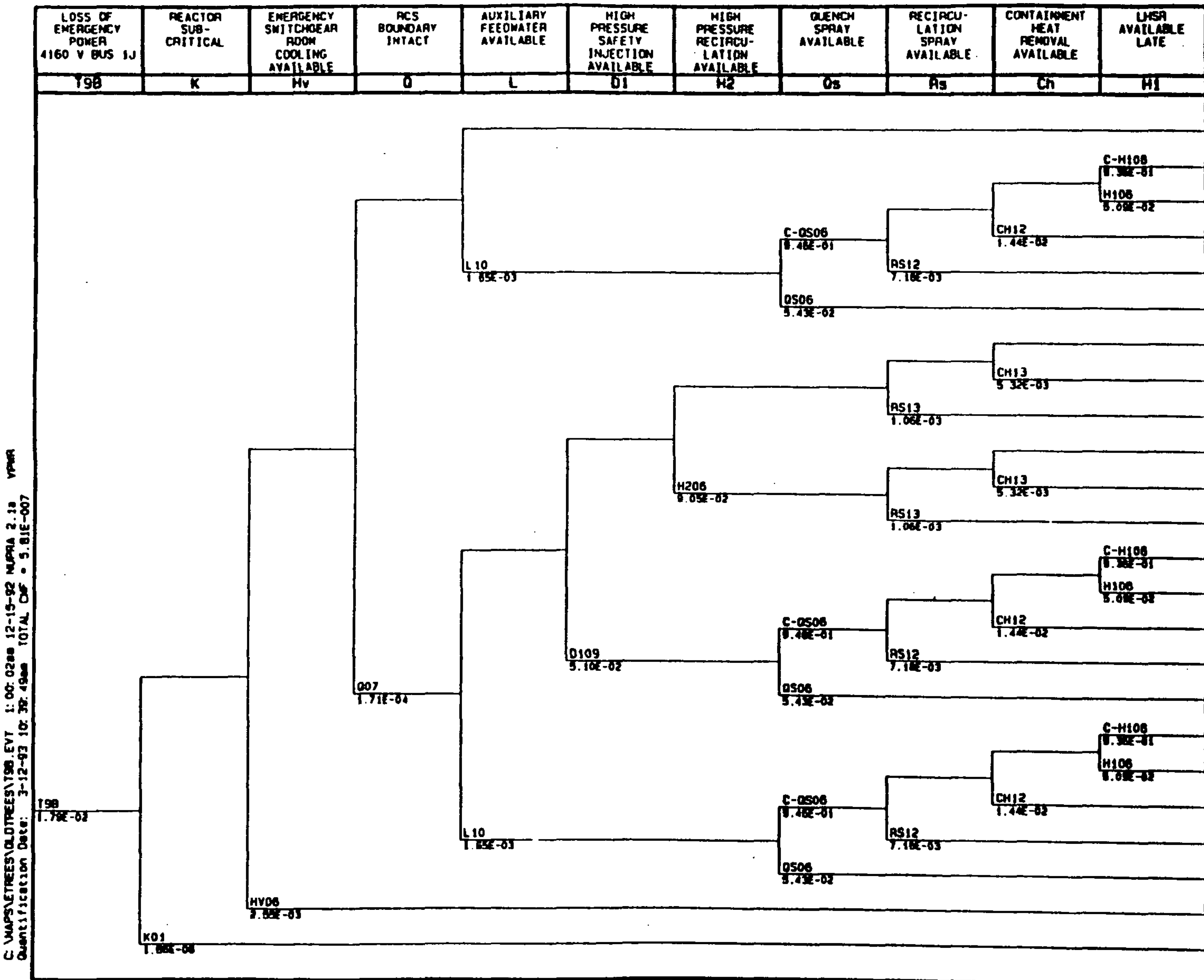
T9A: LOSS OF EMERGENCY POWER 4160 V BUS 1H EVENT TREE



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T9ATr	OK	
P02	T9ATrRC2	4	8.33E-07
P03	T9ATrRC2Ch	5	1.87E-08
P04	T9ATrRC2Rs	6	0.00E+00
P05	T9ATrRC2Qs	6	1.17E-08
P06	T9ATrRC2RC3	7	1.07E-07
P07	T9ATrLt	OK	
P08	T9ATrLtRC1	4	1.53E-08
P09	T9ATrLtRC1Ch	5	8.22E-10
P10	T9ATrLtRC1Rs	6	0.00E+00
P11	T9ATrLtRC1Qs	6	1.89E-08
P12	T9ATrLtRC1RC3	7	0.00E+00
P13	T9ATrO	OK	
P14	T9ATrOH1	21	3.88E-07
P15	T9ATrOCh	22	0.00E+00
P16	T9ATrORs	23	9.42E-10
P17	T9ATrOD1	20	3.07E-07
P18	T9ATrOD1H1	21	0.00E+00
P19	T9ATrOD1Ch	22	1.69E-08
P20	T9ATrOD1Rs	23	0.00E+00
P21	T9ATrOD1Qs	23	8.77E-09
P22	T9ATrORC1	18	2.01E-08
P23	T9ATrORC1Ch	18	0.00E+00
P24	T9ATrORC1Rs	18	0.00E+00
P25	T9ATrORC1Qs	18	0.00E+00
P26	T9ATrORC1RC3	19	0.00E+00

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T9ATr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T9A LOSS OF 4160 V BUS 1H EVENT TREE

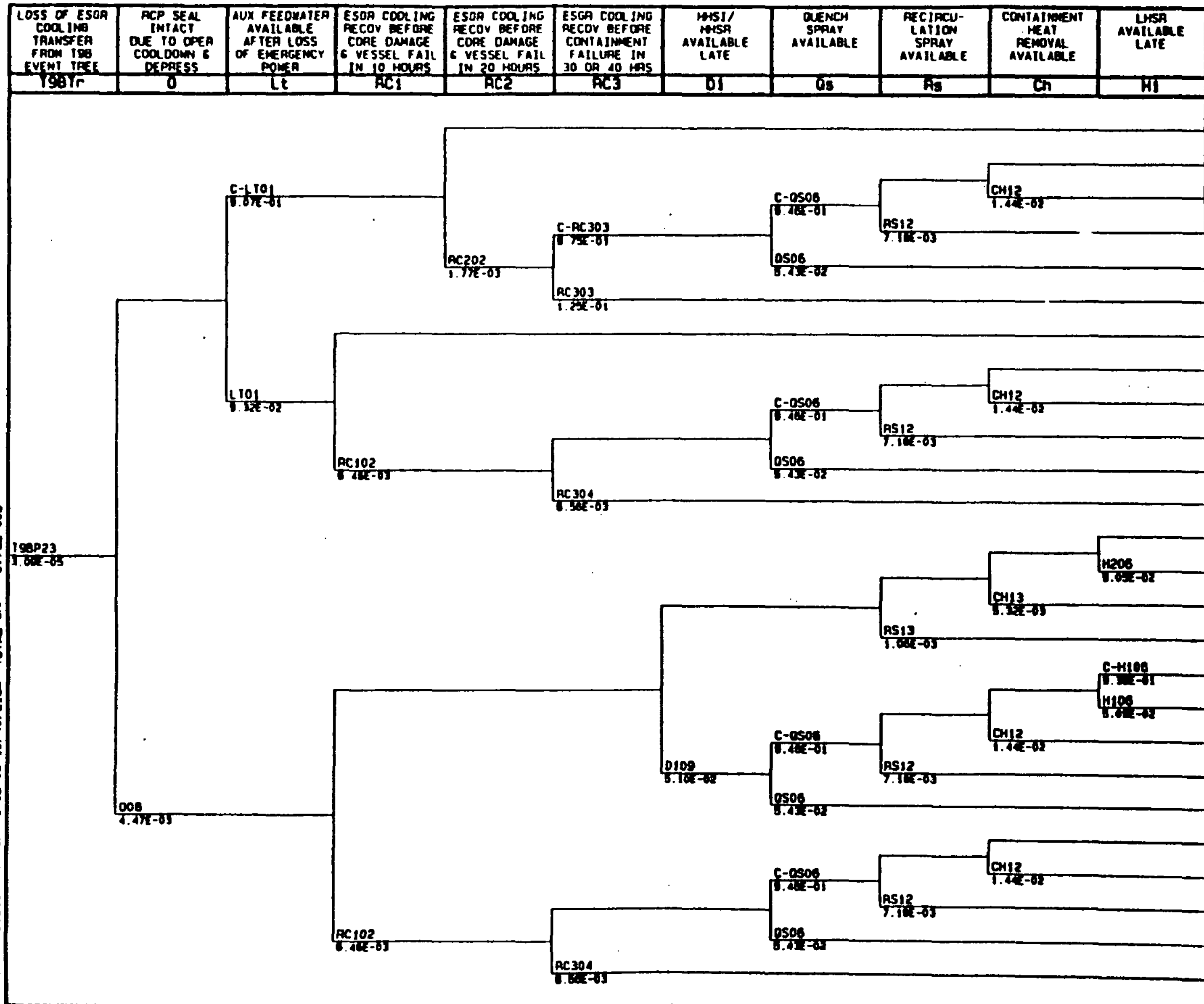


SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	T9B	OK	
P02	T9BL	8	2.37E-07
P03	T9BLH1	9	1.15E-08
P04	T9BLCh	10	5.44E-10
P05	T9BLRs	11	1.26E-10
P06	T9BLQs	11	1.78E-08
P07	T9BQ	TR	3.08E-08S2
P08	T9BQCh	1	1.06E-10
P09	T9BQRs	2	2.16E-11
P10	T9BQH2	21	1.79E-07
P11	T9BQH2Ch	22	0.00E+00
P12	T9BQH2Rs	23	3.47E-11
P13	T9BQD1	20	1.30E-07
P14	T9BQD1H1	21	5.66E-10
P15	T9BQD1Ch	22	0.00E+00
P16	T9BQD1Rs	23	2.36E-11
P17	T9BQD1Qs	23	4.31E-09
P18	T9BQL	20	1.40E-11
P19	T9BQLH1	21	0.00E+00
P20	T9BQLCh	22	0.00E+00
P21	T9BQLRs	23	0.00E+00
P22	T9BQLQs	23	0.00E+00
P23	T9BHv	TR	3.09E-05T8
P24	T9BK	TR	3.18E-08TH

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

T9B: LOSS OF EMERGENCY POWER 4160 V BUS 1J EVENT TREE

C:\NAPS\ETREES\OLDTREES\T9BTR.EVT 1:00:02am 12-15-92 NUPRA 2.1a VPNR
Quantification Date: 3-12-93 10:40:21am TOTAL CMF = 6.78E-008

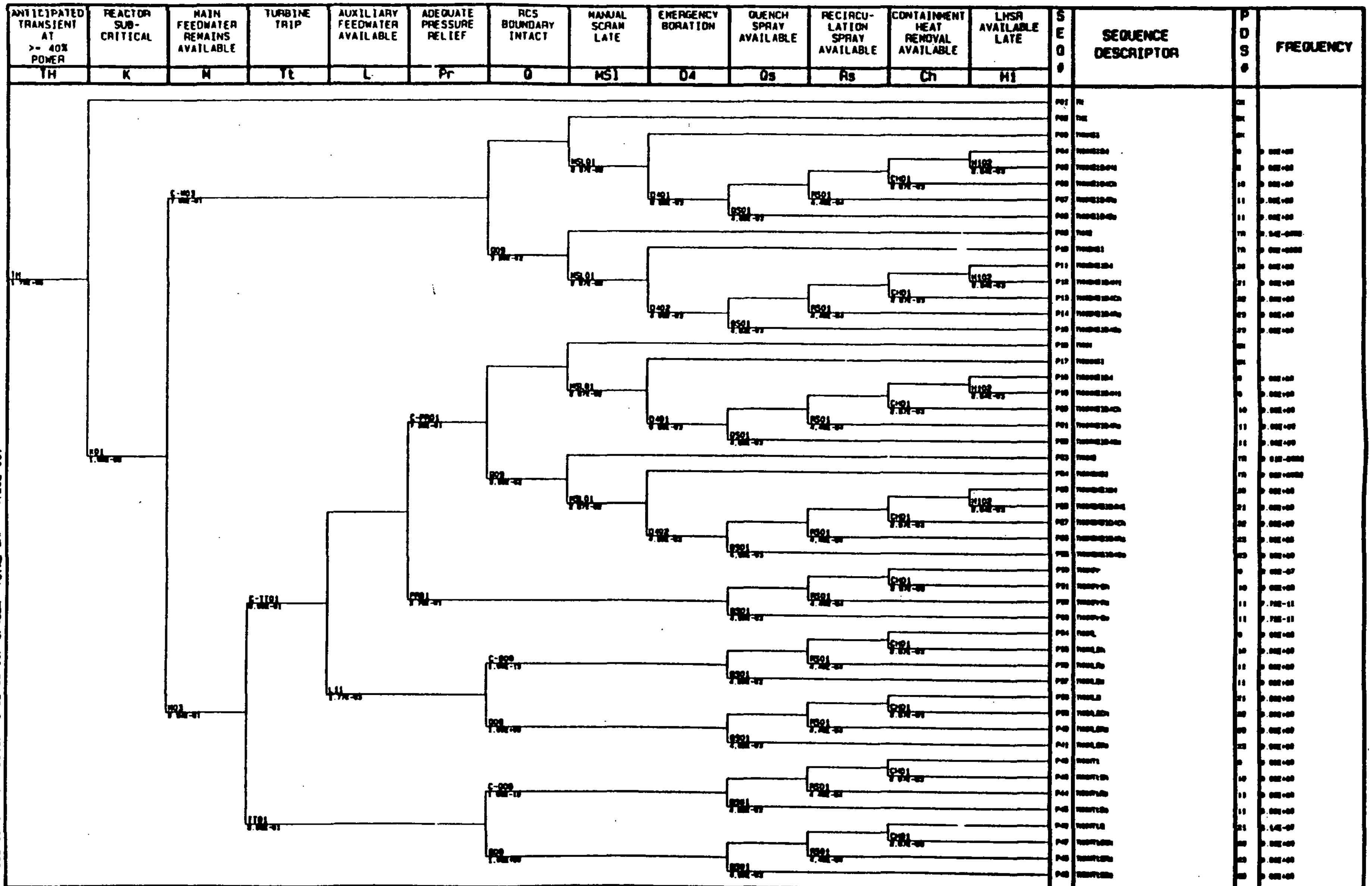


SEQ #	SEQUENCE DESCRIPTOR	POS #	FREQUENCY
P01	T9BTr	OK	
P02	T9BTrRC2	4	0.00E+00
P03	T9BTrRC2Ch	5	1.09E-08
P04	T9BTrRC2Rs	6	0.00E+00
P05	T9BTrRC2Qs	6	0.00E+00
P06	T9BTrRC2RC3	7	2.71E-09
P07	T9BTrLt	OK	
P08	T9BTrLtRC1	4	0.00E+00
P09	T9BTrLtRC1Ch	5	1.05E-09
P10	T9BTrLtRC1Rs	6	0.00E+00
P11	T9BTrLtRC1Qs	6	0.00E+00
P12	T9BTrLtRC1RC3	7	0.00E+00
P13	T9BTrO	OK	
P14	T9BTrOH1	21	2.53E-08
P15	T9BTrOCh	22	0.00E+00
P16	T9BTrORs	23	1.67E-10
P17	T9BTrOD1	20	1.78E-08
P18	T9BTrOD1H1	21	0.00E+00
P19	T9BTrOD1Ch	22	0.00E+00
P20	T9BTrOD1Rs	23	0.00E+00
P21	T9BTrOD1Qs	23	0.00E+00
P22	T9BTrORC1	18	2.08E-09
P23	T9BTrORC1Ch	18	0.00E+00
P24	T9BTrORC1Rs	18	0.00E+00
P25	T9BTrORC1Qs	18	0.00E+00
P26	T9BTrORC1RC3	19	0.00E+00

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

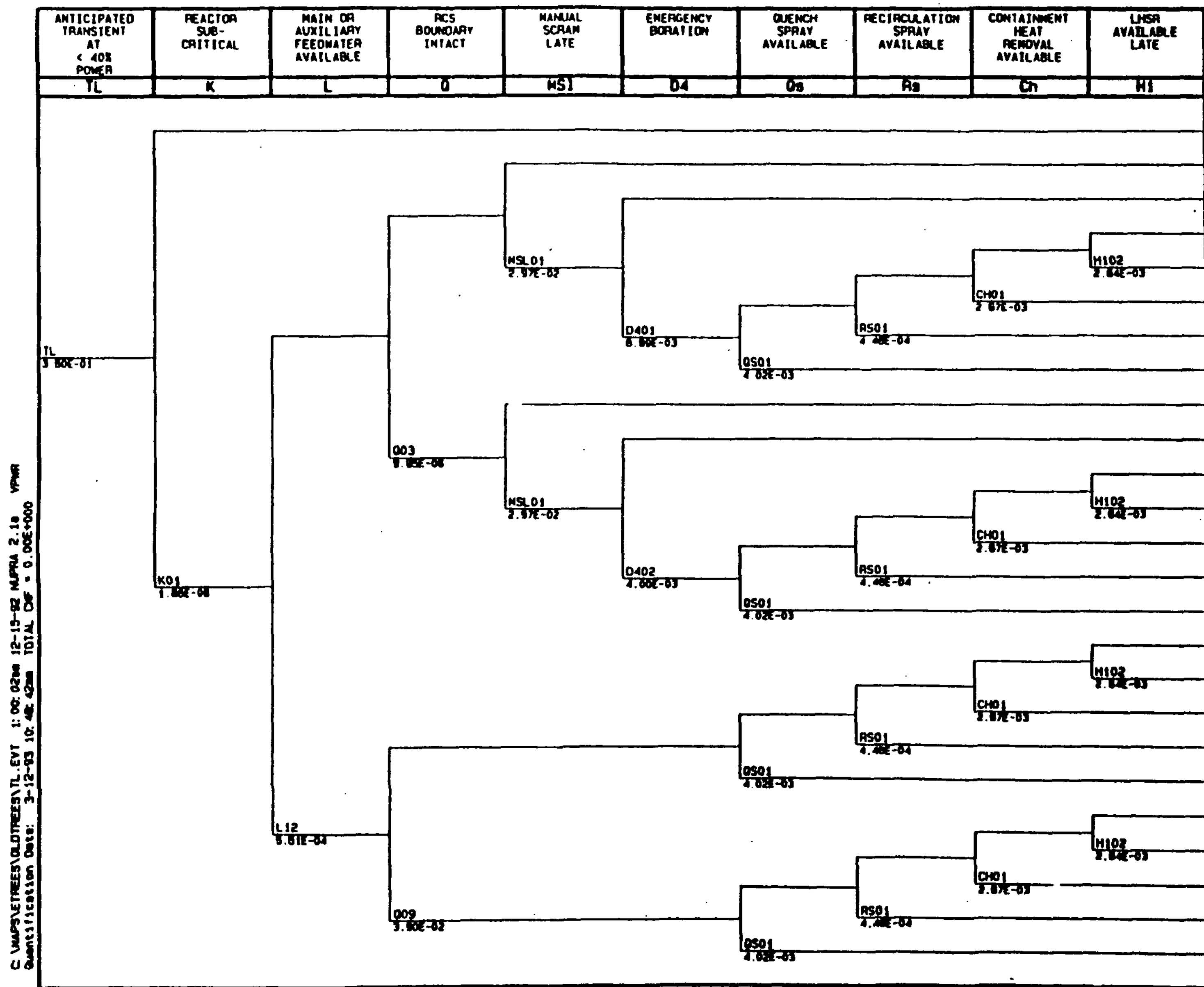
T9BTr: LOSS OF EMERGENCY SWITCHGEAR ROOM COOLING TRANSFER FROM T9B LOSS OF 4160 V BUS 1J EVENT TREE

C:\NAPS\ETREES\OLDTREES\TH.EVT 1:00:02am 12-15-92 NUPRA 2.1a VPNR
Quantification Date: 3-12-93 10:45:45am TOTAL CDF = 4.20E-007



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

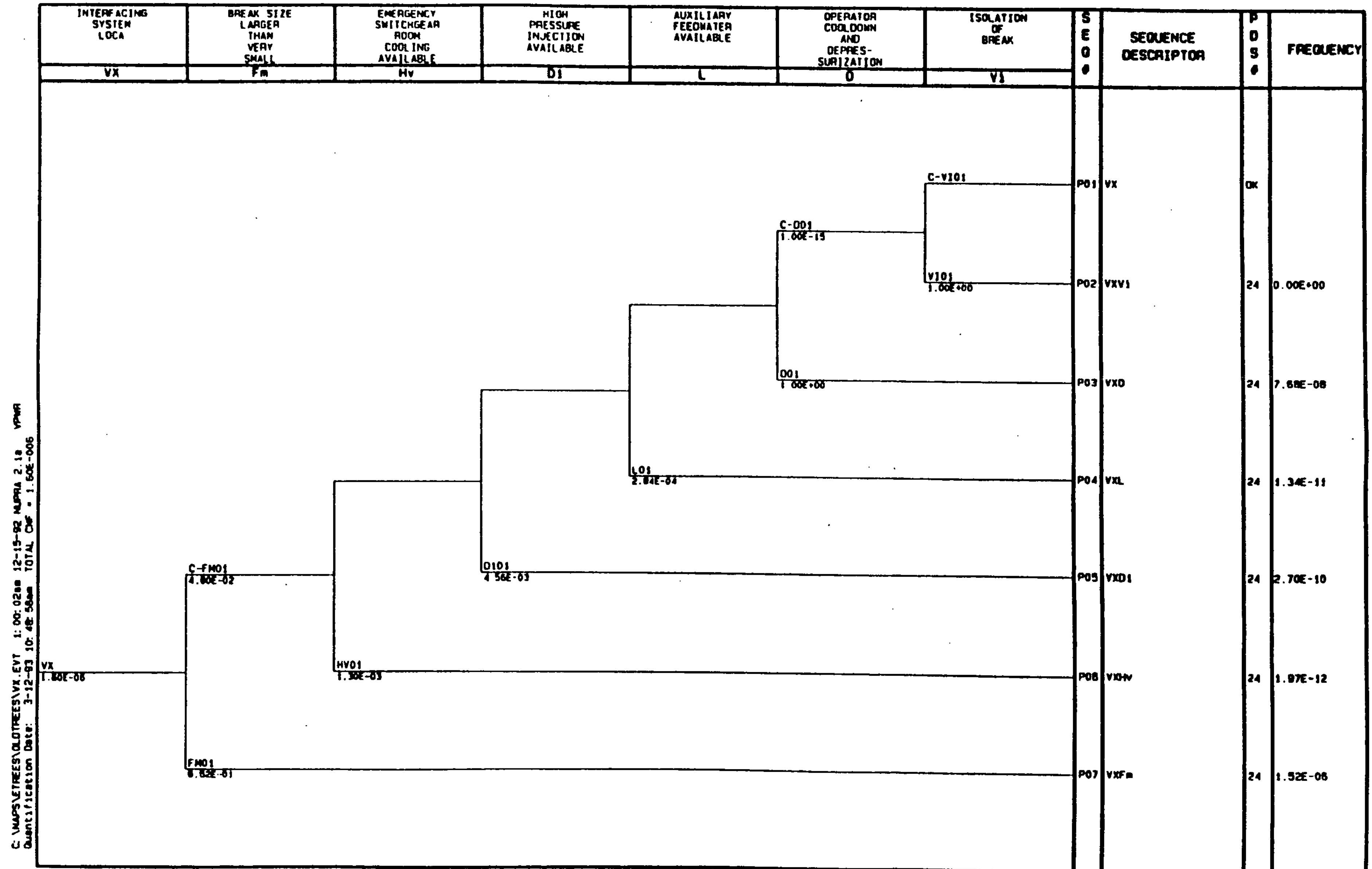
TH: HIGH POWER ATWS EVENT TREE
(ANTICIPATED TRANSIENT WITHOUT SCRAM AT 40% OR MORE POWER)



SEQ #	SEQUENCE DESCRIPTOR	PDS #	FREQUENCY
P01	TL	OK	
P02	TLK	OK	
P03	TLKMSI	OK	
P04	TLKMSID4	8	0.00E+00
P05	TLKMSID4H1	9	0.00E+00
P06	TLKMSID4Ch	10	0.00E+00
P07	TLKMSID4Rs	11	0.00E+00
P08	TLKMSID4Qs	11	0.00E+00
P09	TLKQ	TR	0.00E+0052
P10	TLKQMSI	TR	0.00E+0052
P11	TLKQMSID4	20	0.00E+00
P12	TLKQMSID4H1	21	0.00E+00
P13	TLKQMSID4Ch	22	0.00E+00
P14	TLKQMSID4Rs	23	0.00E+00
P15	TLKQMSID4Qs	23	0.00E+00
P16	TLKL	8	0.00E+00
P17	TLKLH1	9	0.00E+00
P18	TLKLCh	10	0.00E+00
P19	TLKLRs	11	0.00E+00
P20	TLKLQs	11	0.00E+00
P21	TLKLQ	20	0.00E+00
P22	TLKLQH1	21	0.00E+00
P23	TLKLQCh	22	0.00E+00
P24	TLKLQRs	23	0.00E+00
P25	TLKLQQs	23	0.00E+00

NORTH ANNA INDIVIDUAL PLANT EXAMINATION

TL: LOW POWER ATWS EVENT TREE
(ANTICIPATED TRANSIENT WITHOUT SCRAM, LESS THA[illegible] POWER)



NORTH ANNA INDIVIDUAL PLANT EXAMINATION

VX: INTERFACING SYSTEM LOCA EVENT TREE

AUXILIARY FEEDWATER SYSTEM FAULT TREE
FROM NORTH ANA IPE

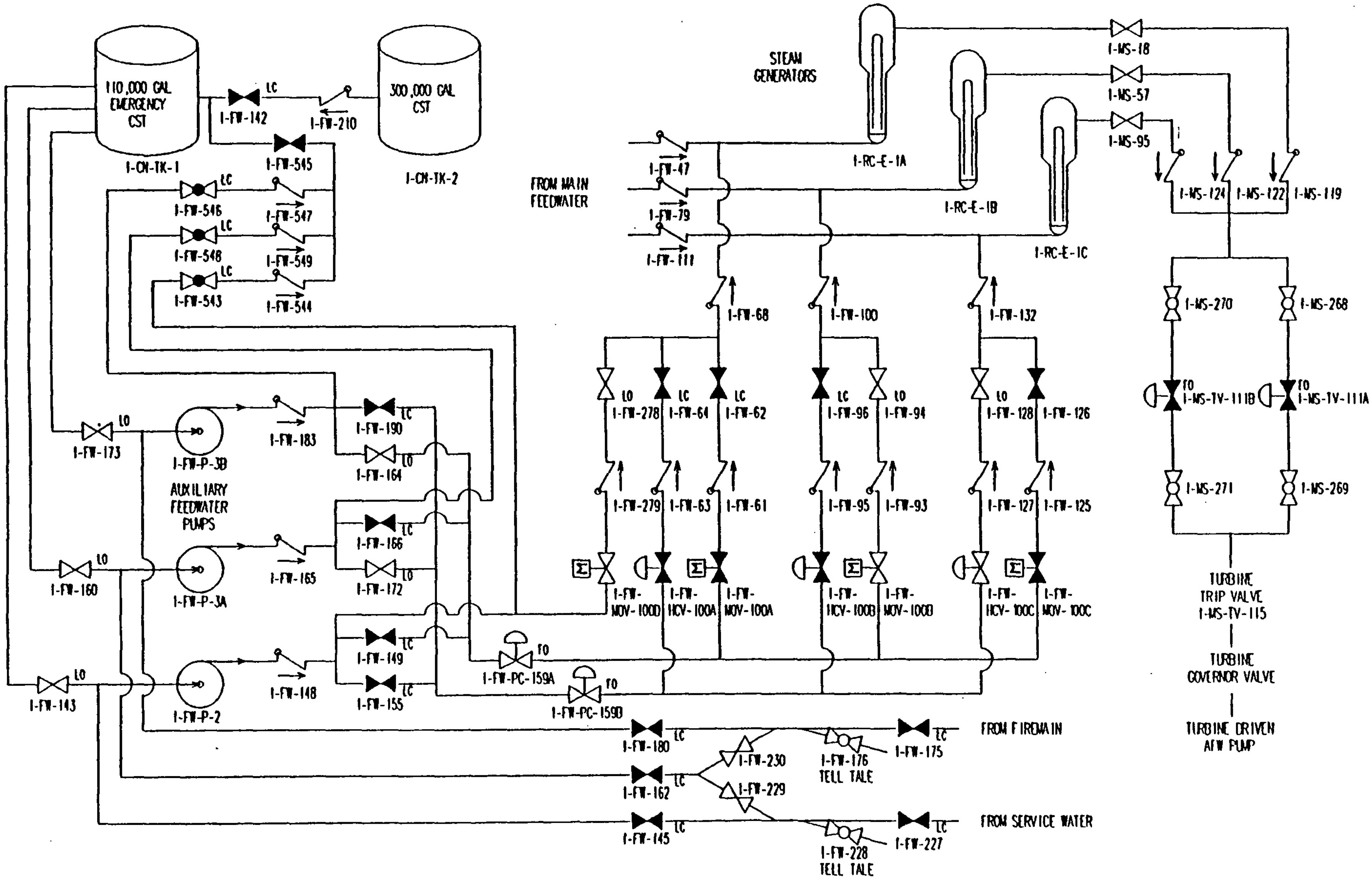
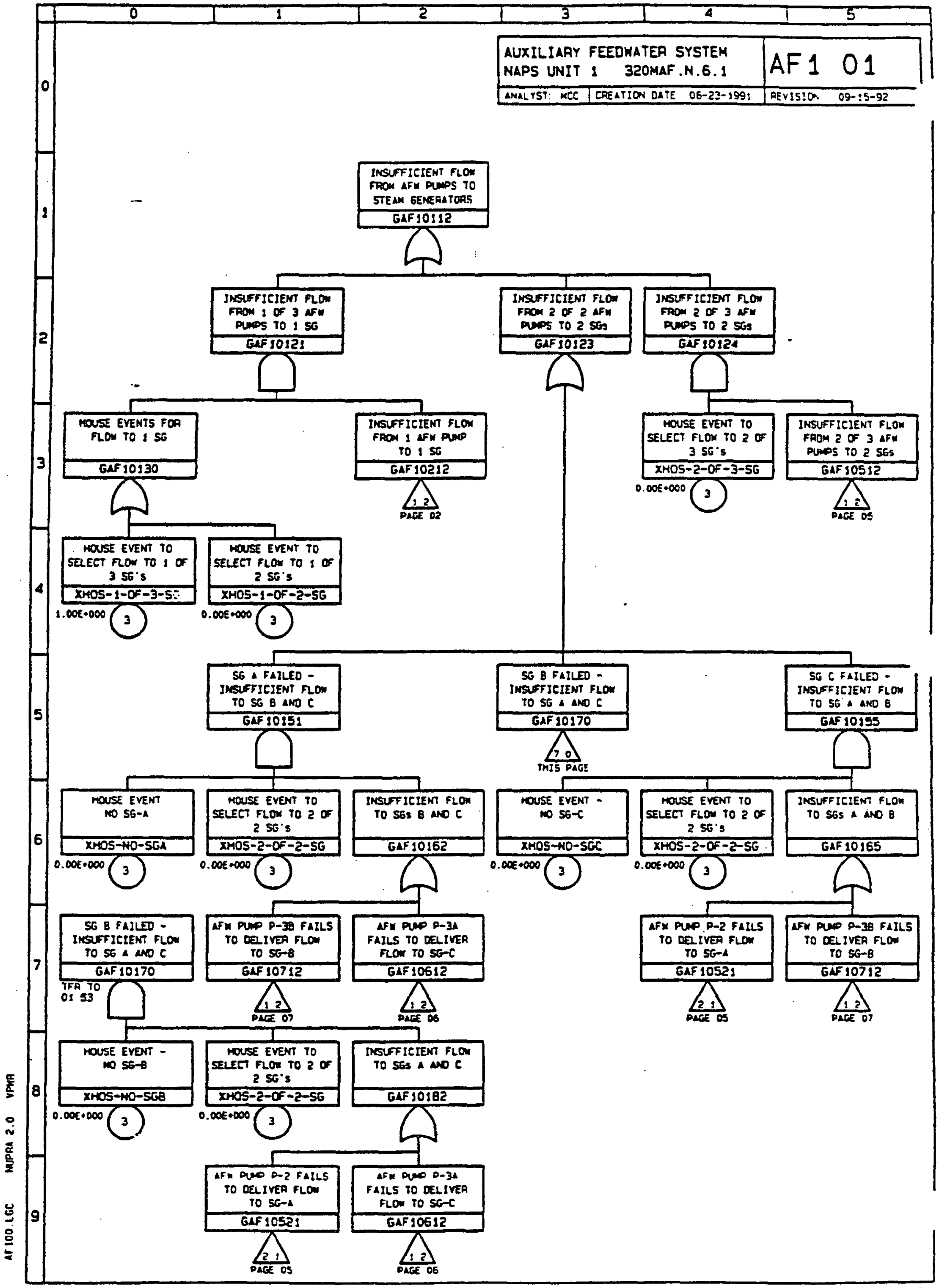
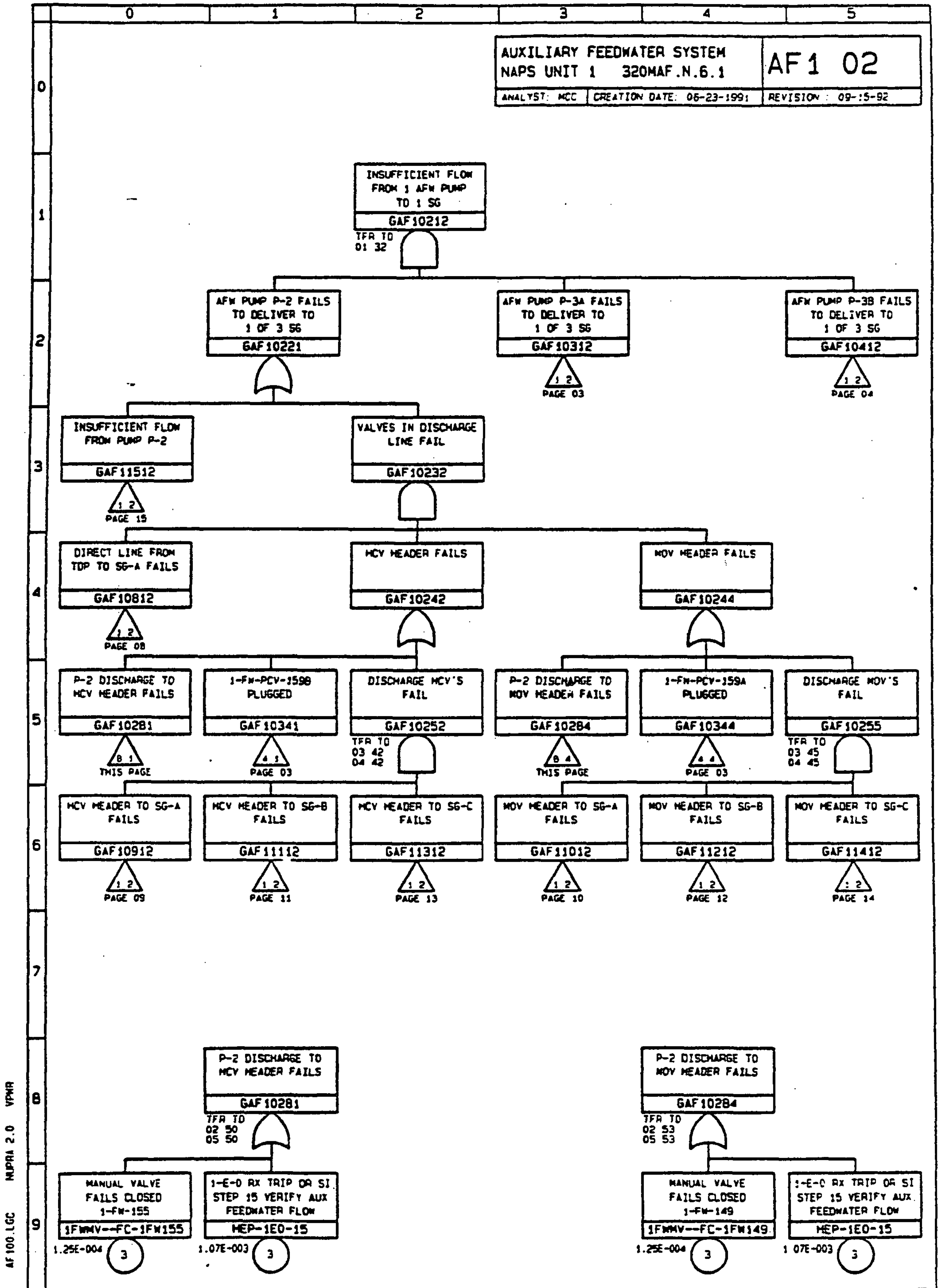
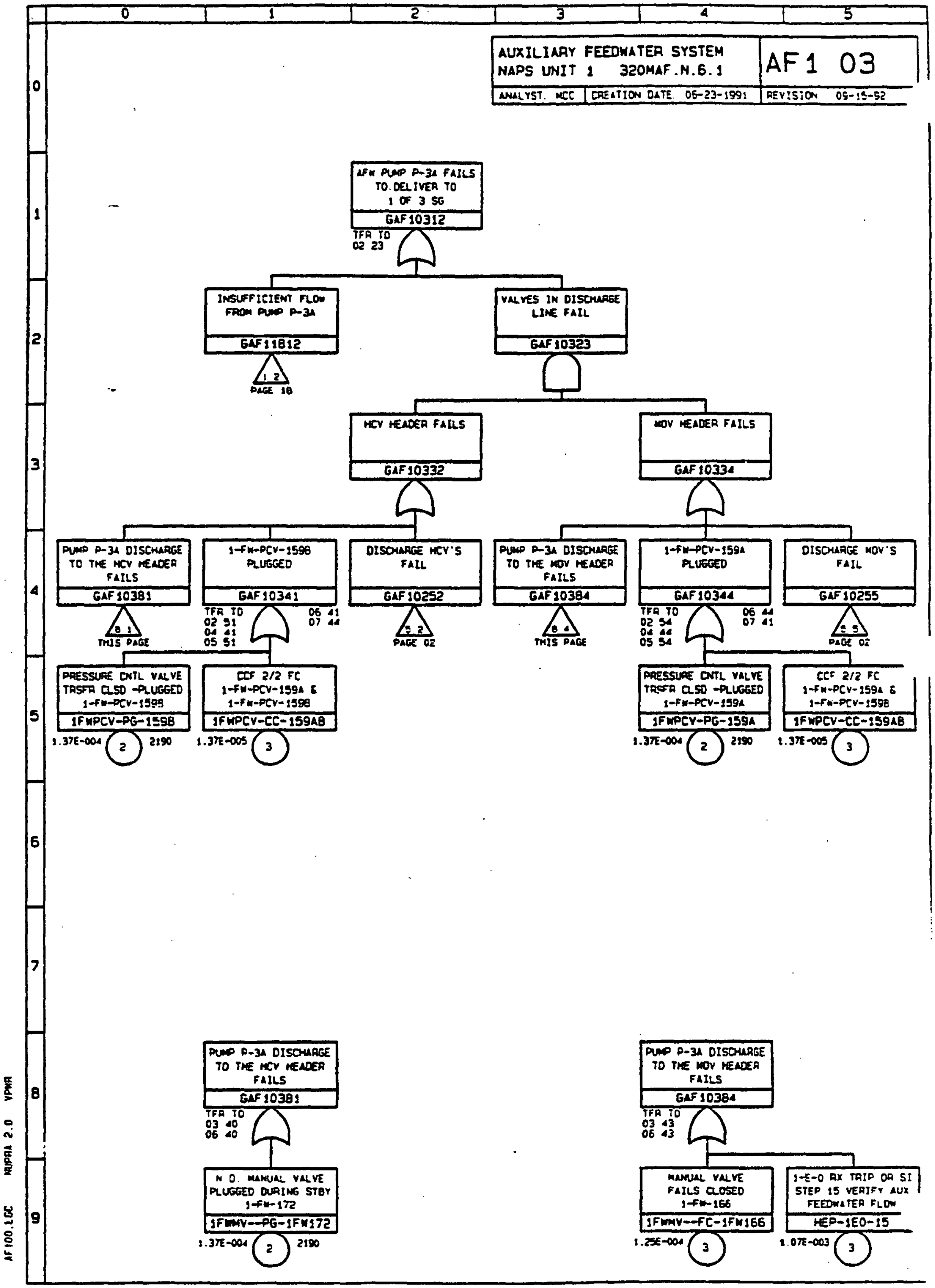


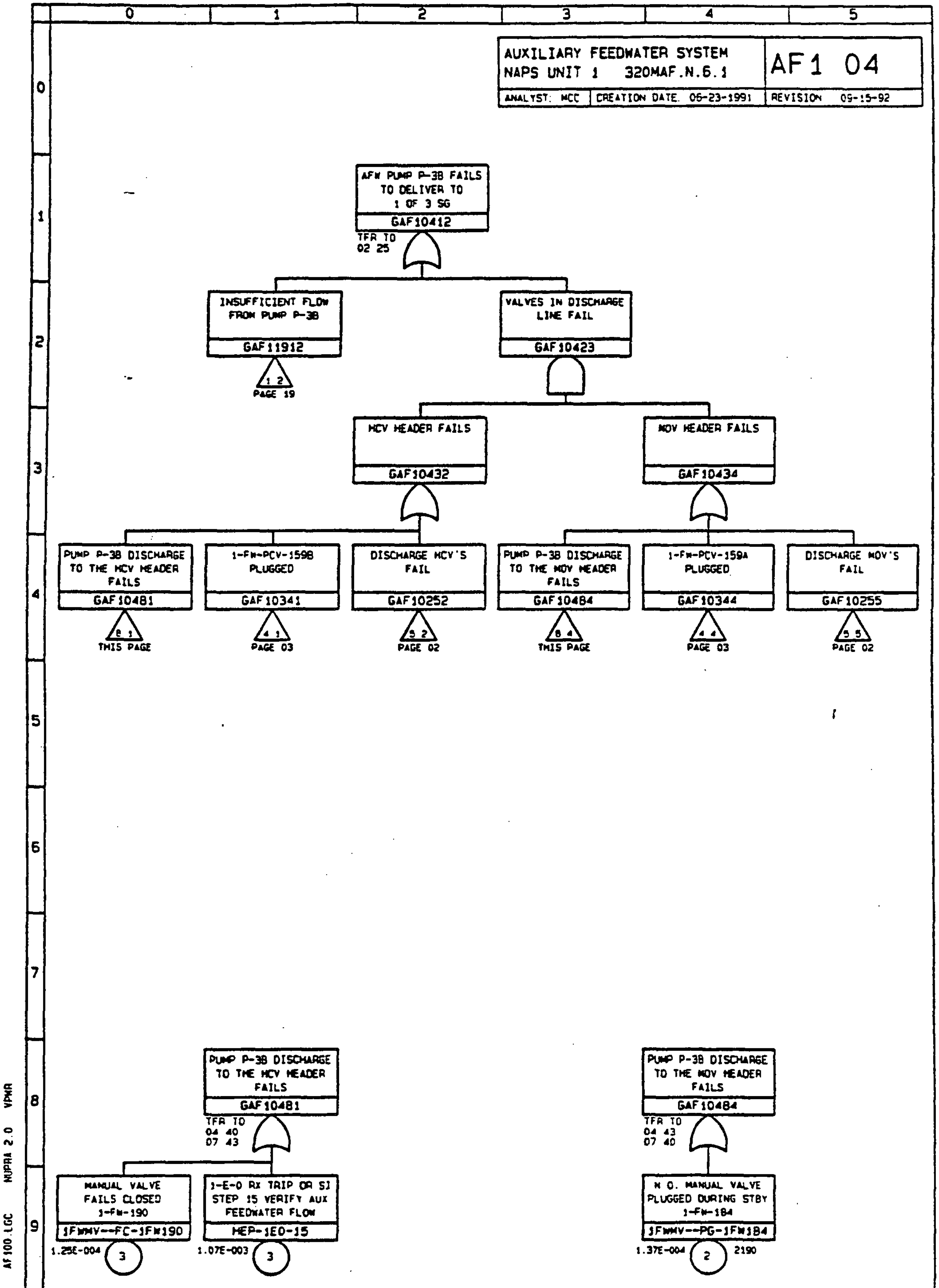
FIGURE A.13-1
AUXILIARY FEEDWATER SYSTEM


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 01
ANALYST: MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
INSUFFICIENT FLOW FROM AFW PUMPS TO STEAM GENERATORS GAF10112
INSUFFICIENT FLOW FROM 1 OF 3 AFW PUMPS TO 1 SG GAF10121
INSUFFICIENT FLOW FROM 2 OF 2 AFW PUMPS TO 2 SGs GAF10123
INSUFFICIENT FLOW FROM 2 OF 3 AFW PUMPS TO 2 SGs GAF10124
HOUSE EVENTS FOR FLOW TO 1 SG GAF10130
INSUFFICIENT FLOW FROM 1 AFW PUMP TO 1 SG GAF10212
PAGE 02
HOUSE EVENT TO SELECT FLOW TO 2 OF 3 SG's XHOS-2-OF-3-SG
0.00E+000
INSUFFICIENT FLOW FROM 2 OF 3 AFW PUMPS TO 2 SGs GAF10512
PAGE 05
HOUSE EVENT TO SELECT FLOW TO 1 OF 3 SG's XHOS-1-OF-3-SG
1.00E+000
HOUSE EVENT TO SELECT FLOW TO 1 OF 2 SG's XHOS-1-OF-2-SG
0.00E+000
SG A FAILED - INSUFFICIENT FLOW TO SG B AND C GAF10151
SG B FAILED - INSUFFICIENT FLOW TO SG A AND C GAF10170
THIS PAGE
SG C FAILED - INSUFFICIENT FLOW TO SG A AND B GAF10155
HOUSE EVENT NO SG-A XHOS-NO-SGA
0.00E+000
HOUSE EVENT TO SELECT FLOW TO 2 OF 2 SG's XHOS-2-OF-2-SG
0.00E+000
INSUFFICIENT FLOW TO SGs B AND C GAF10162
HOUSE EVENT - NO SG-C XHOS-NO-SGC
0.00E+000
HOUSE EVENT TO SELECT FLOW TO 2 OF 2 SG's XHOS-2-OF-2-SG
0.00E+000
INSUFFICIENT FLOW TO SGs A AND B GAF10165
SG B FAILED - INSUFFICIENT FLOW TO SG A AND C GAF10170
TFR TO 01 53
AFW PUMP P-3B FAILS TO DELIVER FLOW TO SG-B GAF10712
PAGE 07
AFW PUMP P-3A FAILS TO DELIVER FLOW TO SG-C GAF10612
PAGE 06
AFW PUMP P-2 FAILS TO DELIVER FLOW TO SG-A GAF10521
PAGE 05
AFW PUMP P-3B FAILS TO DELIVER FLOW TO SG-B GAF10712
PAGE 07
HOUSE EVENT - NO SG-B XHOS-NO-SGB
0.00E+000
HOUSE EVENT TO SELECT FLOW TO 2 OF 2 SG's XHOS-2-OF-2-SG
0.00E+000
INSUFFICIENT FLOW TO SGs A AND C GAF10182
AFW PUMP P-2 FAILS TO DELIVER FLOW TO SG-A GAF10521
PAGE 05
AFW PUMP P-3A FAILS TO DELIVER FLOW TO SG-C GAF10612
PAGE 06
AF100.LGC NUPRA 2.0 VPHR

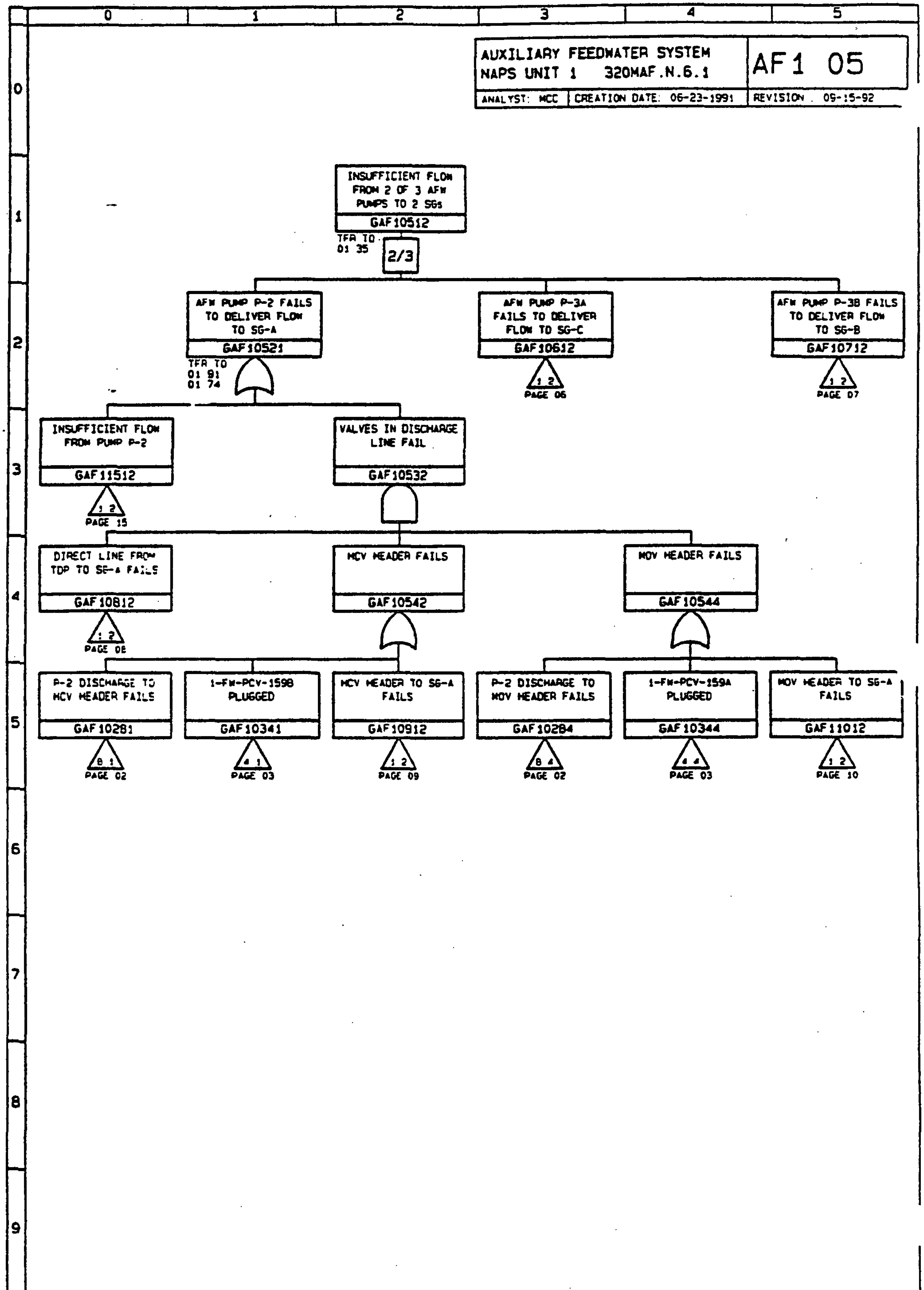

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 02
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION: 09-15-92
INSUFFICIENT FLOW FROM 1 AFW PUMP TO 1 SG
GAF10212
TFR TO 01 32
AFW PUMP P-2 FAILS TO DELIVER TO 1 OF 3 SG
GAF10221
AFW PUMP P-3A FAILS TO DELIVER TO 1 OF 3 SG
GAF10312
PAGE 03
AFW PUMP P-3B FAILS TO DELIVER TO 1 OF 3 SG
GAF10412
PAGE 04
INSUFFICIENT FLOW FROM PUMP P-2
GAF11512
PAGE 15
VALVES IN DISCHARGE LINE FAIL
GAF10232
DIRECT LINE FROM TDP TO SG-A FAILS
GAF10812
PAGE 08
HCV HEADER FAILS
GAF10242
MOV HEADER FAILS
GAF10244
P-2 DISCHARGE TO HCV HEADER FAILS
GAF10281
THIS PAGE
1-FW-PCV-159B PLUGGED
GAF10341
PAGE 03
DISCHARGE HCV'S FAIL
GAF10252
TFR TO 03 42 04 42
P-2 DISCHARGE TO MOV HEADER FAILS
GAF10284
THIS PAGE
1-FW-PCV-159A PLUGGED
GAF10344
PAGE 03
DISCHARGE MOV'S FAIL
GAF10255
TFR TO 03 45 04 45
HCV HEADER TO SG-A FAILS
GAF10912
PAGE 09
HCV HEADER TO SG-B FAILS
GAF11112
PAGE 11
HCV HEADER TO SG-C FAILS
GAF11312
PAGE 13
MOV HEADER TO SG-A FAILS
GAF11012
PAGE 10
MOV HEADER TO SG-B FAILS
GAF11212
PAGE 12
MOV HEADER TO SG-C FAILS
GAF11412
PAGE 14
P-2 DISCHARGE TO HCV HEADER FAILS
GAF10281
TFR TO 02 50 05 50
P-2 DISCHARGE TO MOV HEADER FAILS
GAF10284
TFR TO 02 53 05 53
MANUAL VALVE FAILS CLOSED 1-FW-155
1FWMV--FC-1FW155
1.25E-004
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
MANUAL VALVE FAILS CLOSED 1-FW-149
1FWMV--FC-1FW149
1.25E-004
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
AF100.LGC NUPRA 2.0 VPWR

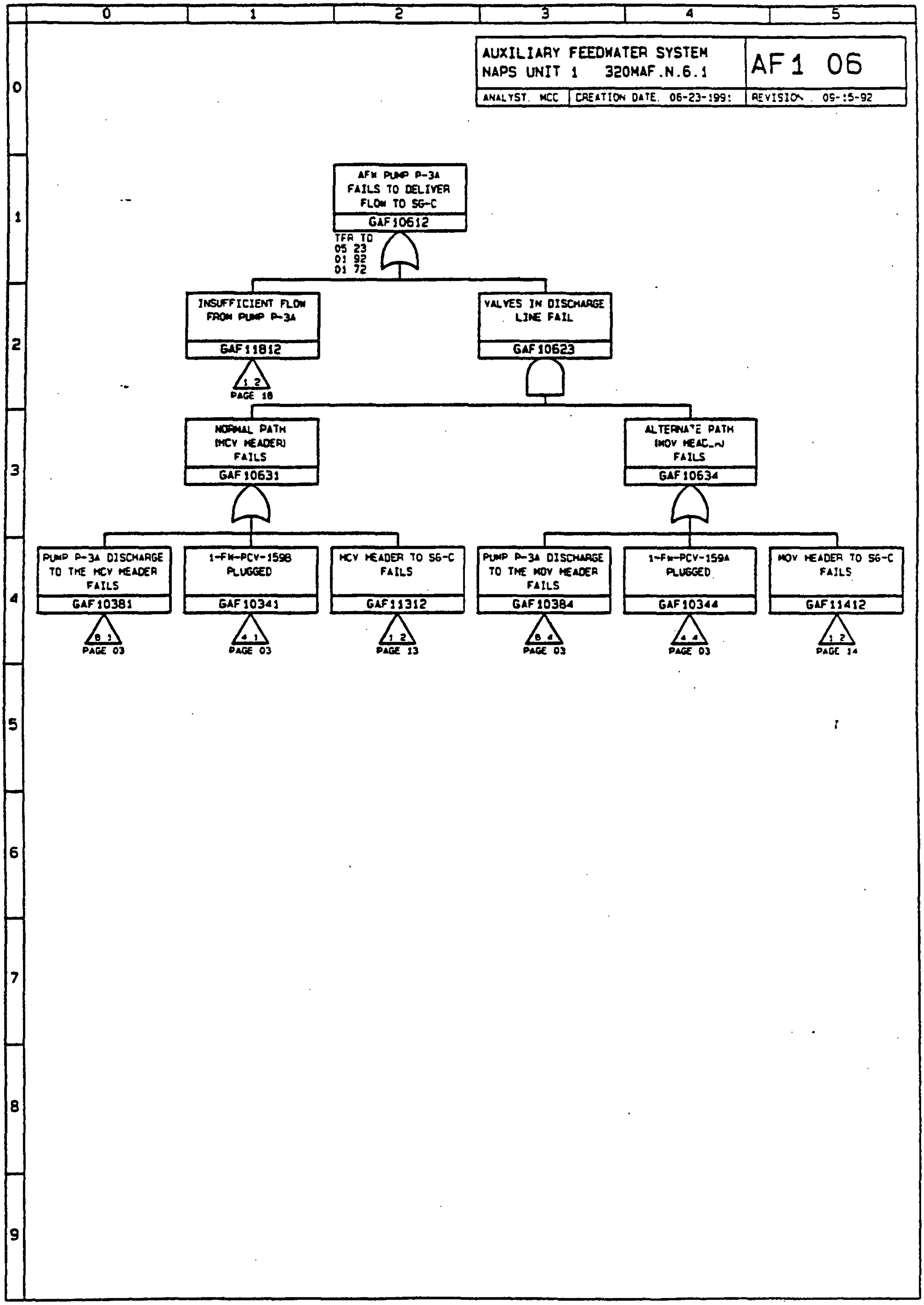


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 03
ANALYST. MCC
CREATION DATE. 06-23-1991
REVISION 09-15-92
AFW PUMP P-3A FAILS TO DELIVER TO 1 OF 3 SG
GAF10312
TFR TO 02 23
INSUFFICIENT FLOW FROM PUMP P-3A
GAF11812
PAGE 18
VALVES IN DISCHARGE LINE FAIL
GAF10323
HCV HEADER FAILS
GAF10332
MOV HEADER FAILS
GAF10334
PUMP P-3A DISCHARGE TO THE HCV HEADER FAILS
GAF10381
THIS PAGE
1-FW-PCV-159B PLUGGED
GAF10341
TFR TO 02 51 04 41 05 51 06 41 07 44
DISCHARGE HCV'S FAIL
GAF10252
PAGE 02
PUMP P-3A DISCHARGE TO THE MOV HEADER FAILS
GAF10384
THIS PAGE
1-FW-PCV-159A PLUGGED
GAF10344
TFR TO 02 54 04 44 05 54 06 44 07 41
DISCHARGE MOV'S FAIL
GAF10255
PAGE 02
PRESSURE CNTL VALVE TRSFR CLSD -PLUGGED 1-FW-PCV-159B
1FWPCV-PG-159B
1.37E-004 2 2190
CCF 2/2 FC 1-FW-PCV-159A & 1-FW-PCV-159B
1FWPCV-CC-159AB
1.37E-005 3
PRESSURE CNTL VALVE TRSFR CLSD -PLUGGED 1-FW-PCV-159A
1FWPCV-PG-159A
1.37E-004 2 2190
CCF 2/2 FC 1-FW-PCV-159A & 1-FW-PCV-159B
1FWPCV-CC-159AB
1.37E-005 3
PUMP P-3A DISCHARGE TO THE HCV HEADER FAILS
GAF10381
TFR TO 03 40 06 40
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-172
1FWMV--PG-1FW172
1.37E-004 2 2190
PUMP P-3A DISCHARGE TO THE MOV HEADER FAILS
GAF10384
TFR TO 03 43 06 43
MANUAL VALVE FAILS CLOSED 1-FW-166
1FWMV--FC-1FW166
1.25E-004 3
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003 3
AF100.1GC NUPRA 2.0 VPWR

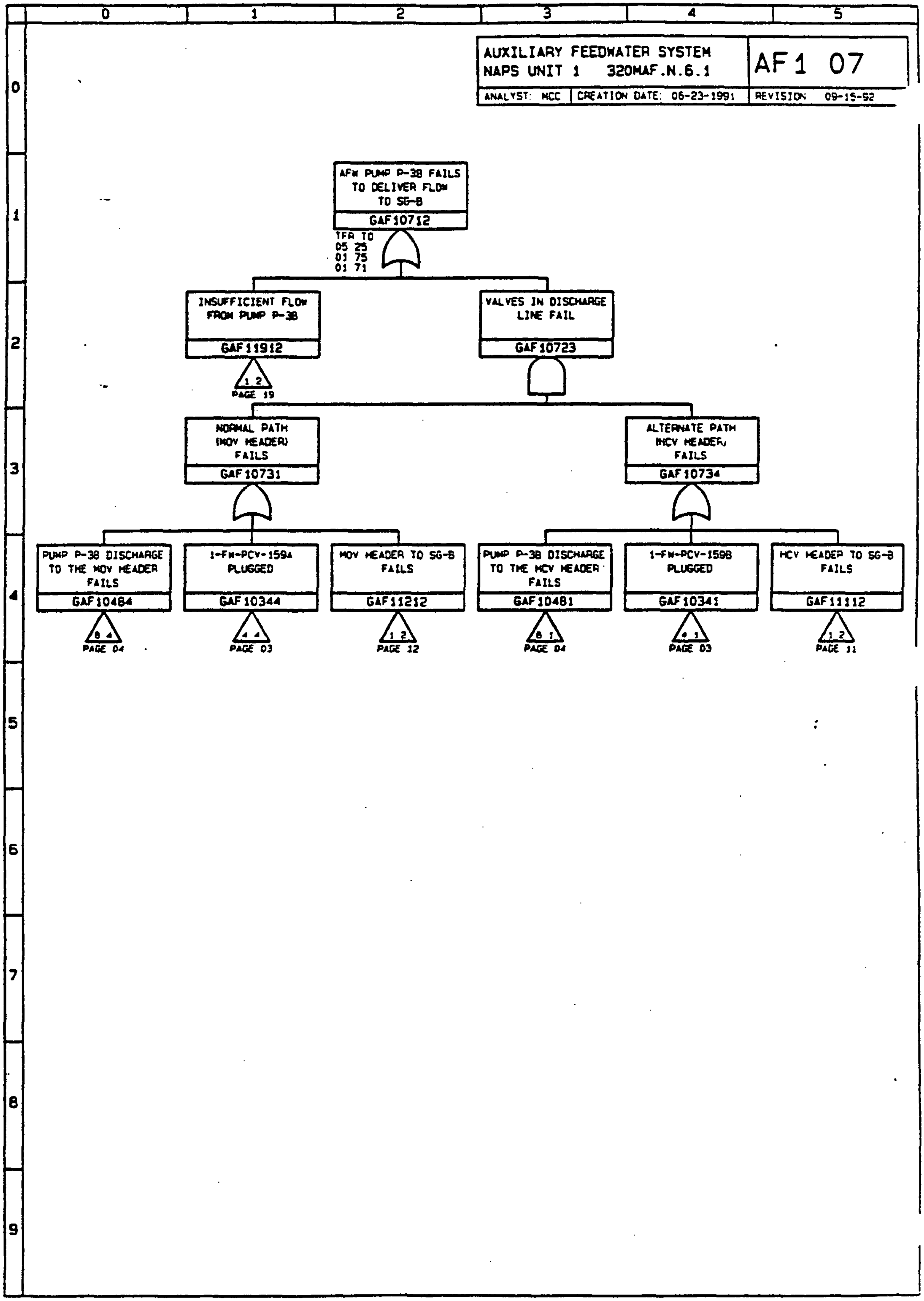


0
1
2
3
4
5
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 04
ANALYST: MCC
CREATION DATE. 06-23-1991
REVISION 09-15-92
AFW PUMP P-3B FAILS TO DELIVER TO 1 OF 3 SG
GAF10412
TFR TO 02 25
INSUFFICIENT FLOW FROM PUMP P-3B
GAF11912
1 2
PAGE 19
VALVES IN DISCHARGE LINE FAIL
GAF10423
HCV HEADER FAILS
GAF10432
MOV HEADER FAILS
GAF10434
PUMP P-3B DISCHARGE TO THE HCV HEADER FAILS
GAF10481
8 1
THIS PAGE
1-FW-PCV-159B PLUGGED
GAF10341
4 1
PAGE 03
DISCHARGE HCV'S FAIL
GAF10252
5 2
PAGE 02
PUMP P-3B DISCHARGE TO THE MOV HEADER FAILS
GAF10484
8 4
THIS PAGE
1-FW-PCV-159A PLUGGED
GAF10344
4 4
PAGE 03
DISCHARGE MOV'S FAIL
GAF10255
5 5
PAGE 02
PUMP P-3B DISCHARGE TO THE HCV HEADER FAILS
GAF10481
TFR TO 04 40 07 43
MANUAL VALVE FAILS CLOSED 1-FW-190
1FWMV--FC-1FW190
1.25E-004
3
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
3
PUMP P-3B DISCHARGE TO THE MOV HEADER FAILS
GAF10484
TFR TO 04 43 07 40
N O. MANUAL VALVE PLUGGED DURING STBY 1-FW-184
1FWMV--PG-1FW184
1.37E-004
2
2190
AF100.LGC NUPRA 2.0 VPWR

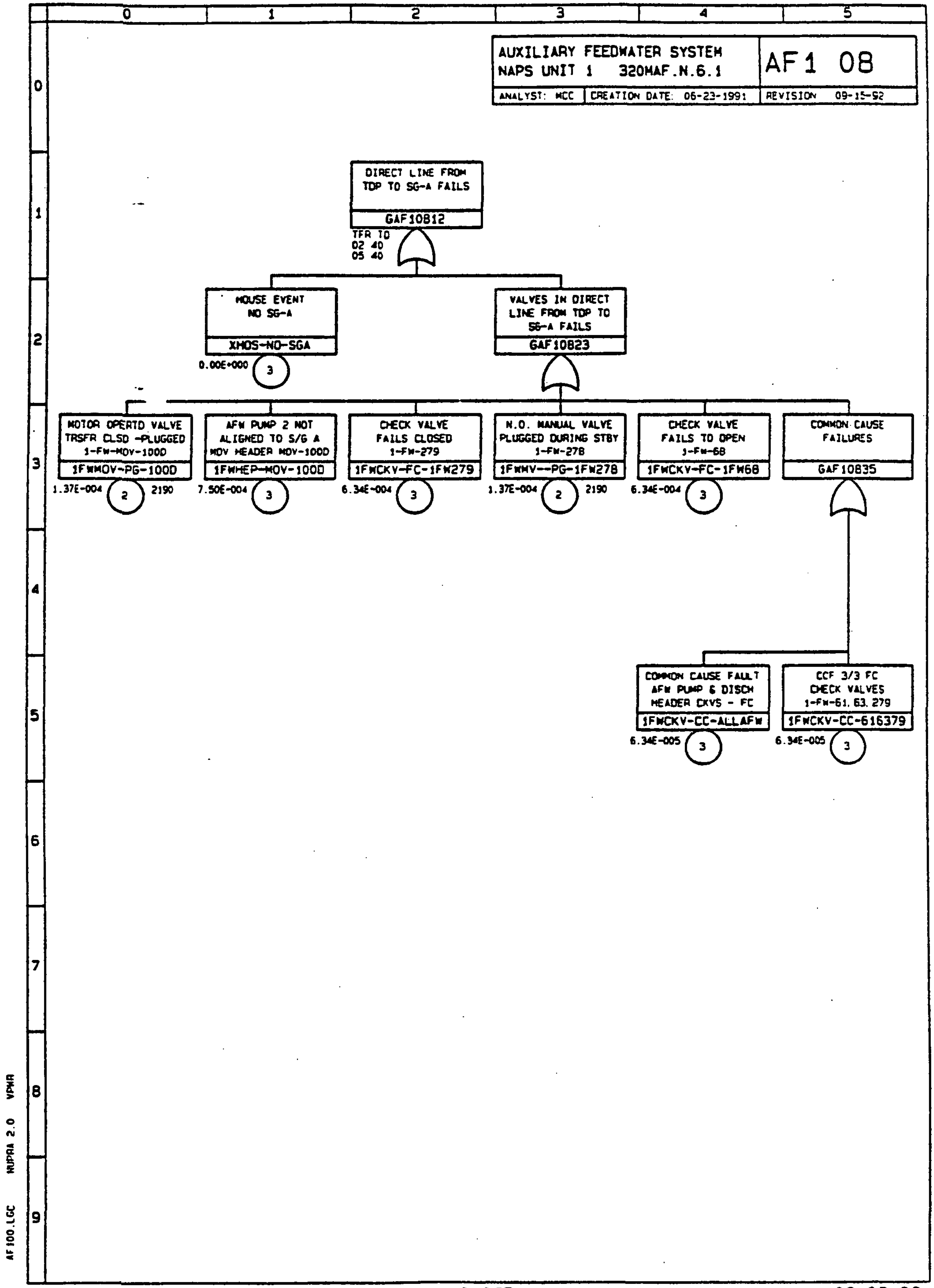

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 05
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION . 09-15-92
INSUFFICIENT FLOW FROM 2 OF 3 AFW PUMPS TO 2 SGs
GAF10512
TFR TO 01 35
2/3
AFW PUMP P-2 FAILS TO DELIVER FLOW TO SG-A
GAF10521
TFR TO 01 91 01 74
AFW PUMP P-3A FAILS TO DELIVER FLOW TO SG-C
GAF10612
PAGE 06
AFW PUMP P-3B FAILS TO DELIVER FLOW TO SG-B
GAF10712
PAGE 07
INSUFFICIENT FLOW FROM PUMP P-2
GAF11512
PAGE 15
VALVES IN DISCHARGE LINE FAIL
GAF10532
DIRECT LINE FROM TDP TO SG-A FAILS
GAF10812
PAGE 08
HCV HEADER FAILS
GAF10542
MOV HEADER FAILS
GAF10544
P-2 DISCHARGE TO HCV HEADER FAILS
GAF10281
PAGE 02
1-FW-PCV-159B PLUGGED
GAF10341
PAGE 03
HCV HEADER TO SG-A FAILS
GAF10912
PAGE 09
P-2 DISCHARGE TO MOV HEADER FAILS
GAF10284
PAGE 02
1-FW-PCV-159A PLUGGED
GAF10344
PAGE 03
MOV HEADER TO SG-A FAILS
GAF11012
PAGE 10
AF100.LGC NUPRA 2.0 VPMR

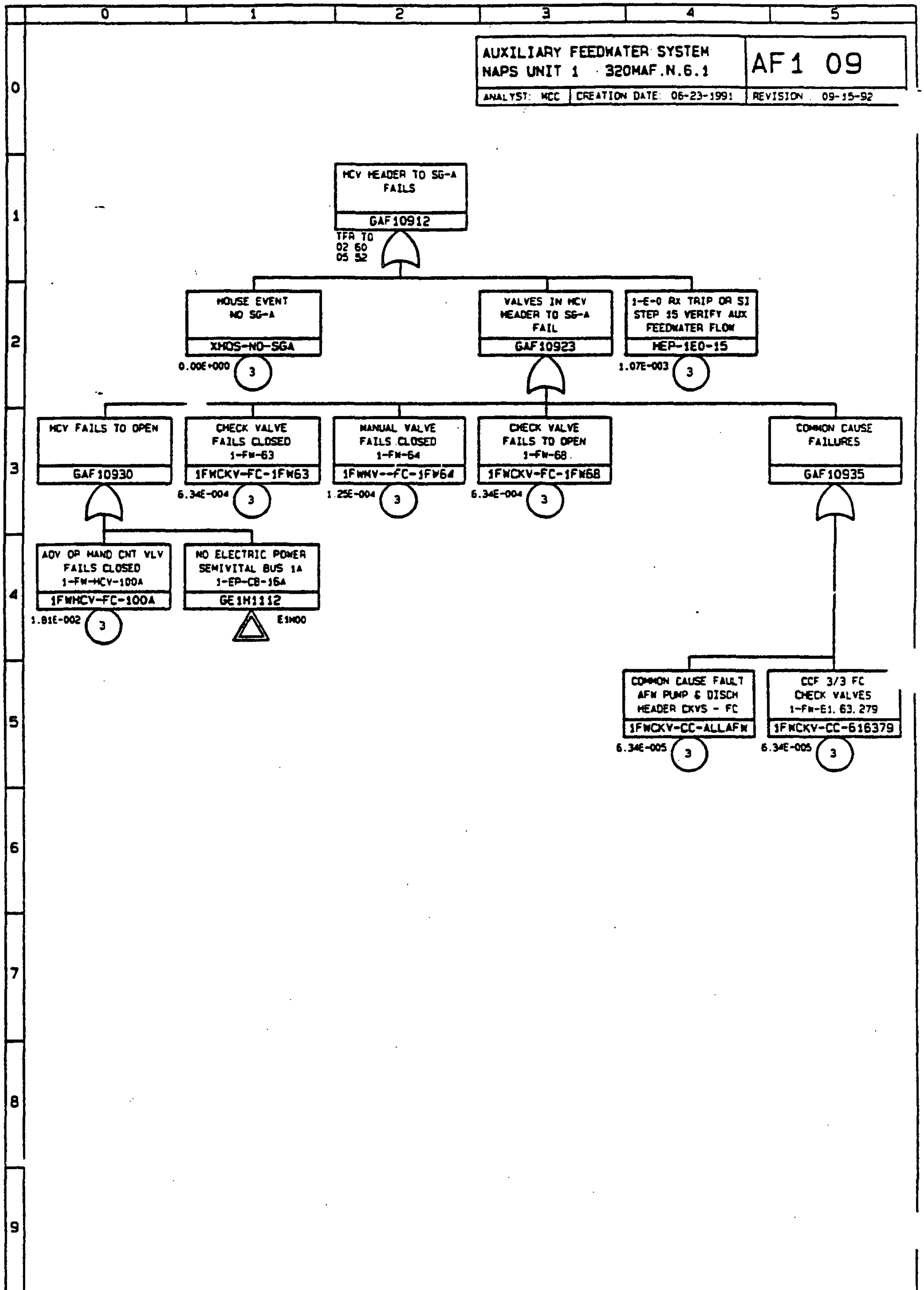


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 06
ANALYST. MCC
CREATION DATE. 06-23-1991
REVISION. 09-15-92
AFW PUMP P-3A FAILS TO DELIVER FLOW TO SG-C
GAF10612
TFR TO 05 23 01 92 01 72
INSUFFICIENT FLOW FROM PUMP P-3A
GAF11812
PAGE 18
VALVES IN DISCHARGE LINE FAIL
GAF10623
NORMAL PATH (HCV HEADER) FAILS
GAF10631
ALTERNATE PATH (MOV HEADER) FAILS
GAF10634
PUMP P-3A DISCHARGE TO THE HCV HEADER FAILS
GAF10381
PAGE 03
1-FW-PCV-159B PLUGGED
GAF10341
PAGE 03
HCV HEADER TO SG-C FAILS
GAF11312
PAGE 13
PUMP P-3A DISCHARGE TO THE MOV HEADER FAILS
GAF10384
PAGE 03
1-FW-PCV-159A PLUGGED
GAF10344
PAGE 03
MOV HEADER TO SG-C FAILS
GAF11412
PAGE 14
AF100.LGC NUPRA 2.0 VPHR

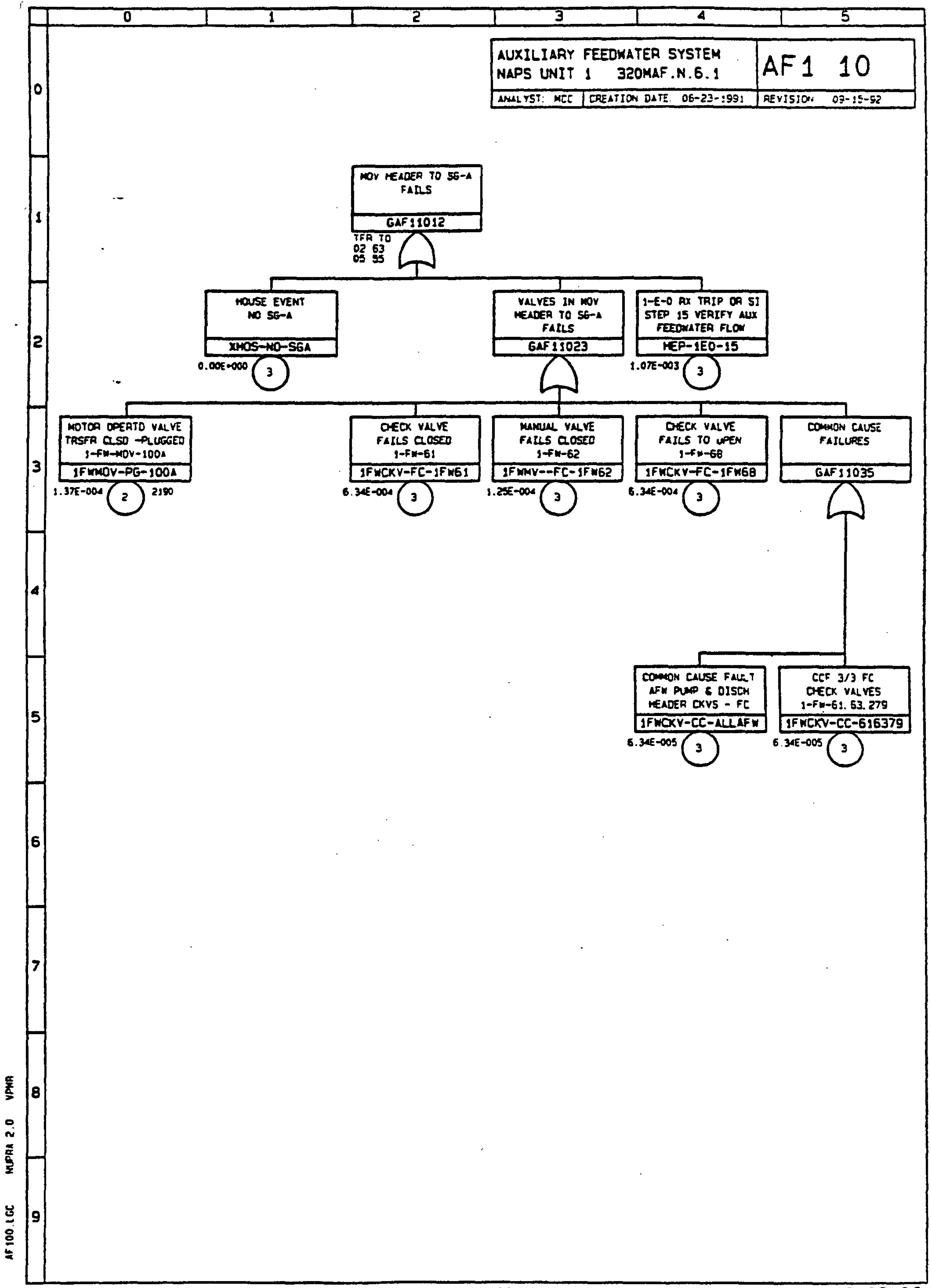


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 07
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
AFW PUMP P-3B FAILS TO DELIVER FLOW TO SG-B
GAF10712
TFR TO 05 25 01 75 01 71
INSUFFICIENT FLOW FROM PUMP P-3B
GAF11912
PAGE 19
VALVES IN DISCHARGE LINE FAIL
GAF10723
NORMAL PATH (MOV HEADER) FAILS
GAF10731
ALTERNATE PATH (HCV HEADER) FAILS
GAF10734
PUMP P-3B DISCHARGE TO THE MOV HEADER FAILS
GAF10484
PAGE 04
1-FW-PCV-159A PLUGGED
GAF10344
PAGE 03
MOV HEADER TO SG-B FAILS
GAF11212
PAGE 12
PUMP P-3B DISCHARGE TO THE HCV HEADER FAILS
GAF10481
PAGE 04
1-FW-PCV-159B PLUGGED
GAF10341
PAGE 03
HCV HEADER TO SG-B FAILS
GAF11112
PAGE 11
AF100.LGC NUPRA 2.0 VPMR

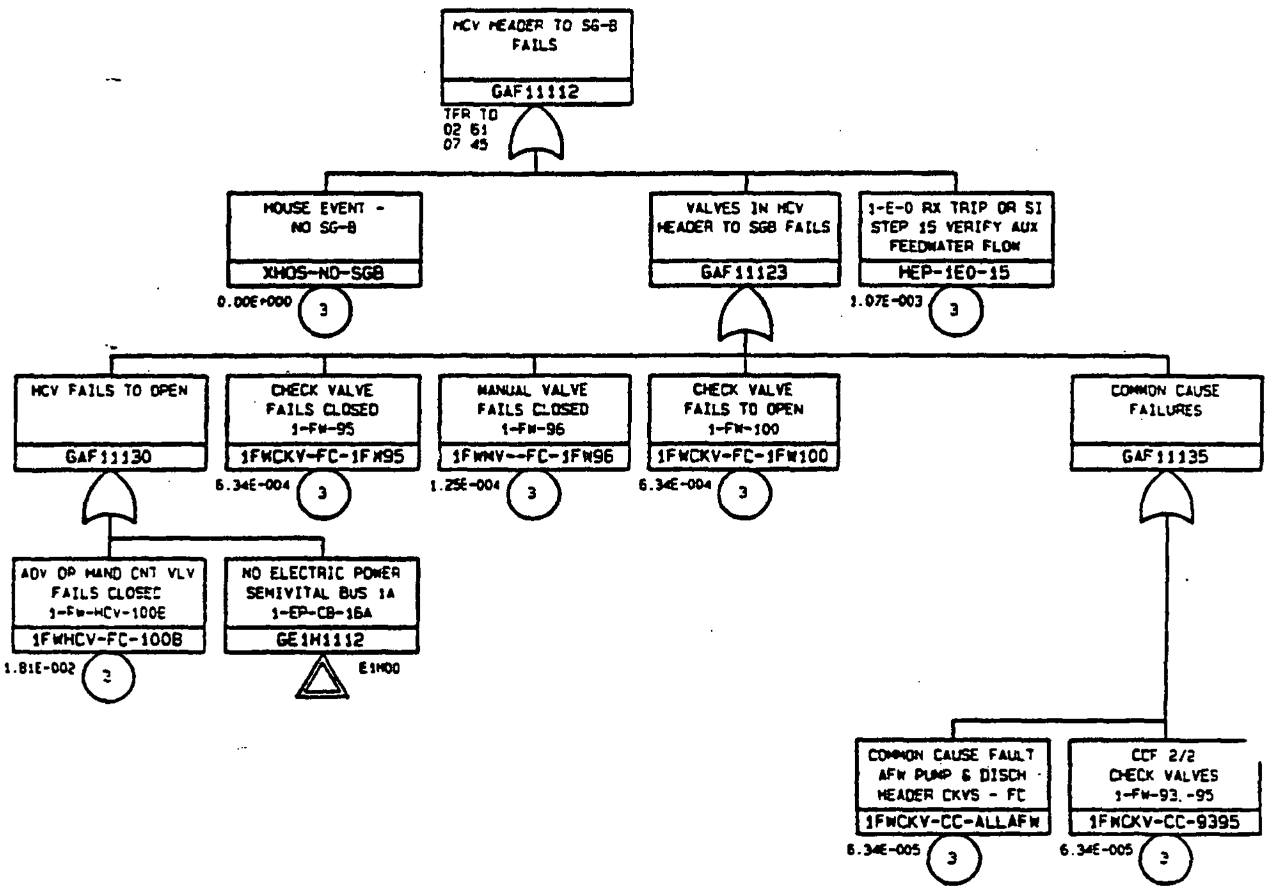

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 08
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
DIRECT LINE FROM TDP TO SG-A FAILS
GAF10812
TFR TO 02 40 05 40
HOUSE EVENT NO SG-A
XHOS-NO-SGA
0.00E+000
VALVES IN DIRECT LINE FROM TDP TO SG-A FAILS
GAF10823
MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-100D
1FWMOV-PG-100D
1.37E-004
2190
AFW PUMP 2 NOT ALIGNED TO S/G A MOV HEADER MOV-100D
1FWHEP-MOV-100D
7.50E-004
CHECK VALVE FAILS CLOSED 1-FW-279
1FWCKV-FC-1FW279
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-278
1FWMV--PG-1FW278
1.37E-004
2190
CHECK VALVE FAILS TO OPEN 1-FW-68
1FWCKV-FC-1FW68
6.34E-004
COMMON CAUSE FAILURES
GAF10835
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
CCF 3/3 FC CHECK VALVES 1-FW-61, 63, 279
1FWCKV-CC-616379
6.34E-005
AF100.LGC NUPRA 2.0 VPWR



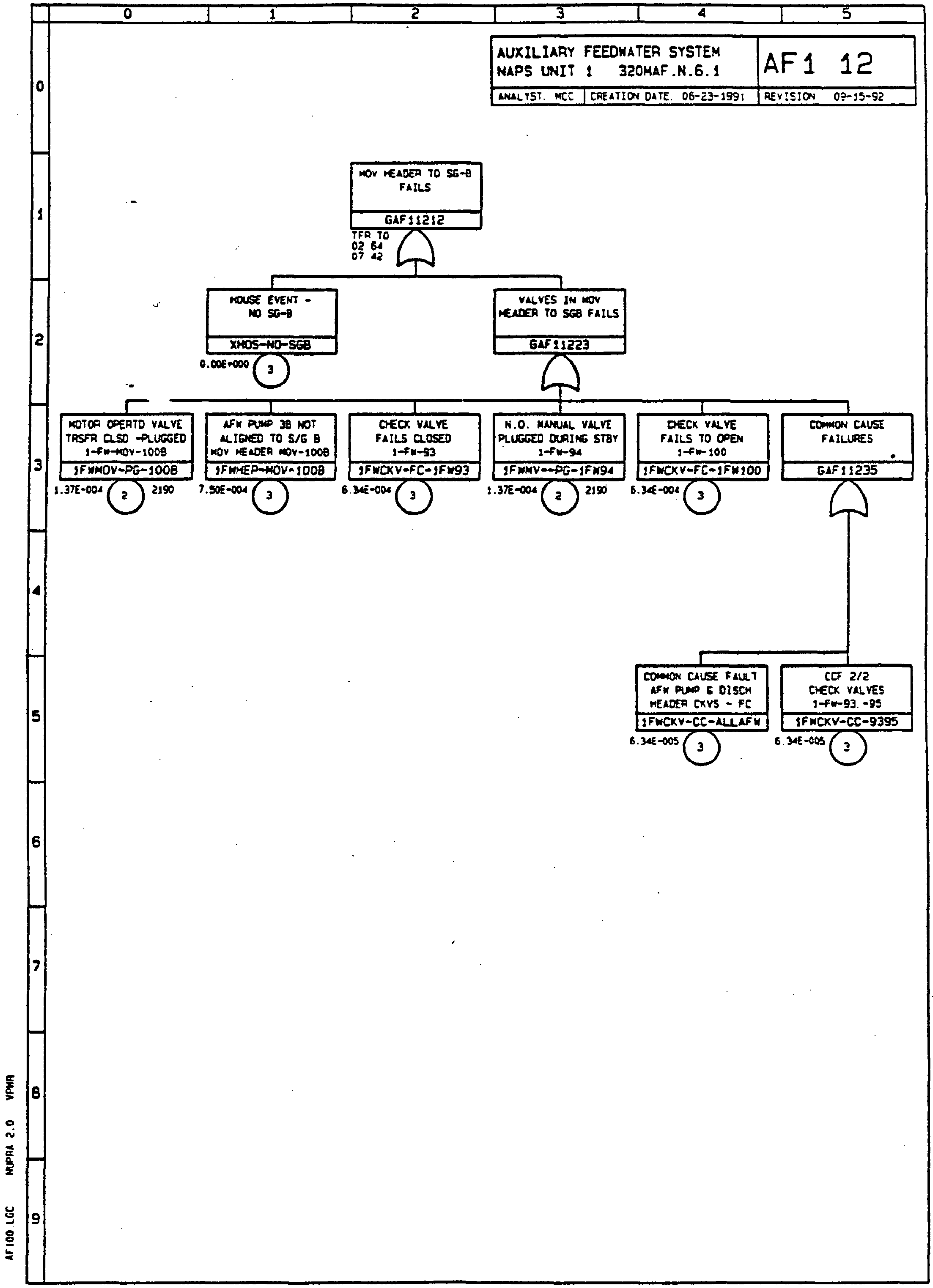
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 09
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
HCV HEADER TO SG-A FAILS
GAF10912
TFR TO 02 60 05 52
HOUSE EVENT NO SG-A
XHOS-NO-SGA
0.00E+000
VALVES IN HCV HEADER TO SG-A FAIL
GAF10923
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
HCV FAILS TO OPEN
GAF10930
CHECK VALVE FAILS CLOSED 1-FW-63
1FWCKV-FC-1FW63
6.34E-004
MANUAL VALVE FAILS CLOSED 1-FW-64
1FWMV--FC-1FW64
1.25E-004
CHECK VALVE FAILS TO OPEN 1-FW-68
1FWCKV-FC-1FW68
6.34E-004
COMMON CAUSE FAILURES
GAF10935
AOV OR HAND CNT VLV FAILS CLOSED 1-FW-HCV-100A
1FWHCV-FC-100A
1.81E-002
NO ELECTRIC POWER SEMIVITAL BUS 1A 1-EP-CB-16A
GE1H1112
E1H00
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
CCF 3/3 FC CHECK VALVES 1-FW-E1, 63, 279
1FWCKV-CC-616379
6.34E-005

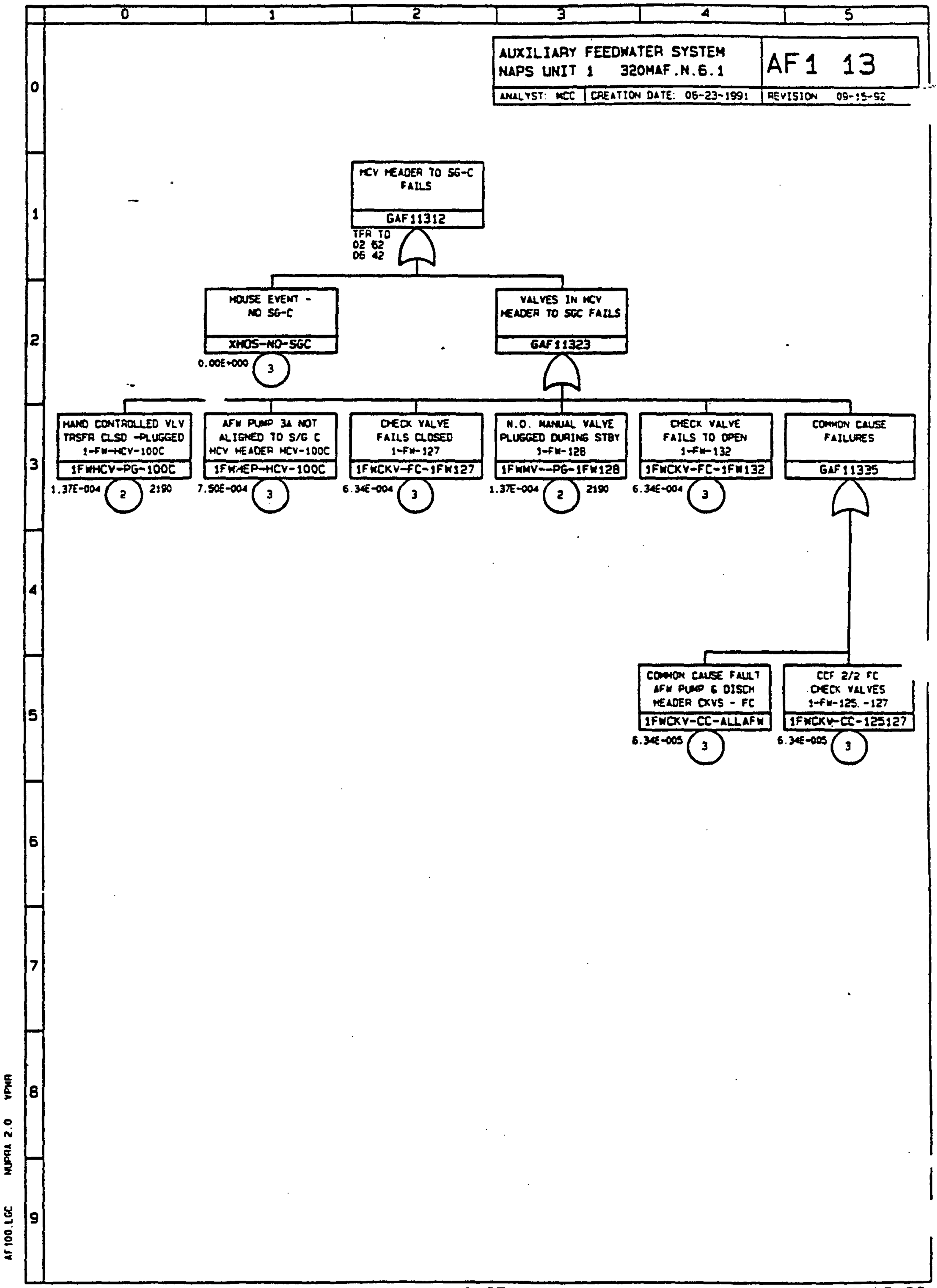

0
1
2
3
4
5
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 10
ANALYST: MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
MOV HEADER TO SG-A FAILS
GAF11012
TFR TO
02 63
05 55
HOUSE EVENT NO SG-A
XHOS-NO-SGA
0.00E+000
3
VALVES IN MOV HEADER TO SG-A FAILS
GAF11023
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
3
MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-100A
1FWMOV-PG-100A
1.37E-004
2
2190
CHECK VALVE FAILS CLOSED 1-FW-61
1FWCKV-FC-1FW61
6.34E-004
3
MANUAL VALVE FAILS CLOSED 1-FW-62
1FWMV--FC-1FW62
1.25E-004
3
CHECK VALVE FAILS TO OPEN 1-FW-68
1FWCKV-FC-1FW68
6.34E-004
3
COMMON CAUSE FAILURES
GAF11035
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
3
CCF 3/3 FC CHECK VALVES 1-FW-61, 63, 279
1FWCKV-CC-616379
6.34E-005
3
0
1
2
3
4
5
6
7
8
9
AF100.LGC NUPRA 2.0 VPMR

AUXILIARY FEEDWATER SYSTEM NAPS UNIT 1 320MAF.N.6.1	AF1 11
ANALYST: MCC | CREATION DATE: 06-23-1991	REVISION 09-15-92

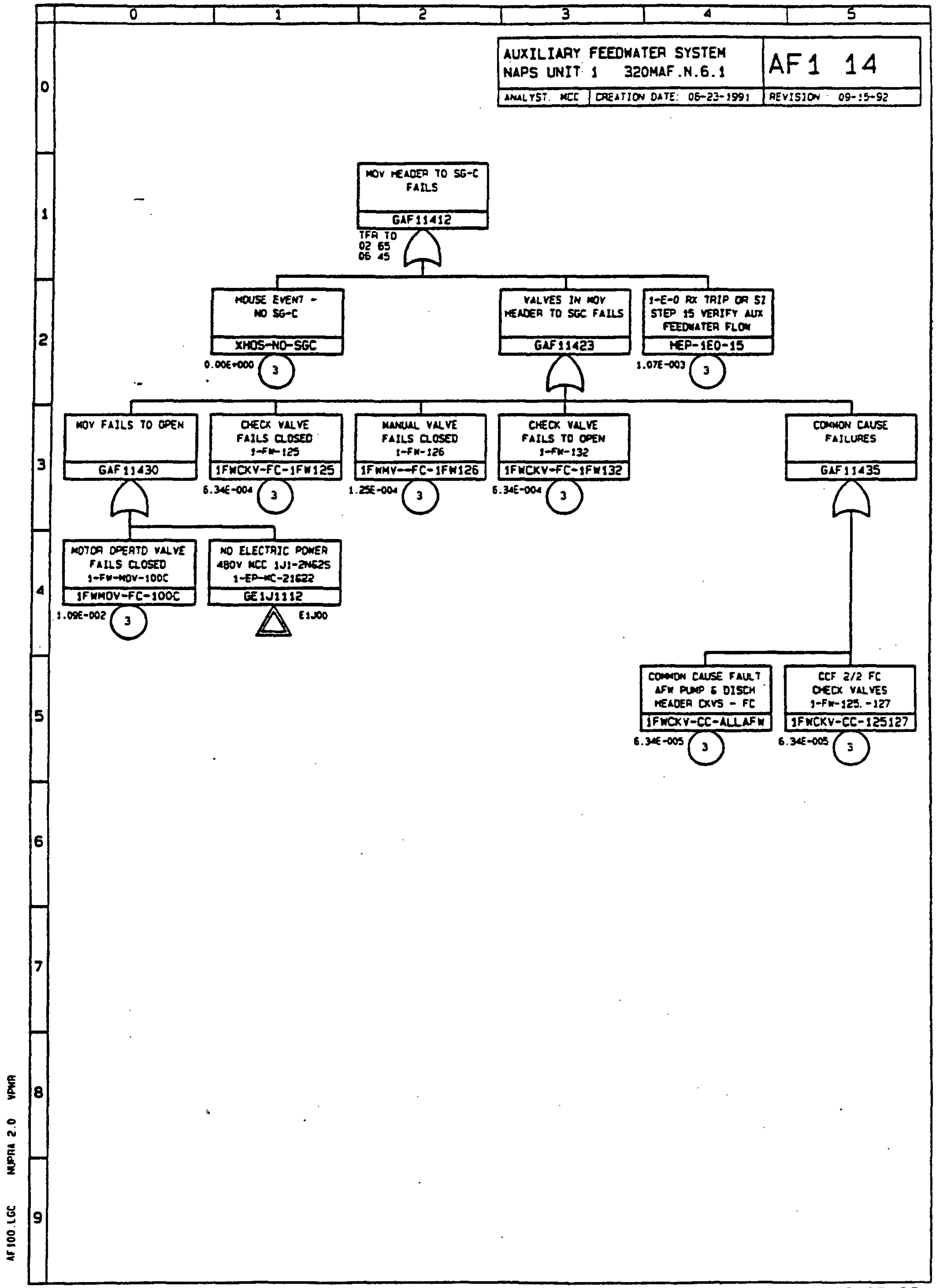


AF100.LGC NUPRA 2.0 VPWR

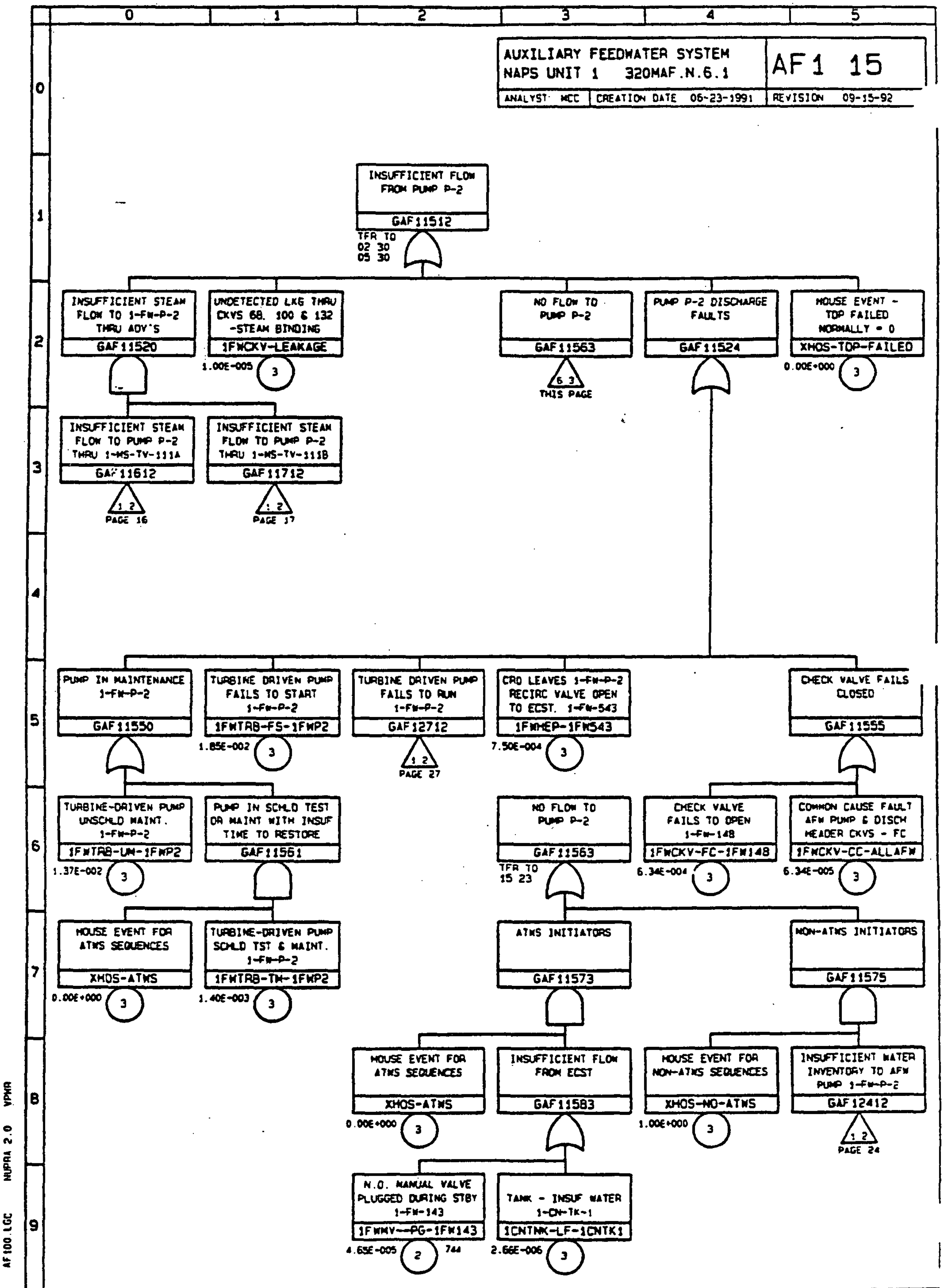

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 12
ANALYST. MCC
CREATION DATE. 06-23-1991
REVISION 09-15-92
MOV HEADER TO SG-B FAILS
GAF11212
TFR TO 02 64 07 42
HOUSE EVENT - NO SG-B
XHOS-NO-SGB
0.00E+000
VALVES IN MOV HEADER TO SGB FAILS
GAF11223
MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-100B
1FWMOV-PG-100B
1.37E-004
2190
AFW PUMP 3B NOT ALIGNED TO S/G B MOV HEADER MOV-100B
1FWHEP-MOV-100B
7.50E-004
CHECK VALVE FAILS CLOSED 1-FW-93
1FWCKV-FC-1FW93
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-94
1FWMV--PG-1FW94
1.37E-004
2190
CHECK VALVE FAILS TO OPEN 1-FW-100
1FWCKV-FC-1FW100
6.34E-004
COMMON CAUSE FAILURES
GAF11235
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
CCF 2/2 CHECK VALVES 1-FW-93, -95
1FWCKV-CC-9395
6.34E-005
AF100.LGC NUPRA 2.0 VPMR



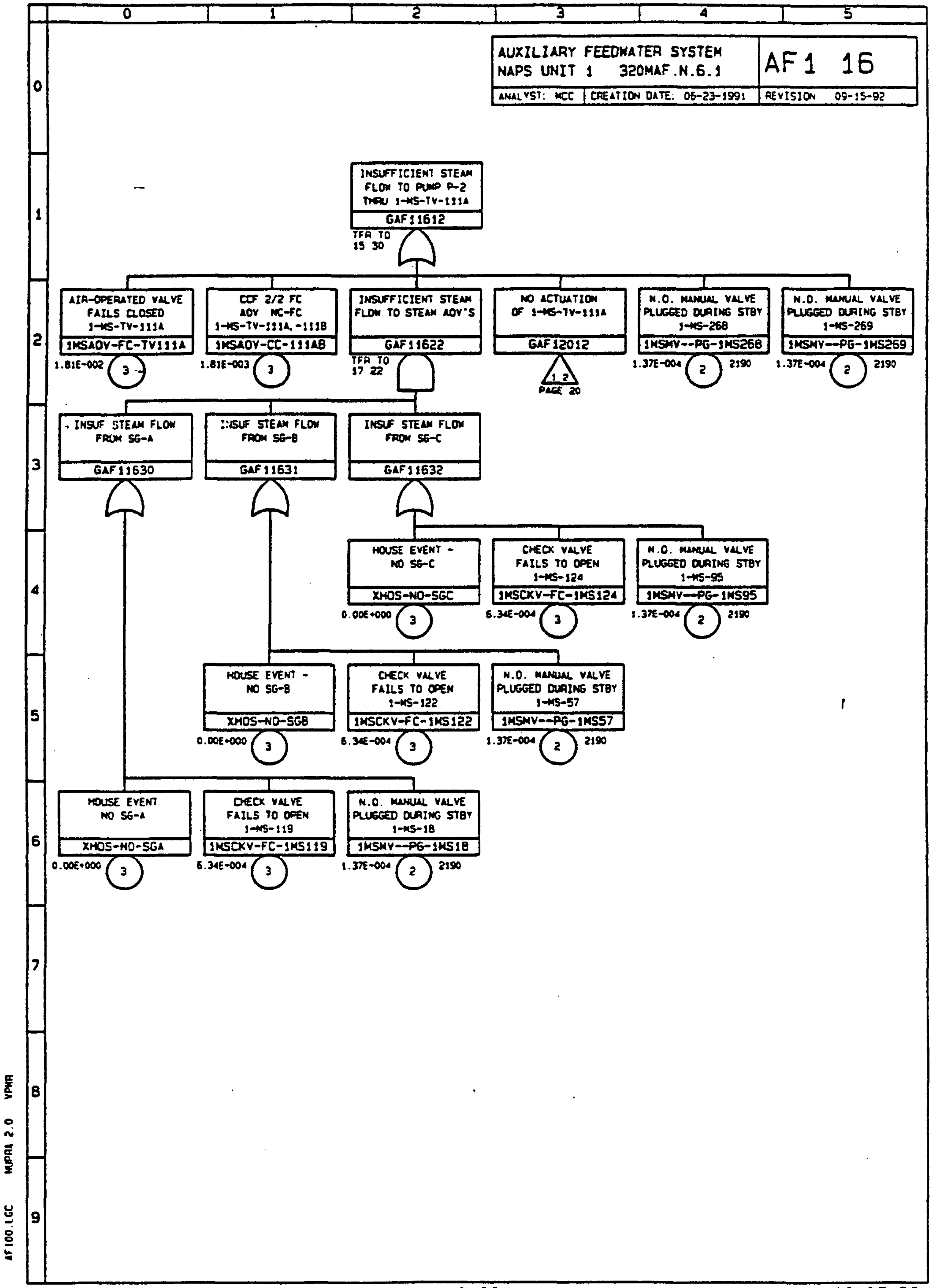
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 13
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
HCV HEADER TO SG-C FAILS
GAF11312
TFR TO 02 62 06 42
HOUSE EVENT - NO SG-C
XHOS-NO-SGC
0.00E+000
VALVES IN HCV HEADER TO SGC FAILS
GAF11323
HAND CONTROLLED VLV TRSFR CLSD -PLUGGED 1-FW-HCV-100C
1FWHCV-PG-100C
1.37E-004
2190
AFW PUMP 3A NOT ALIGNED TO S/G C HCV HEADER HCV-100C
1FWHEP-HCV-100C
7.50E-004
CHECK VALVE FAILS CLOSED 1-FW-127
1FWCKV-FC-1FW127
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-128
1FWMV--PG-1FW128
1.37E-004
2190
CHECK VALVE FAILS TO OPEN 1-FW-132
1FWCKV-FC-1FW132
6.34E-004
COMMON CAUSE FAILURES
GAF11335
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
CCF 2/2 FC CHECK VALVES 1-FW-125, -127
1FWCKV-CC-125127
6.34E-005
AF100.LGC NUPRA 2.0 VPHR

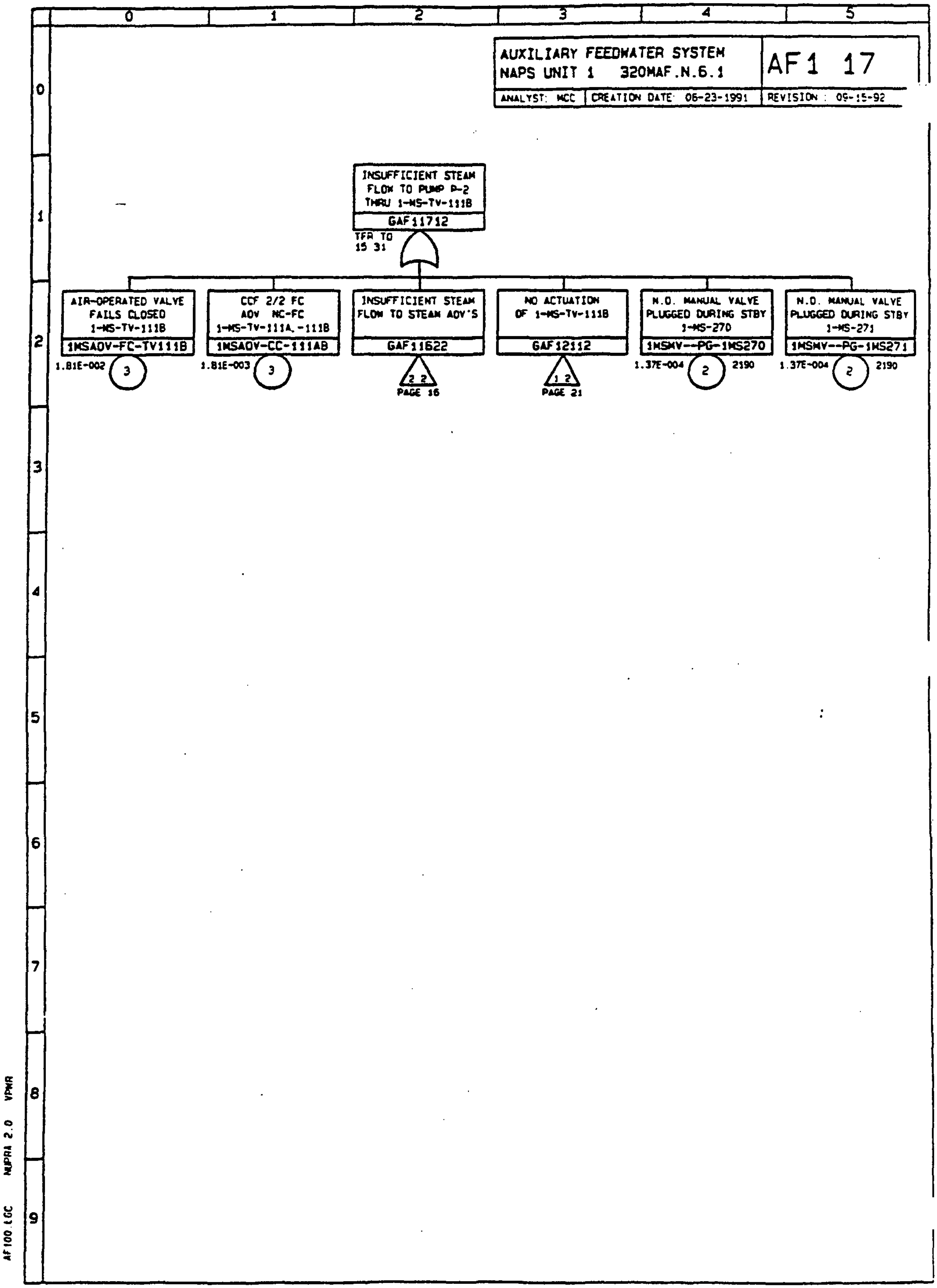


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 14
ANALYST. MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
MOV HEADER TO SG-C FAILS
GAF11412
TFR TO 02 65 06 45
HOUSE EVENT - NO SG-C
XHOS-NO-SGC
0.00E+000
VALVES IN MOV HEADER TO SGC FAILS
GAF11423
1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-15
1.07E-003
MOV FAILS TO OPEN
GAF11430
CHECK VALVE FAILS CLOSED 1-FW-125
1FWCKV-FC-1FW125
6.34E-004
MANUAL VALVE FAILS CLOSED 1-FW-126
1FWMV--FC-1FW126
1.25E-004
CHECK VALVE FAILS TO OPEN 1-FW-132
1FWCKV-FC-1FW132
6.34E-004
COMMON CAUSE FAILURES
GAF11435
MOTOR OPERTD VALVE FAILS CLOSED 1-FW-MOV-100C
1FWMOV-FC-100C
1.09E-002
NO ELECTRIC POWER 480V MCC 1J1-2N62S 1-EP-MC-21622
GE1J1112
E1J00
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
CCF 2/2 FC CHECK VALVES 1-FW-125,-127
1FWCKV-CC-125127
6.34E-005
AF100.LGC NUPRA 2.0 VPWR

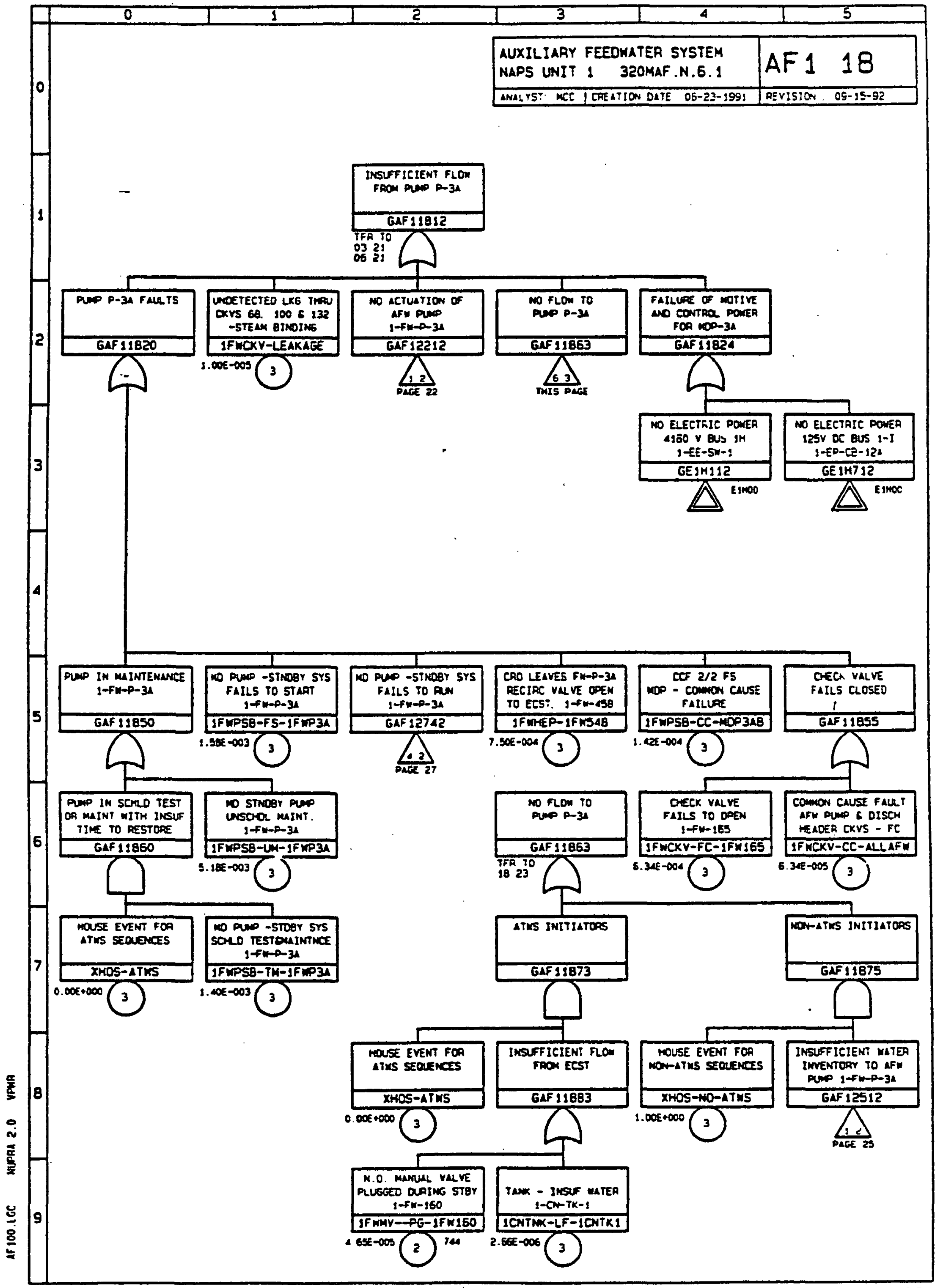


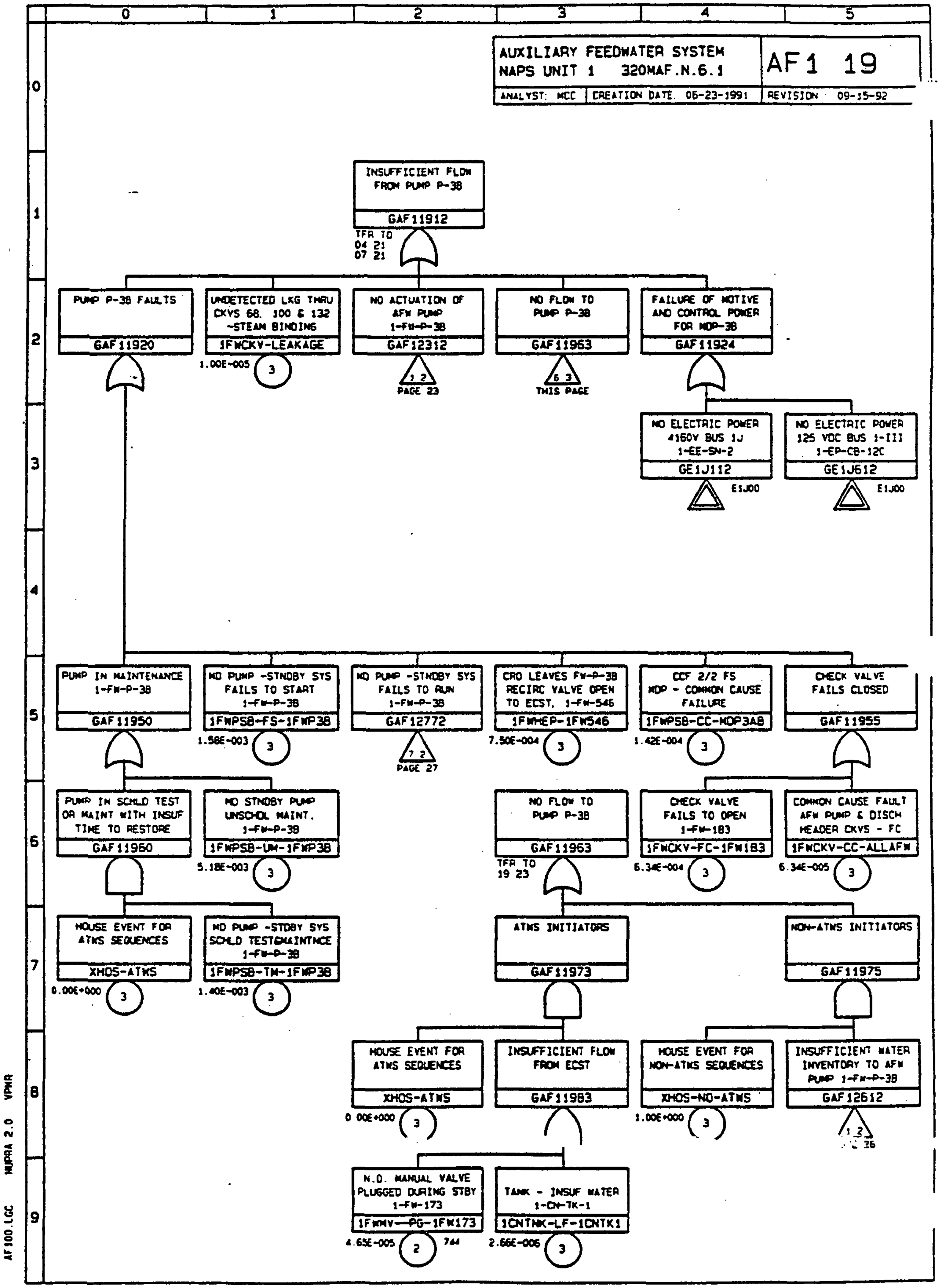
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 15
ANALYST: MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
INSUFFICIENT FLOW FROM PUMP P-2
GAF11512
TFR TO 02 30 05 30
INSUFFICIENT STEAM FLOW TO 1-FW-P-2 THRU ADV'S
GAF11520
UNDETECTED LKG THRU CKVS 68, 100 & 132 -STEAM BINDING
1FWCKV-LEAKAGE
1.00E-005
NO FLOW TO PUMP P-2
GAF11563
THIS PAGE
PUMP P-2 DISCHARGE FAULTS
GAF11524
HOUSE EVENT - TOP FAILED NORMALLY = 0
XHOS-TOP-FAILED
0.00E+000
INSUFFICIENT STEAM FLOW TO PUMP P-2 THRU 1-MS-TV-111A
GAF11612
PAGE 16
INSUFFICIENT STEAM FLOW TO PUMP P-2 THRU 1-MS-TV-111B
GAF11712
PAGE 17
PUMP IN MAINTENANCE 1-FW-P-2
GAF11550
TURBINE DRIVEN PUMP FAILS TO START 1-FW-P-2
1FWTRB-FS-1FWP2
1.85E-002
TURBINE DRIVEN PUMP FAILS TO RUN 1-FW-P-2
GAF12712
PAGE 27
CRD LEAVES 1-FW-P-2 RECIRC VALVE OPEN TO ECST. 1-FW-543
1FWHEP-1FW543
7.50E-004
CHECK VALVE FAILS CLOSED
GAF11555
TURBINE-DRIVEN PUMP UNSCHLD MAINT. 1-FW-P-2
1FWTRB-UM-1FWP2
1.37E-002
PUMP IN SCHLD TEST OR MAINT WITH INSUF TIME TO RESTORE
GAF11561
NO FLOW TO PUMP P-2
GAF11563
TFR TO 15 23
CHECK VALVE FAILS TO OPEN 1-FW-148
1FWCKV-FC-1FW148
6.34E-004
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
TURBINE-DRIVEN PUMP SCHLD TST & MAINT. 1-FW-P-2
1FWTRB-TM-1FWP2
1.40E-003
ATWS INITIATORS
GAF11573
NON-ATWS INITIATORS
GAF11575
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
INSUFFICIENT FLOW FROM ECST
GAF11583
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-2
GAF12412
PAGE 24
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-143
1FWMV--PG-1FW143
4.65E-005
744
TANK - INSUF WATER 1-CN-TK-1
1CNTNK-LF-1CNTK1
2.66E-006
AF100.LGC NUPRA 2.0 VPHR

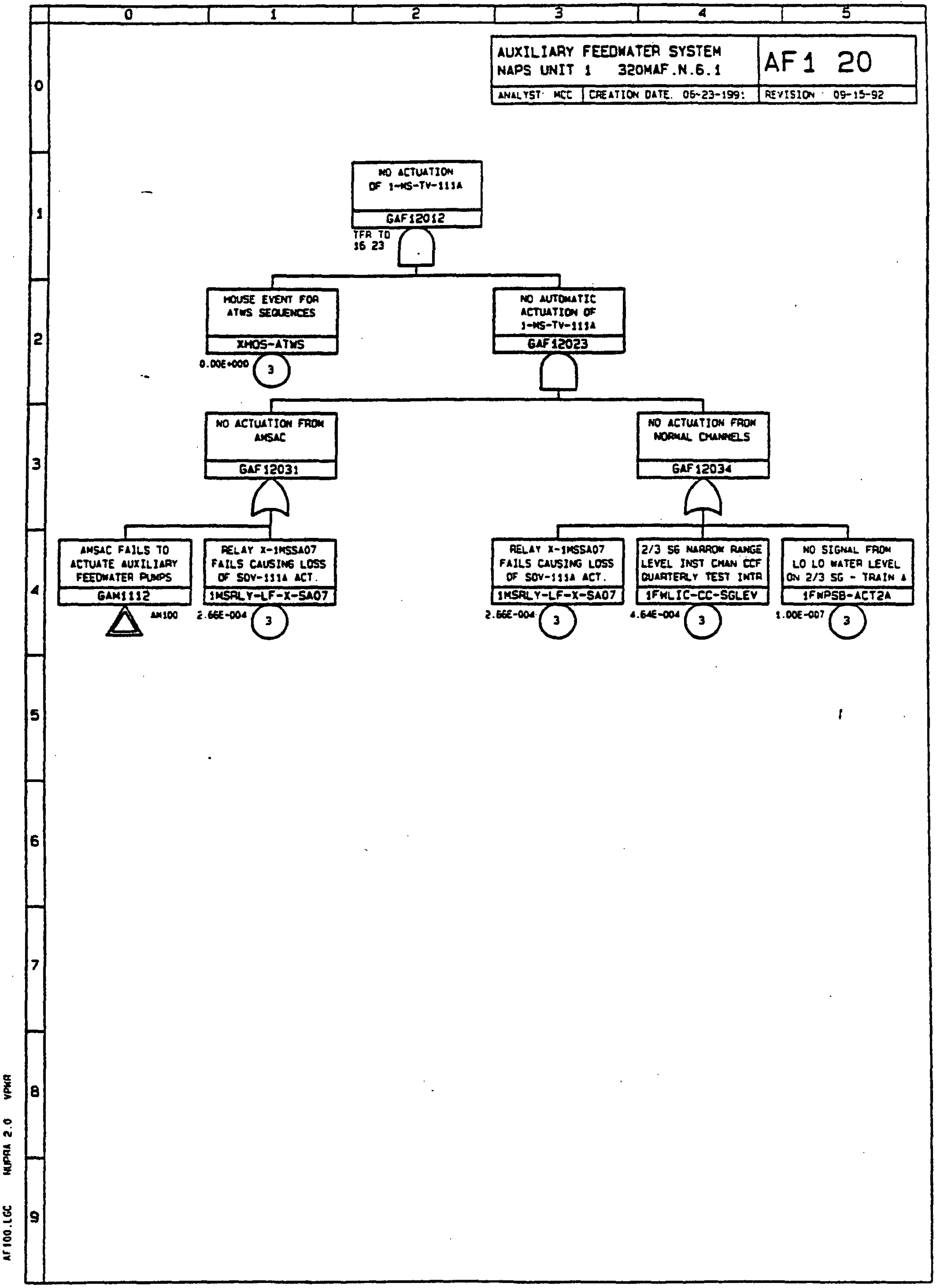

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 16
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
INSUFFICIENT STEAM FLOW TO PUMP P-2 THRU 1-MS-TV-111A
GAF11612
TFR TO 15 30
AIR-OPERATED VALVE FAILS CLOSED 1-MS-TV-111A
1MSAOV-FC-TV111A
1.81E-002
CCF 2/2 FC AOV NC-FC 1-MS-TV-111A,-111B
1MSAOV-CC-111AB
1.81E-003
INSUFFICIENT STEAM FLOW TO STEAM AOV'S
GAF11622
TFR TO 17 22
NO ACTUATION OF 1-MS-TV-111A
GAF12012
PAGE 20
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-268
1MSMV--PG-1MS268
1.37E-004
2190
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-269
1MSMV--PG-1MS269
1.37E-004
2190
INSUF STEAM FLOW FROM SG-A
GAF11630
INSUF STEAM FLOW FROM SG-B
GAF11631
INSUF STEAM FLOW FROM SG-C
GAF11632
HOUSE EVENT - NO SG-C
XHOS-NO-SGC
0.00E+000
CHECK VALVE FAILS TO OPEN 1-MS-124
1MSCKV-FC-1MS124
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-95
1MSMV--PG-1MS95
1.37E-004
2190
HOUSE EVENT - NO SG-B
XHOS-NO-SGB
0.00E+000
CHECK VALVE FAILS TO OPEN 1-MS-122
1MSCKV-FC-1MS122
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-57
1MSMV--PG-1MS57
1.37E-004
2190
HOUSE EVENT NO SG-A
XHOS-NO-SGA
0.00E+000
CHECK VALVE FAILS TO OPEN 1-MS-119
1MSCKV-FC-1MS119
6.34E-004
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-18
1MSMV--PG-1MS18
1.37E-004
2190
AF100.LGC NUPRA 2.0 VPMR



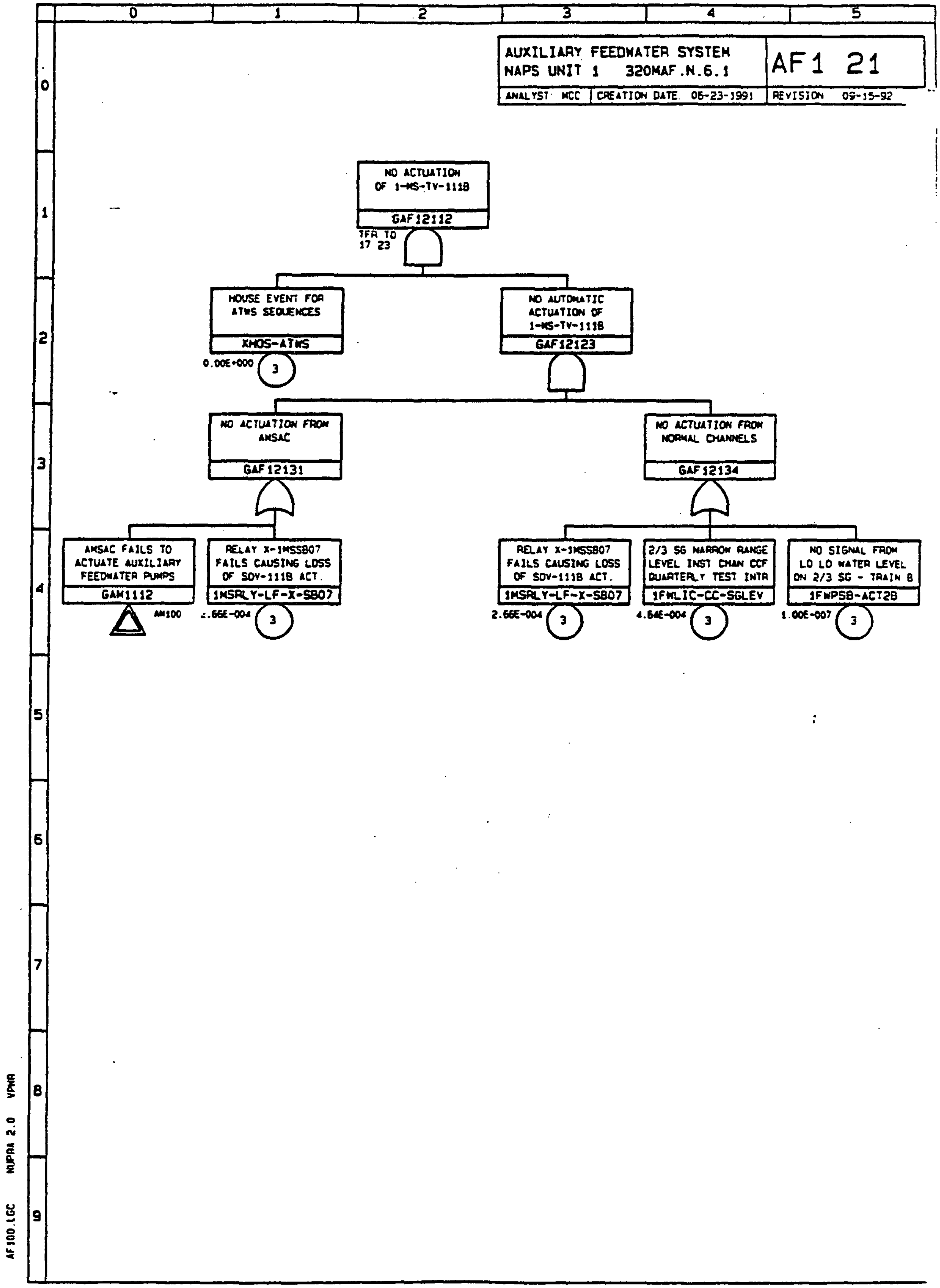
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 17
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION : 09-15-92
INSUFFICIENT STEAM FLOW TO PUMP P-2 THRU 1-MS-TV-111B
GAF11712
TFR TO 15 31
AIR-OPERATED VALVE FAILS CLOSED 1-MS-TV-111B
1MSAOV-FC-TV111B
1.81E-002
CCF 2/2 FC AOV NC-FC 1-MS-TV-111A,-111B
1MSAOV-CC-111AB
1.81E-003
INSUFFICIENT STEAM FLOW TO STEAM AOV'S
GAF11622
PAGE 16
NO ACTUATION OF 1-MS-TV-111B
GAF12112
PAGE 21
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-270
1MSMV--PG-1MS270
1.37E-004
2190
N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-271
1MSMV--PG-1MS271
1.37E-004
2190
AF100.LGC NUPRA 2.0 VPNR


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 18
ANALYST: MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
INSUFFICIENT FLOW FROM PUMP P-3A
GAF11812
TFR TO 03 21 06 21
PUMP P-3A FAULTS
GAF11820
UNDETECTED LKG THRU CKVS 68, 100 & 132 -STEAM BINDING
1FWCKV-LEAKAGE
1.00E-005
NO ACTUATION OF AFW PUMP 1-FW-P-3A
GAF12212
PAGE 22
NO FLOW TO PUMP P-3A
GAF11863
THIS PAGE
FAILURE OF MOTIVE AND CONTROL POWER FOR MDP-3A
GAF11824
NO ELECTRIC POWER 4160 V BUS 1H 1-EE-SW-1
GE1H112
E1H00
NO ELECTRIC POWER 125V DC BUS 1-I 1-EP-CB-12A
GE1H712
E1H0C
PUMP IN MAINTENANCE 1-FW-P-3A
GAF11850
MD PUMP -STNDBY SYS FAILS TO START 1-FW-P-3A
1FWPSB-FS-1FWP3A
1.58E-003
MD PUMP -STNDBY SYS FAILS TO RUN 1-FW-P-3A
GAF12742
PAGE 27
CRO LEAVES FW-P-3A RECIRC VALVE OPEN TO ECST. 1-FW-458
1FWHEP-1FW548
7.50E-004
CCF 2/2 FS MDP - COMMON CAUSE FAILURE
1FWPSB-CC-MDP3AB
1.42E-004
CHECK VALVE FAILS CLOSED
GAF11855
PUMP IN SCHLD TEST OR MAINT WITH INSUF TIME TO RESTORE
GAF11860
MD STNDBY PUMP UNSCHDL MAINT. 1-FW-P-3A
1FWPSB-UM-1FWP3A
5.18E-003
NO FLOW TO PUMP P-3A
GAF11863
TFR TO 18 23
CHECK VALVE FAILS TO OPEN 1-FW-165
1FWCKV-FC-1FW165
6.34E-004
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
MD PUMP -STDBY SYS SCHLD TEST&MAINTNCE 1-FW-P-3A
1FWPSB-TM-1FWP3A
1.40E-003
ATWS INITIATORS
GAF11873
NON-ATWS INITIATORS
GAF11875
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
INSUFFICIENT FLOW FROM ECST
GAF11883
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-3A
GAF12512
PAGE 25
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-160
1FWMV--PG-1FW160
4.65E-005
744
TANK - INSUF WATER 1-CN-TK-1
1CNTNK-LF-1CNTK1
2.66E-006
AF100.LGC NUPRA 2.0 VPHR

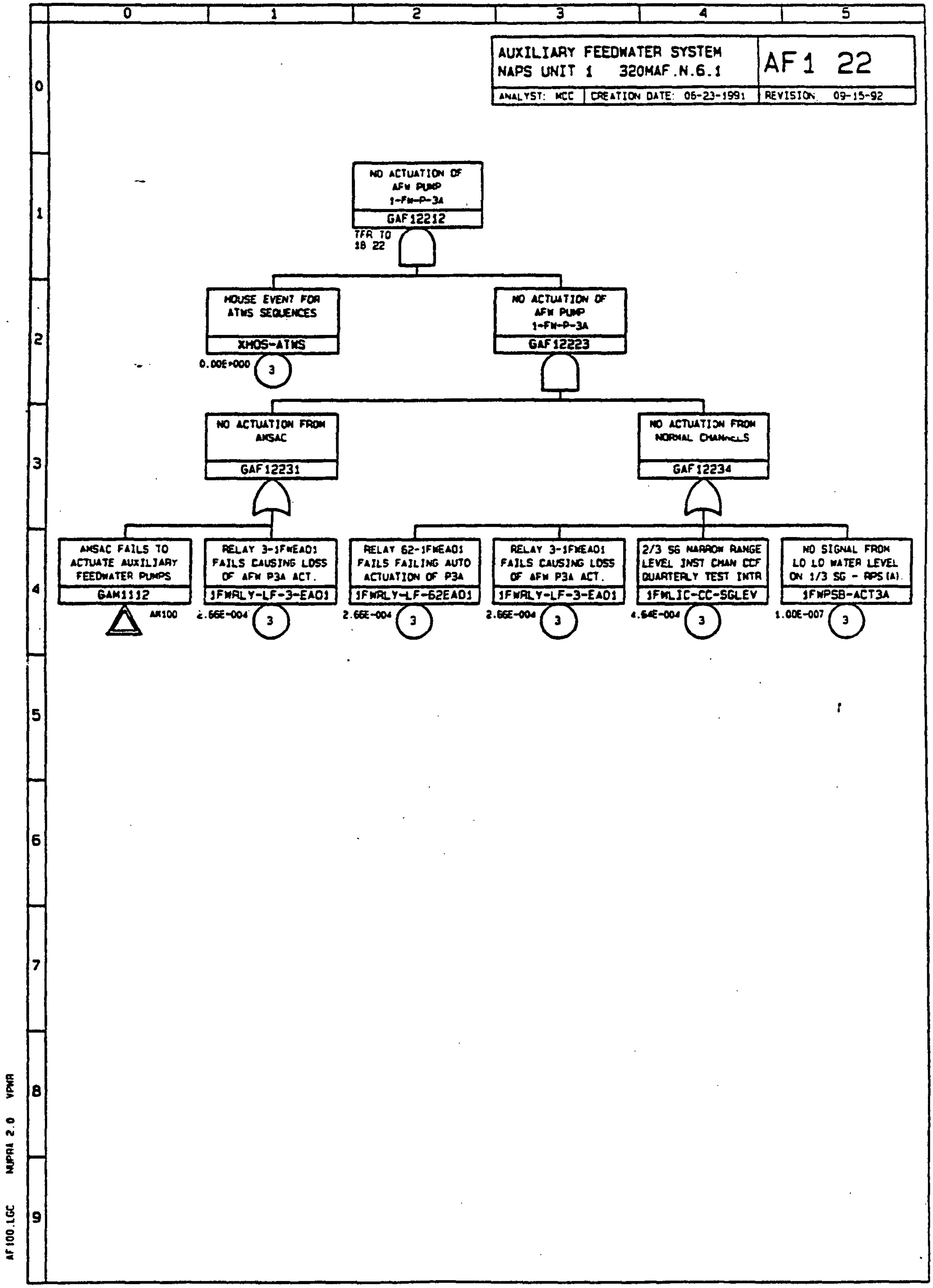

AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 19
ANALYST: MCC
CREATION DATE. 06-23-1991
REVISION 09-15-92
INSUFFICIENT FLOW FROM PUMP P-3B
GAF11912
TFR TO 04 21 07 21
PUMP P-3B FAULTS
GAF11920
UNDETECTED LKG THRU CKVS 68, 100 & 132 -STEAM BINDING
1FWCKV-LEAKAGE
1.00E-005
NO ACTUATION OF AFW PUMP 1-FW-P-3B
GAF12312
PAGE 23
NO FLOW TO PUMP P-3B
GAF11963
THIS PAGE
FAILURE OF MOTIVE AND CONTROL POWER FOR MDP-3B
GAF11924
NO ELECTRIC POWER 4160V BUS 1J 1-EE-SW-2
GE1J112
E1J00
NO ELECTRIC POWER 125 VDC BUS 1-III 1-EP-CB-12C
GE1J612
E1J00
PUMP IN MAINTENANCE 1-FW-P-3B
GAF11950
NO PUMP -STNDBY SYS FAILS TO START 1-FW-P-3B
1FWPSB-FS-1FWP3B
1.58E-003
NO PUMP -STNDBY SYS FAILS TO RUN 1-FW-P-3B
GAF12772
PAGE 27
CRO LEAVES FW-P-3B RECIRC VALVE OPEN TO ECST, 1-FW-546
1FWHEP-1FW546
7.50E-004
CCF 2/2 FS MDP - COMMON CAUSE FAILURE
1FWPSB-CC-MDP3AB
1.42E-004
CHECK VALVE FAILS CLOSED
GAF11955
PUMP IN SCHLD TEST OR MAINT WITH INSUF TIME TO RESTORE
GAF11960
NO STNDBY PUMP UNSCHDL MAINT. 1-FW-P-3B
1FWPSB-UM-1FWP3B
5.18E-003
NO FLOW TO PUMP P-3B
GAF11963
TFR TO 19 23
CHECK VALVE FAILS TO OPEN 1-FW-183
1FWCKV-FC-1FW183
6.34E-004
COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-CC-ALLAFW
6.34E-005
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
NO PUMP -STDBY SYS SCHLD TEST&MAINTNCE 1-FW-P-3B
1FWPSB-TM-1FWP3B
1.40E-003
ATWS INITIATORS
GAF11973
NON-ATWS INITIATORS
GAF11975
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
INSUFFICIENT FLOW FROM ECST
GAF11983
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-3B
GAF12612
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-173
1FWMV--PG-1FW173
4.65E-005
TANK - INSUF WATER 1-CN-TK-1
1CNTNK-LF-1CNTK1
2.66E-006
AF100.LGC NUPRA 2.0 VPMR



0
1
2
3
4
5
AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 20
ANALYST: MCC
CREATION DATE. 06-23-1991
REVISION 09-15-92
NO ACTUATION OF 1-MS-TV-111A
GAF12012
TFR TO 16 23
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
3
NO AUTOMATIC ACTUATION OF 1-MS-TV-111A
GAF12023
NO ACTUATION FROM AMSAC
GAF12031
NO ACTUATION FROM NORMAL CHANNELS
GAF12034
AMSAC FAILS TO ACTUATE AUXILIARY FEEDWATER PUMPS
GAM1112
AM100
RELAY X-1MSSA07 FAILS CAUSING LOSS OF SOV-111A ACT.
1MSRLY-LF-X-SA07
2.66E-004
3
RELAY X-1MSSA07 FAILS CAUSING LOSS OF SOV-111A ACT.
1MSRLY-LF-X-SA07
2.66E-004
3
2/3 SG NARROW RANGE LEVEL INST CHAN CCF QUARTERLY TEST INTR
1FWLIC-CC-SGLEV
4.64E-004
3
NO SIGNAL FROM LO LO WATER LEVEL ON 2/3 SG - TRAIN A
1FWPSB-ACT2A
1.00E-007
3
5
6
7
8
9
AF100.LGC NUPRA 2.0 VPWR

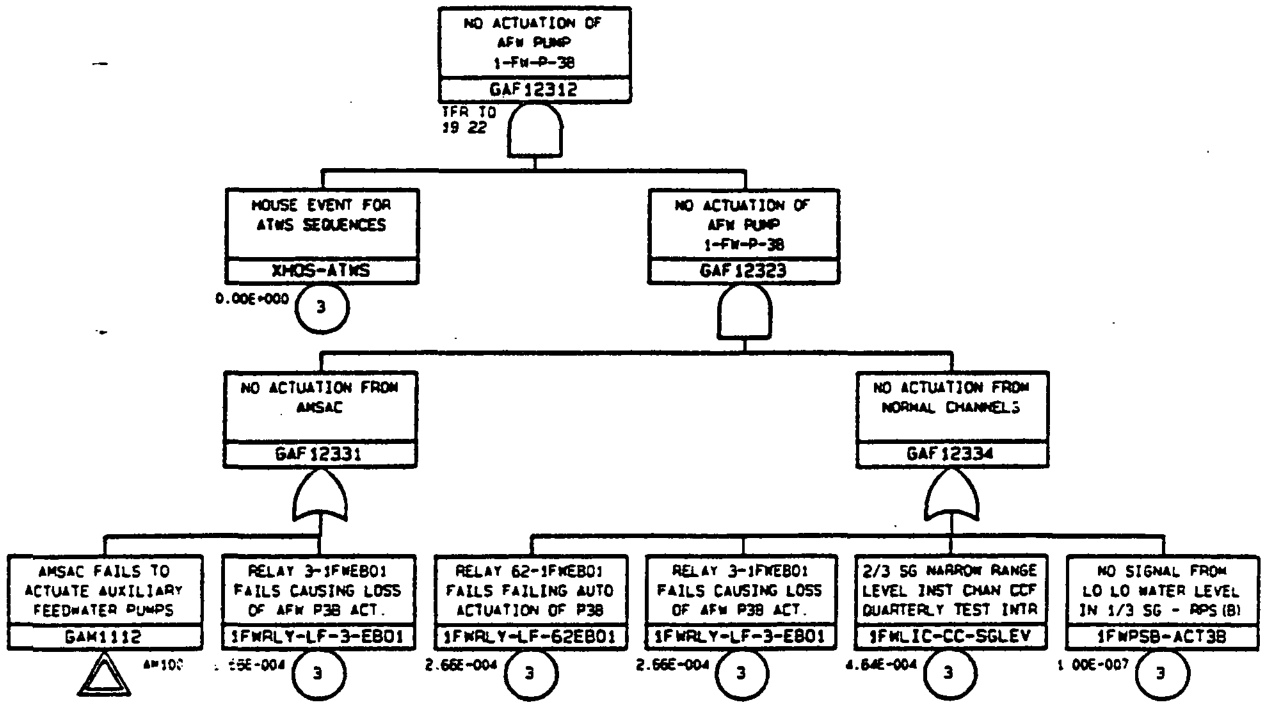


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 21
ANALYST MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
NO ACTUATION OF 1-MS-TV-111B
GAF12112
TFR TO 17 23
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
NO AUTOMATIC ACTUATION OF 1-MS-TV-111B
GAF12123
NO ACTUATION FROM AMSAC
GAF12131
NO ACTUATION FROM NORMAL CHANNELS
GAF12134
AMSAC FAILS TO ACTUATE AUXILIARY FEEDWATER PUMPS
GAM1112
AM100
RELAY X-1MSSB07 FAILS CAUSING LOSS OF SOV-111B ACT.
1MSRLY-LF-X-SB07
2.66E-004
RELAY X-1MSSB07 FAILS CAUSING LOSS OF SOV-111B ACT.
1MSRLY-LF-X-SB07
2.66E-004
2/3 SG NARROW RANGE LEVEL INST CHAN CCF QUARTERLY TEST INTR
1FWLIC-CC-SGLEV
4.64E-004
NO SIGNAL FROM LO LO WATER LEVEL ON 2/3 SG - TRAIN B
1FWPSB-ACT2B
1.00E-007
AF100.LGC NUPRA 2.0 VPMR



AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 22
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
NO ACTUATION OF AFW PUMP 1-FW-P-3A
GAF12212
TFR TO 18 22
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
NO ACTUATION OF AFW PUMP 1-FW-P-3A
GAF12223
NO ACTUATION FROM AMSAC
GAF12231
NO ACTUATION FROM NORMAL CHANNELS
GAF12234
AMSAC FAILS TO ACTUATE AUXILIARY FEEDWATER PUMPS
GAM1112
AM100
RELAY 3-1FWEA01 FAILS CAUSING LOSS OF AFW P3A ACT.
1FWRLY-LF-3-EA01
2.66E-004
RELAY 62-1FWEA01 FAILS FAILING AUTO ACTUATION OF P3A
1FWRLY-LF-62EA01
2.66E-004
RELAY 3-1FWEA01 FAILS CAUSING LOSS OF AFW P3A ACT.
1FWRLY-LF-3-EA01
2.66E-004
2/3 SG NARROW RANGE LEVEL INST CHAN CCF QUARTERLY TEST INTR
1FWLIC-CC-SGLEV
4.64E-004
NO SIGNAL FROM LO LO WATER LEVEL ON 1/3 SG - RPS (A)
1FWPSB-ACT3A
1.00E-007
AF100.LGC NUPRA 2.0 VPWR

AUXILIARY FEEDWATER SYSTEM NAPS UNIT 1 320MAF.N.6.1	AF1 23
ANALYST: MCC | CREATION DATE: 06-23-1991	REVISION : 09-15-92



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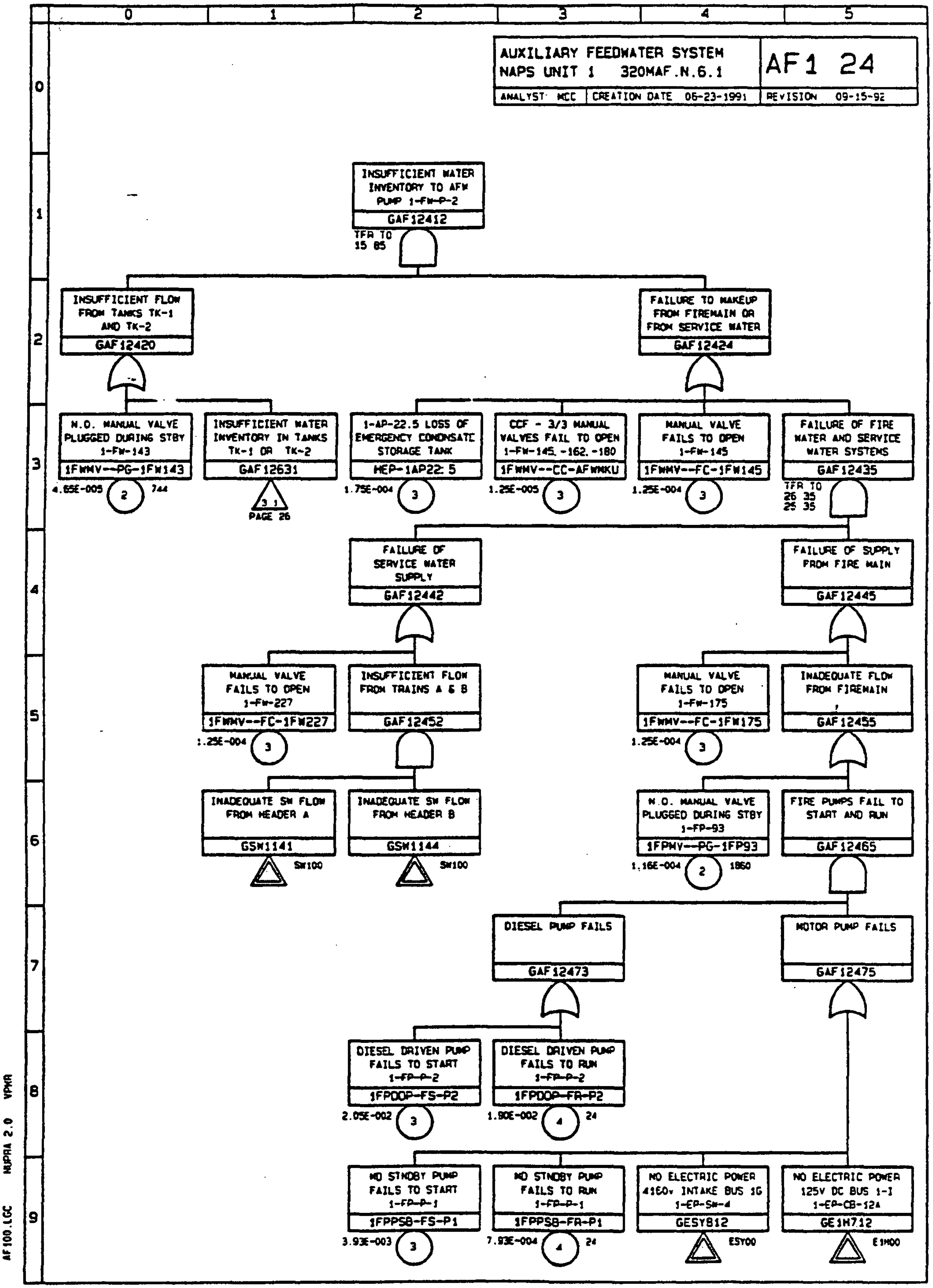
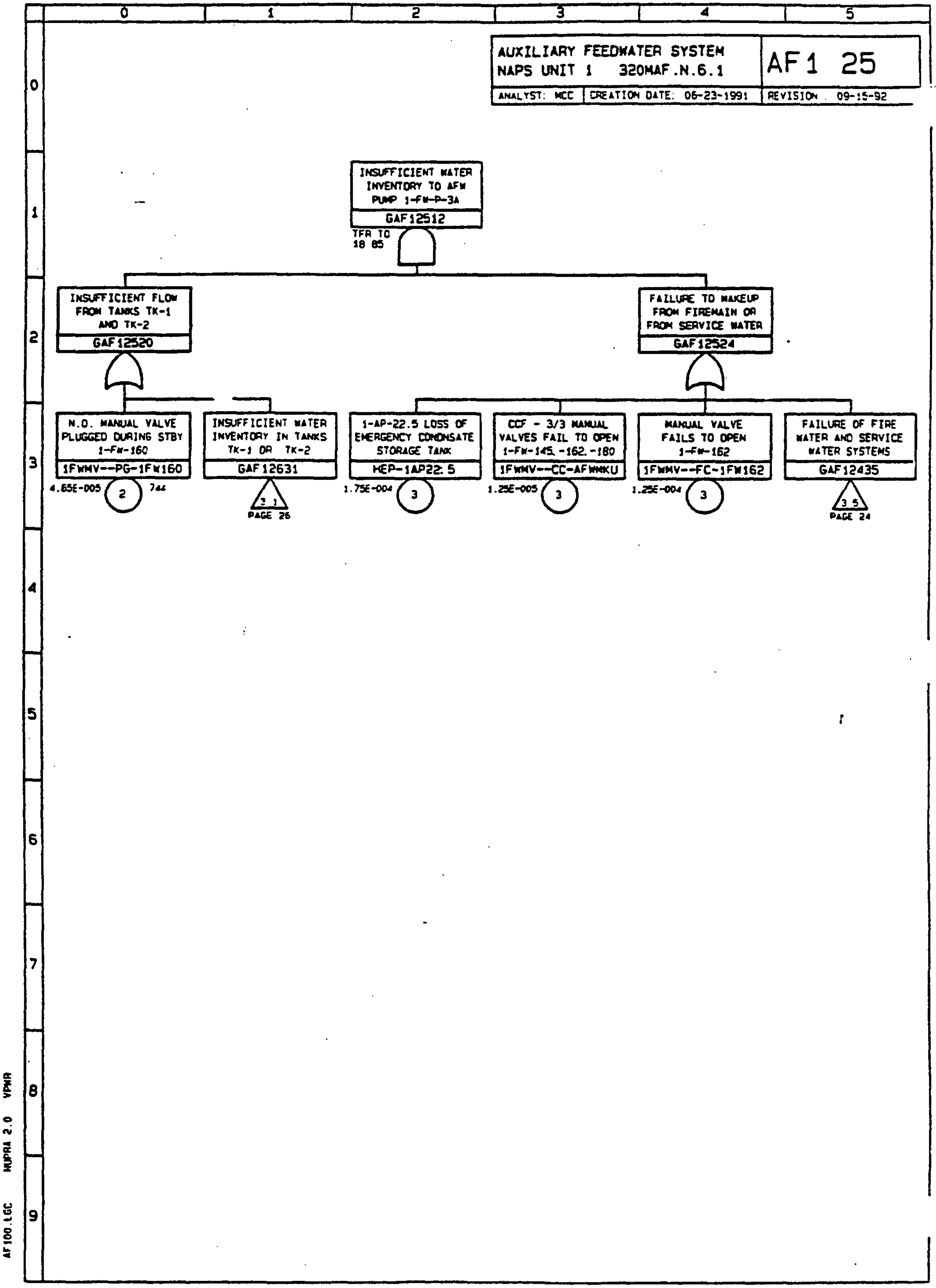
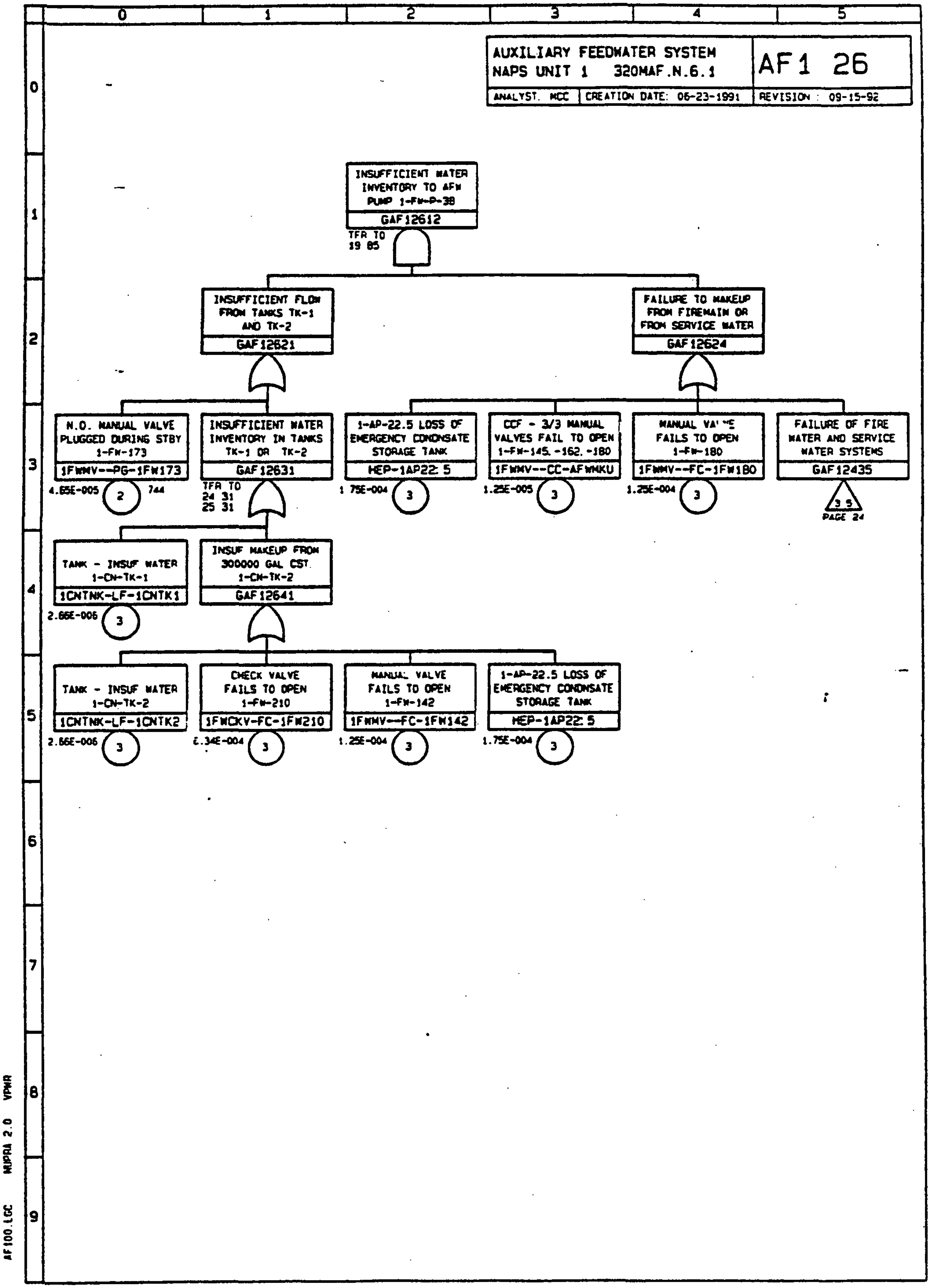
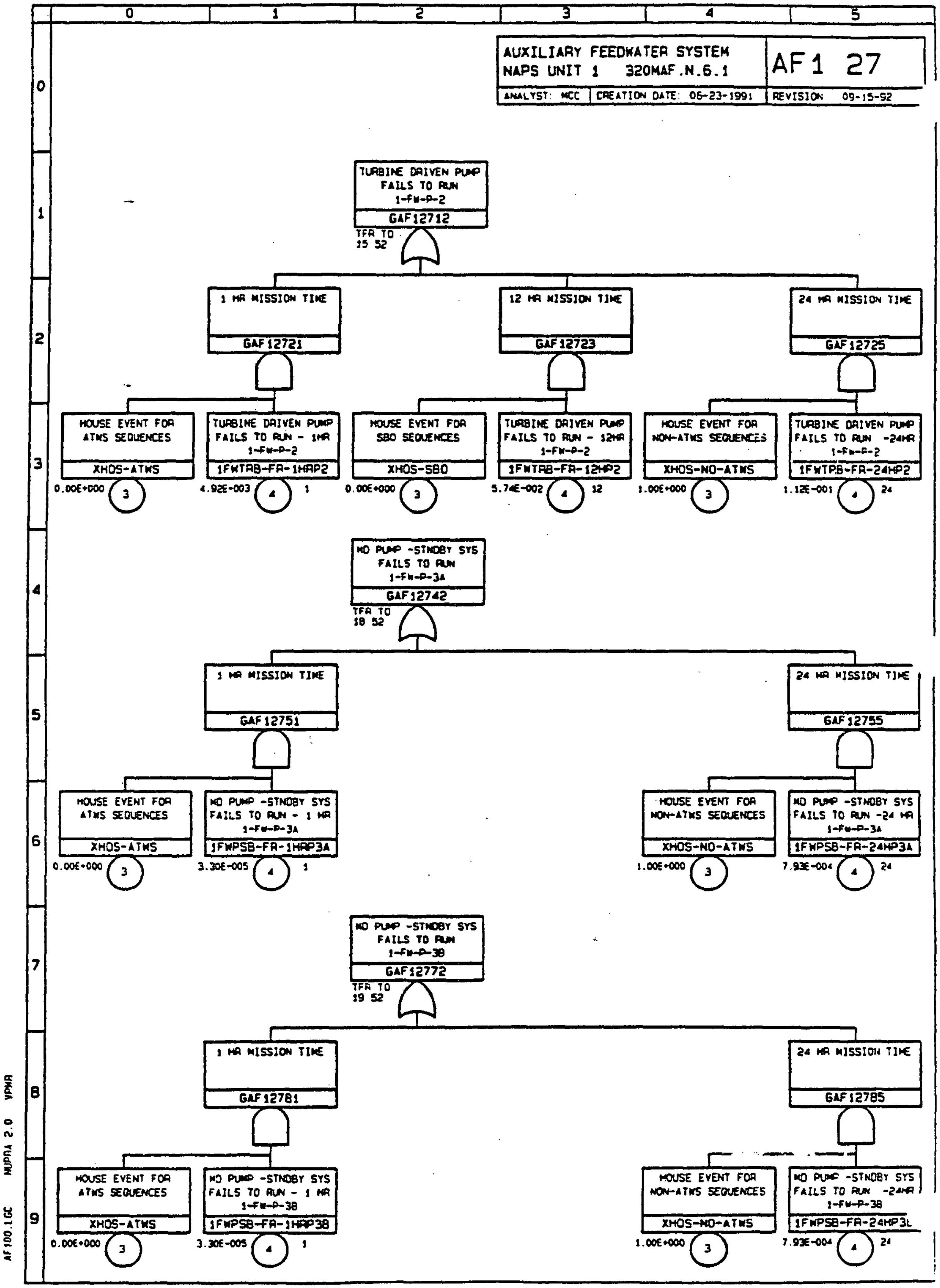


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 24
ANALYST MCC
CREATION DATE 06-23-1991
REVISION 09-15-92
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-2
GAF12412
TFR TO 15 85
INSUFFICIENT FLOW FROM TANKS TK-1 AND TK-2
GAF12420
FAILURE TO MAKEUP FROM FIREMAIN OR FROM SERVICE WATER
GAF12424
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-143
1FWMV--PG-1FW143
4.65E-005
744
INSUFFICIENT WATER INVENTORY IN TANKS TK-1 OR TK-2
GAF12631
PAGE 26
1-AP-22.5 LOSS OF EMERGENCY CONDENSATE STORAGE TANK
HEP-1AP22.5
1.75E-004
CCF - 3/3 MANUAL VALVES FAIL TO OPEN 1-FW-145, -162, -180
1FWMV--CC-AFWMKU
1.25E-005
MANUAL VALVE FAILS TO OPEN 1-FW-145
1FWMV--FC-1FW145
1.25E-004
FAILURE OF FIRE WATER AND SERVICE WATER SYSTEMS
GAF12435
TFR TO 26 35 25 35
FAILURE OF SERVICE WATER SUPPLY
GAF12442
FAILURE OF SUPPLY FROM FIRE MAIN
GAF12445
MANUAL VALVE FAILS TO OPEN 1-FW-227
1FWMV--FC-1FW227
1.25E-004
INSUFFICIENT FLOW FROM TRAINS A & B
GAF12452
MANUAL VALVE FAILS TO OPEN 1-FW-175
1FWMV--FC-1FW175
1.25E-004
INADEQUATE FLOW FROM FIREMAIN
GAF12455
INADEQUATE SW FLOW FROM HEADER A
GSW1141
SW100
INADEQUATE SW FLOW FROM HEADER B
GSW1144
SW100
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FP-93
1FPMV--PG-1FP93
1.16E-004
1860
FIRE PUMPS FAIL TO START AND RUN
GAF12465
DIESEL PUMP FAILS
GAF12473
MOTOR PUMP FAILS
GAF12475
DIESEL DRIVEN PUMP FAILS TO START 1-FP-P-2
1FPDDP-FS-P2
2.05E-002
DIESEL DRIVEN PUMP FAILS TO RUN 1-FP-P-2
1FPDDP-FR-P2
1.90E-002
24
MD STNDBY PUMP FAILS TO START 1-FP-P-1
1FPPSB-FS-P1
3.93E-003
MD STNDBY PUMP FAILS TO RUN 1-FP-P-1
1FPPSB-FR-P1
7.93E-004
24
NO ELECTRIC POWER 4160v INTAKE BUS 1G 1-EP-SW-4
GESY812
ESY00
NO ELECTRIC POWER 125V DC BUS 1-I 1-EP-CB-12A
GE1H712
E1H00
AF100.LGC NUPRA 2.0 VPHR



AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 25
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-3A
GAF12512
TFR TO 18 85
INSUFFICIENT FLOW FROM TANKS TK-1 AND TK-2
GAF12520
FAILURE TO MAKEUP FROM FIREMAIN OR FROM SERVICE WATER
GAF12524
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-160
1FWMV--PG-1FW160
4.65E-005
744
INSUFFICIENT WATER INVENTORY IN TANKS TK-1 OR TK-2
GAF12631
PAGE 26
1-AP-22.5 LOSS OF EMERGENCY CONDENSATE STORAGE TANK
HEP-1AP22.5
1.75E-004
CCF - 3/3 MANUAL VALVES FAIL TO OPEN 1-FW-145, -162, -180
1FWMV--CC-AFWMKU
1.25E-005
MANUAL VALVE FAILS TO OPEN 1-FW-162
1FWMV--FC-1FW162
1.25E-004
FAILURE OF FIRE WATER AND SERVICE WATER SYSTEMS
GAF12435
PAGE 24
AF100.LGC NUPRA 2.0 VPWR


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 26
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION: 09-15-92
INSUFFICIENT WATER INVENTORY TO AFW PUMP 1-FW-P-3B
GAF12612
TFR TO 19 85
INSUFFICIENT FLOW FROM TANKS TK-1 AND TK-2
GAF12621
FAILURE TO MAKEUP FROM FIREMAIN OR FROM SERVICE WATER
GAF12624
N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-173
1FWMV--PG-1FW173
4.65E-005
744
INSUFFICIENT WATER INVENTORY IN TANKS TK-1 OR TK-2
GAF12631
TFR TO 24 31 25 31
1-AP-22.5 LOSS OF EMERGENCY CONDENSATE STORAGE TANK
HEP-1AP22.5
1.75E-004
CCF - 3/3 MANUAL VALVES FAIL TO OPEN 1-FW-145, -162, -180
1FWMV--CC-AFWHKU
1.25E-005
FAILS TO OPEN 1-FW-180
1FWMV--FC-1FW180
1.25E-004
FAILURE OF FIRE WATER AND SERVICE WATER SYSTEMS
GAF12435
PAGE 24
TANK - INSUF WATER 1-CN-TK-1
1CNTNK-LF-1CNTK1
2.66E-006
INSUF MAKEUP FROM 300000 GAL CST 1-CN-TK-2
GAF12641
TANK - INSUF WATER 1-CN-TK-2
1CNTNK-LF-1CNTK2
2.66E-006
CHECK VALVE FAILS TO OPEN 1-FW-210
1FWCKV-FC-1FW210
1.25E-004
MANUAL VALVE FAILS TO OPEN 1-FW-142
1FWMV--FC-1FW142
1.25E-004
1-AP-22.5 LOSS OF EMERGENCY CONDENSATE STORAGE TANK
HEP-1AP22.5
1.75E-004
AF100.LGC NUPRA 2.0 VPNR


AUXILIARY FEEDWATER SYSTEM
NAPS UNIT 1 320MAF.N.6.1
AF1 27
ANALYST: MCC
CREATION DATE: 06-23-1991
REVISION 09-15-92
TURBINE DRIVEN PUMP FAILS TO RUN 1-FW-P-2
GAF12712
TFR TO 15 52
1 HR MISSION TIME
GAF12721
12 HR MISSION TIME
GAF12723
24 HR MISSION TIME
GAF12725
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
TURBINE DRIVEN PUMP FAILS TO RUN - 1HR 1-FW-P-2
1FWTPB-FR-1HRP2
4.92E-003
HOUSE EVENT FOR SBO SEQUENCES
XHOS-SBO
0.00E+000
TURBINE DRIVEN PUMP FAILS TO RUN - 12HR 1-FW-P-2
1FWTPB-FR-12HP2
5.74E-002
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
TURBINE DRIVEN PUMP FAILS TO RUN -24HR 1-FW-P-2
1FWTPB-FR-24HP2
1.12E-001
MD PUMP -STNDBY SYS FAILS TO RUN 1-FW-P-3A
GAF12742
TFR TO 18 52
1 HR MISSION TIME
GAF12751
24 HR MISSION TIME
GAF12755
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
MD PUMP -STNDBY SYS FAILS TO RUN - 1 HR 1-FW-P-3A
1FWPSB-FR-1HRP3A
3.30E-005
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
MD PUMP -STNDBY SYS FAILS TO RUN -24 HR 1-FW-P-3A
1FWPSB-FR-24HP3A
7.93E-004
MD PUMP -STNDBY SYS FAILS TO RUN 1-FW-P-3B
GAF12772
TFR TO 19 52
1 HR MISSION TIME
GAF12781
24 HR MISSION TIME
GAF12785
HOUSE EVENT FOR ATWS SEQUENCES
XHOS-ATWS
0.00E+000
MD PUMP -STNDBY SYS FAILS TO RUN - 1 HR 1-FW-P-3B
1FWPSB-FR-1HRP3B
3.30E-005
HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-ATWS
1.00E+000
MD PUMP -STNDBY SYS FAILS TO RUN -24HR 1-FW-P-3B
1FWPSB-FR-24HP3L
7.93E-004
AF100.LGC NUPRA 2.0 VPHR

PLANT GENERAL DESIGN & SAFETY INJECTION SYSTEM INFORMATION FROM NORTH ANNA IPE

TABLE 2-2
SUMMARY OF DESIGN FEATURES: NORTH ANNA UNIT 1

1.	Coolant Injection System	a.	High-Pressure Safety Injection and Recirculation System with 2 trains and 3 pumps. System provides normal makeup flow with crosstie to Unit 2.
		b.	Low-Pressure Injection and Recirculation System with 2 trains and 2 pumps.
2.	Heat Removal Systems	a.	Power Conversion System.
		b.	Auxiliary Feedwater System (AFW) with 3 trains and 3 pumps (2 MDP, 1 TDP)*.
		c.	RHR System with 2 pumps and 2 trains inside Containment.
		d.	2 pressurizer power operated relief valves.
3.	Reactivity Control Systems	a.	Control rods.
		b.	Chemical and Volume Control (CH) System.
4.	Key Support Systems	a.	DC power provided by 2 trains of batteries.
		b.	Emergency AC power provided by 2 dedicated diesel generators (both self-cooled).
		c.	Component Cooling Water provides normal cooling to RCP thermal barriers.

		d.	Service Water is normally fed from a reservoir. Lake Anna serves as an alternate supply of Service Water. The SW system provides heat removal from Containment following an accident.
5.	Containment Structure	a.	Subatmospheric (10 psia).
		b.	1.82 million cubic feet.
		c.	45 psig design pressure.
		d.	Reinforced concrete.
6.	Containment Systems	a.	Quench Spray injection initiated at 28 psia with 2 trains and 2 pumps.
		b.	Inside Recirculation Spray (IRS) initiated at 28 psia with time delay with 2 trains and 2 pumps (both pumps inside Containment).
		c.	Outside Recirculation Spray initiated at 28 psia with time delay with 2 trains and 2 pumps (both pumps outside Containment).
		d.	The Inside and Outside Spray Recirculation Systems provide the only form of Containment heat removal after a LOCA.

*MDP - motor driven pumps
TDP - turbine driven pumps

A.7 SAFETY INJECTION SYSTEM

Schematics for this system are shown in Figures A.7-1 and A.7-9. The one line diagrams include the safety injection subsystems and the safety injection actuation logic trains.

A.7.1 SI System Major Components

The Safety Injection System consists of three accumulators, one hydrostatic test pump, three high head safety injection (HHSI) pumps (also called charging pumps), one boron injection tank (BIT), and two low head safety injection (LHSI) pumps. This subsection describes the major SI System components and the flow paths used to achieve the purpose. The RWST is a major component of the QS System, but it has many safety related interfaces with the SI System. Therefore, the RWST interfaces will be discussed with the SI System major components.

Accumulators

The Safety Injection System has three accumulators: 1A, 1B, and 1C. Two of the three accumulators refill the reactor inlet plenum, downcomer, and lower core basket with borated water following a LOCA. The third accumulator is assumed in the accident analysis to be dumped out of the break. The accumulators are considered to be passive components since no electrical signal, operator action, or power is required for their operation. This subsection describes accumulator 1A. Accumulators 1B and 1C are identical except for valve numbering. The accumulators are located on the 216-foot level of Containment inside the crane wall. Figure 52-2 shows a piping diagram for accumulator 1A. Each accumulator is a pressure vessel filled with at least 7580 gallons of 2200 to 2400 parts per million (ppm) borated water and pressurized with nitrogen gas to 599 to 667 psig. The carbon steel vessel is internally clad with stainless steel and has a total volume of 1450 cubic feet. Remote accumulator pressure and level indication is provided in the Main Control Room.

Each accumulator is connected to its respective RCS cold leg through a motor-operated, accumulator isolation valve MOV-1865A and two swing-check valves. The accumulator isolation valve is used to prevent emptying the accumulator during normal plant cooldown and depressurization. All of the accumulator isolation valves are opened during RCS pressurization when the RCS pressure is between 900 and 950 psig. Above 100 psig, power is removed from the valve operators, and the power supply breakers are locked open. This action partially satisfies technical specification requirements for accumulator operability.

During RCS depressurization in support of unit shutdown, the MOVs are energized when RCS pressure is <1990 psig. This is done by unlocking the admin. locks on the power supply breakers (located on the emergency bus 480 V MCCs in the cable vault), removing the locks, and closing the respective breakers. The MOVs are left open until RCS pressure has been reduced to 950 psig. They are then closed, but the valve operators remain energized until RCS temperature is reduced to <350°F.

The accumulator check valves are normally held shut by the higher RCS pressure of 2235 psig. During a LOCA, when RCS pressure drops below the approximately 600 psig, the check valves open and the accumulator discharges into the RCS without any external requirements. A connection is provided upstream of each check valve for accumulator sampling and to permit testing the check valves for seal leakage during RCS pressurization when there is about 100 psi differential pressure across the valves.

Refueling water storage tank

There is one refueling water storage tank (RWST) per unit. It is located in the yard next to the Safeguards Building. The RWST performs the following functions:

1. Provides borated water to the HHSI pumps, LHSI pumps, and quench spray pumps.
2. Provides alternate source of water to the HHSI pumps during abnormal operations.
3. Provides storage water for the refueling cavity.

The RWST is a vertical, cylindrical tank with a usable capacity of 487,000 gallons. It must contain at least 466,200 gallons of 2300 to 2400 ppm borated water during unit operation in modes 1-4. The proper boron concentration is maintained by the Chemical and Volume Control System (CVCS). The RWST is required to be maintained between 40° and 50°F during unit operation in modes 1-4. The maximum allowed temperature ensures that sufficient cooling capacity is available for the QS System to depressurize Containment in the time required in the event of a LOCA. Further information on the RWST may be found in the QS System training module (NCRODP-53). The water from the RWST is directed to the HHSI and LHSI pumps through a common supply header. Water from the supply header enters the LHSI pumps through individual, normally open, motor-operated valves 1-SI-MOV-1862A, and B. Water to the HHSI pumps passes through parallel, normally shut, motor-operated valves 1-CH-MOV-1115B and D. These valves are redundant to ensure that at least one opens on receipt of a safety injection actuation signal or a VCT low level of 5 percent. The supply header then branches to each of the HHSI pumps through individual, normally open, motor-operated valves 1-CH-MOV-1267A, -1269A, and -1270A.

High head safety injection pumps

The Safety Injection System has three high head safety injection pumps, commonly referred to as "charging pumps." They are located in the charging pump cubicles on the first floor of the Auxiliary Building. During normal operation, at least one pump is operating with the other two lined up for normal charging. When safety injection actuates, all three pumps receive an auto-start signal but only two of the pumps will remain running. The two running pumps will preferentially be powered from different emergency buses to minimize bus loading.

The HHSI pumps are horizontal, eleven-stage, centrifugal pumps. Each pump is designed to pump 150 gpm at 250°F and 2735 psig. Each HHSI pump has a self-contained oil lubrication system. The HHSI pump is driven by a 900 HP, 1800 rpm motor that rotates the pump at 4846 rpm through a speed-increasing gearbox. HHSI pumps 1A and 1C are powered from 4160 V bus 1H. HHSI pump 1B is powered from 4160 V bus 1J. HHSI pump 1C can be used as an alternate pump for either SI train and may be powered alternatively from 4160 V bus 1J. When pump 1C is powered from its alternate source, it has no automatic start features.

To prevent overheating of the HHSI pumps when they are operated at a shutoff head, a mini-flow recirculation line is provided for each pump. The recirculation flow path contains a check valve, an orifice, and an isolation valve MOV-1275A, B, or C. The three mini-flow lines join to form a common header which discharges to the seal water heat exchanger through a common recirculation line isolation valve 1-CH-MOV-1373. The recirculation flow from the seal water heat exchanger is directed back to the suction of the HHSI pumps. During a LOCA, the recirculation line isolation valve is manually shut to maximize HHSI pump flow when RCS pressure decreases below a certain point. The valve is manually reopened if RCS pressure rises above 2000 psig. When RCS pressure is above 2000 psig, the flow through the HHSI pumps is insufficient for pump cooling, and recirculation flow is necessary to prevent pump damage.

The HHSI pumps normally receive water from the VCT through a supply header that contains two series isolation valves MOV-1115C and E. The VCT supply header and the RWST supply header combine into a common HHSI pump suction header. The discharge of LHSI pump 1B can be directed to the HHSI pump supply header through normally shut, isolation valve 1-SI-MOV-1863B. Each HHSI pump is supplied in parallel from the supply header through normally open, isolation valves 1-CH-MOV-1267A, -1269A, and -1270A. LHSI pump 1A can supply each of the HHSI pump suctions through a normally shut, common isolation valve 1-SI-MOV-1863A and individual, normally open, alternative path isolation valves 1-CH-MOV-1267B, -1269B, and -1270B.

The HHSI pumps can discharge water through individual, normally open, outlet valves 1-CH-MOV-1286A, B, and C. This discharge can pass through a common discharge header isolation valve 1-CH-MOV-1289B to the normal RCS charging header. The discharge from 1-CH-MOV-1286A, B, and C can also be directed through the BIT to the RCS cold legs or to the RCS through normally shut isolation valves 1-SI-MOV-1867C or D, hot legs through a normally shut isolation valve 1-SI-MOV-1869B. The discharge of the HHSI pumps can also be directed through individual, normally open, isolation valves 1-CH-MOV-1287A/B/C to either the RCS cold legs through normally shut, alternate path isolation valve 1-SI-MOV-1836 or the RCS hot legs through normally shut, alternative path isolation valve 1-SI-MOV-1869A.

During normal plant operation, water enters the HHSI pump from the VCT through 1-CH-MOV-1115C and E and through HHSI pump suction valve MOV-1267A, -1269A, or -1270A. The discharge of the HHSI pump passes through the pump discharge valve MOV-1286A/B/C through the RCS charging header isolation valve MOV-1289B, FCV-1122, MOV-1289A, the regenerative heat exchanger, HCV-1310, and into B-Loop cold leg downstream of the accumulator discharge line.

During the injection mode, water from the RWST enters the HHSI pumps through 1-CH-MOV-1115B and D and the pumps suction valves MOV-1267A, -1269A, and -1270A. The discharge of the pumps passes through the pump discharge valves 1-CH-MOV-1286A/B/C to the BIT.

During the recirculation mode, water from LHSI pump 1A enters the HHSI pumps through MOV-1863A and the alternate header via pump suction valves MOV-1267B, -1269B, and -1270B. LHSI pump 1B supplies water through MOV-1863B and the normal header via pump suction valves MOV-1267A, -1269A, and -1270A to the HHSI pumps. During cold leg recirculation, the HHSI pumps discharge through discharge valves 1-CH-MOV-1286A, B, and C and the BIT. Later, one of the HHSI pumps is isolated from the other HHSI pump to provide two independent paths to the RCS. Independent paths provide protection against a long-term passive failure causing a complete loss of core cooling. In the cold leg lineup, one HHSI pump discharges through the alternative discharge valve 1-CH-MOV-1287A, B, or C and MOV-1836. During hot leg recirculation, one HHSI pump discharges through its normal discharge valve and 1-SI-MOV-1869B to the RCS hot legs, while the other HHSI pump discharges through its alternative discharge valve and 1-SI-MOV-1869B to the RCS hot legs.

Low head safety injection pumps

There are two low head safety injection pumps for each unit. The pumps are located in Safeguards Area outside of Containment. During normal plant operations, the LHSI pumps are in standby, lined up to pump borated water from the RWST to the RCS cold legs. On receipt of a safety injection signal, the pumps automatically start and deliver large quantities of borated water to the RCS if RCS pressure is less than discharge pressure, otherwise, they will run on recirculation to the RWST.

Each LHSI pump is a vertical, two-stage, mixed flow enclosed impeller, centrifugal pump. The pump has a capacity of 3000 gpm at a temperature of 300°F and a pressure of 175 psig with a design head of 225 feet. The pump suction is located at the bottom of the safeguards pit at the 210-foot elevation. The pump discharges along the shaft vertically to the 256-foot elevation where the mechanical seals and motor are located. The pump is driven by a 250 HP, 4160 V, induction motor that rotates the pump at 1800 rpm. LHSI pump 1A is powered from 4160 V bus 1H and pump 1B from bus 1J. The pumps are protected from overpressure by relief valves 1-SI-RV-1845A, B, and C that relieve to the Safeguards Area. Their setpoints are 220 psig.

The LHSI pump uses tandem mechanical seals to contain the water within the pump at the point where the shaft protrudes through the discharge head. In the event that the inboard seal fails, the outboard seal is capable of handling the full unit pressure. Seal water flow and cooling is provided water from the RWST. Local flow indication is provided for the combined LHSI pumps seal water supply.

The suction of the LHSI pumps is physically located at the bottom of the safeguards valve pit at elevation 210 feet. Water from the containment sump, in particular, gravity drains into the pump suction pit. The containment sump is only a few feet higher than the LHSI pump suction pits. To provide a full suction for the pumps, each pump is provided with two ejectors to remove air from each pump suction area. The air ejectors use the pump discharge as the high pressure source of water to create a suction on the pump suction space. This not only fills the pump suction bell with water, but also increases the flow of water from the sump to the pump suction pit.

A minimum flow bypass line is provided for each pump to recirculate fluid to the RWST to prevent overheating of the pump while operating at shutoff head and for test purposes. Two motor-operated, isolation valves 1-SI-MOV-1885A & C and 1-SI-MOV-1885B & D are piped in series on the recirculation line for each pump. The recirculation line is automatically isolated when the following conditions are satisfied:

1. SI recirc. mode signal is present (from SI, lock-in relay),

2. RWST level is below 24.9 percent, and

3. Either 1-SI-MOV-1863A or B respectively has opened.

During the recirculation mode, the LHSI pumps take a suction on the containment sump. If the recirculation line isolation valves did not shut radioactive gases from the sump water would be released to the atmosphere through the RWST vent. The valves do not shut until minimal cooling flow is ensured by 1-SI-MOV-1863A or B opening.

The LHSI pumps take a suction on either the RWST or on the containment sump. During normal operations and the injection mode, the LHSI pumps are lined up to receive water from the RWST through motor-operated, isolation valves 1-SI-MOV-1862A and B. During the recirculation mode, these isolation valves are shut and the motor-operated, isolation valves 1-SI-MOV-1860A and B from the containment sump are opened. On receipt of a low-low RWST level, 1-SI-MOV-1860A and B will open automatically if a SI recirc mode signal is present and the respective LHSI pump recirculation valves have shut.

The LHSI pump discharge can be directed to the RCS cold legs, the HHSI pump suction, or the RCS hot legs. During normal plant operations and the injection mode, the discharge of the pumps is lined up to the RCS cold legs through normally open, pump discharge valves 1-SI-MOV-1864A and B and a pair of normally open, isolation valves 1-SI-MOV-1890C and D that are piped in parallel. The motor operators for 1-SI-MOV-1890C and D are normally deenergized with their breakers locked open. On initiation of the recirculation mode, the discharge of the LHSI pumps continues to the RCS cold loops with some portion being directed to the suction of the HHSI pumps through normally shut, isolation valves 1-SI-MOV-1863A and B. This lineup ensures net positive suction head to the HHSI pumps, since water is no longer being provided to the HHSI pumps from the RWST. During the recirculation mode, the discharge of the LHSI pumps is periodically lined up to the RCS hot legs through normally shut, isolation valves 1-SI-MOV-1890A and B. On Unit 1, the outside recirculation pumps 1-RS-P-2A and B can discharge to the LHSI pump discharge headers in the event of failure of one or both of the LHSI pumps. Each outside recirculation pump is normally isolated from the corresponding LHSI pump by a pair of series manual isolation valves. They are operated from outside the safeguards building with a T-handle wrench inserted into the associated remote valve operator (a recessed, square-shaped hole in a round, brass device).

A.7.2 Fault Tree Analysis

The Safety Injection system was modeled as a front line system, providing several safety functions.

- D1 - Failure to provide high pressure coolant injection from the RWST using 1/3 HHSI pumps.
- D2 - Failure of the Accumulators to inject water into the cold legs. The success criteria for D2 are 2/2 for large LOCA, 2/3 for intermediate LOCA, and 3/3 for core cooling recovery.
- D3 - Failure to provide low pressure coolant injection from the RWST using 1/2 LHSI pumps.
- Dh - Failure to provide coolant injection flow to the RCS hot legs using 1/2 LHSI pumps in the Containment Sump recirculation mode.
- H1 - Failure to provide low head coolant injection from the Containment Sump, using 1/2 LHSI pumps.
- H2 - Failure to provide high lead coolant injection from the Containment Sump, using the piggyback recirculation mode.
- P - Failure to support feed and bleed cooling by providing 1/3 HHSI pumps injecting from the RWST.

The assumption and notes used to develop the Safety Injection system fault trees are contained in Table A.7-5. The assumptions and notes used to develop the safety injection actuation system fault tree follow.

Safety Injection Fault Tree Modeling Assumptions

1. Variations in boron concentration were not included in the failure analysis. Boron concentration is controlled by Technical Specification to a much narrower range than that required by the PRA. In fact, there are no explicit boron requirements of the accumulators in the PRA. This is because the probability of being out of tolerance enough to have any impact is generally considered (in all past PRA's) to be negligible.

2. Variations in water level and pressure were not considered included in the fault tree model. Water level and pressure are constantly monitored by Technical Specifications. These parameters are annunciated if out of specification.

3. The probability of the discharge valve (1-SI-MOV-1865A/B/C) being inadvertently closed at the time of the initiator was considered negligible in comparison to other faults. The following reasons apply:

   a) failure to be fully open is annunciated

   b) the valve is designed to be fully open or fully closed.

4. The loop selected for the break is not important. All valves receive redundant signals to open.

5. Stroke test interval for 1-SI-MOV-1865A/B/C valves is assumed to be 18 months.

6. Failure of the LHSI pump due to failure of seal cooling was not explicitly modeled. The seal cooling for LHSI pumps is self contained and principally passive. The water level on the seal head tank is constantly monitored and annunciated. Failure of seal cooling is considered to be included in the component boundary of the pump.

7. Failure of bearing cooling to the pump was not explicitly modeled. There is no external cooling supplied for the bearings. As long as the pumped stream is within the design temperature of the pump, the bearing temperatures are considered acceptable. Failure of the bearings for all causes is considered to be within the component boundary of the pump for pump failure, although the accident sequence delineation does not allow the pump to operate if the sump water temperature is over the pump design temperature.

8. Motor heating failures and trace heating failures were not modeled explicitly. The LHSI pumps have no external cooling. All pump failures due to loss of the internal cooling mechanisms are considered within the component boundary of the pump.

9. Misposition errors were not postulated for valves which get an open (or close signal) on an SI.

10. 1-SI-MOV-1890A and B are normally closed and have power removed.

11. Failure of one LHSI pump due to dead-heading when the 885 valves are open, was not postulated. This assumption represents the resolution of NRC concern expressed in Information Notice 87-59. If two pumps share a common recirc line, a slightly higher discharge pressure in one pump could deadhead the other pump. At North Anna, each LHSI pump has a 2 inch minimum flow recirculation line feeding into a 3 inch common header. Due to the quarterly measuring of the

discharge head during the pump test and the 2 to 3 inch pipe size increase, the possibility of having conditions where the NRC concern was applicable was considered negligible. Dead heading of the LHSI pumps due to valve blockage in the minimum flow line or misposition of an 885 valve were explicitly modeled. These faults are considered of much higher probability than the NRC scenario.

12. Containment sump valves 1-SI-MOV-1860A/B were considered to have a flow test frequency of 5 years, although they are never flow tested, only stroked. This assumption provides a plugging failure probability of 2.63E-3, compared to a valve fail to open probability of 1.09E-2.

13. 1-SI-MOV-1864A/B and 1-SI-MOV-1890C/D are flow tested every refueling. 1-SI-MOV-1862A/B are flow tested at 400 gpm every month.

14. As 1-SI-MOV-1863A/B are periodically flow tested, and they are normally closed valves, a plugging failure mode for these valves was not included. The general guideline for the fault tree analysis was that if an active failure mode is postulated for an MOV, there is no reason to include a plugging failure mode also. 1-SI-MOV-1860A/B are the exception to that guideline.

15. Restoration error for 1-QS-38 (Unit 1) and 2-QS-33 (Unit 2) was not postulated, because it is often flowed and under administrative control if it is ever closed. Its position is vicariously verified by every LHSI pump test (PT-57.1). The probability of a restoration error and a valve demand before the next pump test is considered to be small compared to the plugging fault. A plugging fault for 2-QS-33 or 1-QS-38 was postulated with a test interval of three months (PT-57.1).

16. North Anna MAAP analysis shows that the maximum sump water temperature at the time of recirculation, for all transients considered in the IPE, is well within the 250°F design temperature of the pump (which is limited by the graphite bearing assembly).

17. Common cause miscalibration of multiple 1845 relief valves is not modeled.

18. It is assumed that LHSI header pressure will not get high enough in a large LOCA to lift a relief valve.

19. In the event that 1-SI-SV-1845B opens, and the operator diagnoses the event and isolates the valve, equipment failures in the alternate injection paths are not modeled. It is assumed that one hot leg injection path or HHSR path will be available.

20. As the mission time for the injection phase of LHSI is one hour, system failure due to inadvertent opening of a relief valve was not modeled. At 180 gpm, the total flow in one hour would be 10,000 gallons. This is not enough diversion from the RWST to cause insufficient inventory. Nor is it enough to cause flooding of the safeguards area.

21. The cross tie between the recirculation spray system and the LHSI system is not used and was not modeled.

22. Operator action to allow injection through 1-SI-MOV-1836, in the event 1-SI-MOV-1867A/B/C/D fail was included for all initiators. The same operator error probability was used for all initiators.

23. The volume control tank must isolate in order to prevent cavitation of the charging pumps, even if both RWST valves open.

24. Cross tie to the other unit's charging will be modeled in the recovery analysis if necessary. Cross tie requires local operation of two manual valves in the auxiliary building. It is estimated that cross tie will require 20 minutes to accomplish. It is not directed by 1-FR-C.1 as is the case for Surry. The cross tie procedure, 0-AP-48 directs both reactors to be tripped in order to perform the procedure. The time and procedural direction for the set-up of cross tie is not certain at this point in the analysis.

25. One charging pump is running at all times. It was modeled as the 1A pump. The 1B pump is modeled as in standby and on the J Bus, and 1C is modeled as racked into the H bus, and in the "auto-after-stop" condition. In this condition, it will not receive any signals, but can quickly be activated from the control room.

26. Charging pump 1A is dedicated to bus H. Charging pump 1B is dedicated to bus J. Charging pump 1C can be powered from the H or the J bus. H is the normal alignment for Charging pump 1C. There are several interlocks on breaker position to prevent crosstie of the buses through the pump 1C. If pump 1C is on the J bus, it must be running. 1C receives no auto-signals on the J bus. Only one pump can be aligned to the J bus at one time. Two pumps (1A & 1C) can be operating on H at one time (during pump test). If a loss of offsite power occurs during this time, both pumps are tripped off the bus, to prevent the diesel from loading onto a loaded bus.

27. Generally, only 2 Charging pumps will receive an autostart signal. If 1C is on the J bus, then only the 1A pump will receive an autostart. If 1C is on J, then by Administrative procedures, 1C is running.

28. The running pump is not stopped on an SI signal; rather it continues to run.

29. A third pump can be started if another pump fails. In order to have a third pump available, pump 1C must be on H.

30. Two Charging pumps are required by Tech Spec and thus one of the three pumps can theoretically be out of service forever. Two pumps can be out of service for 24 hours. This is handled in the fault tree as follows:

    The A pump is assumed to be running. The B and C pumps are both assigned a term for scheduled maintenance (TM) and unscheduled maintenance (UM). Both frequencies will come from plant specific data. All incidences when two pumps are in maintenance at the same time are lumped together, and this event is applied to both the B and C pumps. All maintenance events involving single pumps are similarly lumped and this event probability is applied to the C pump only. Unavailability due to pump tests are applied to the B and C pumps. Because two pumps can be out of service for up to 24 hours, the combination of pump B in TM and pump C in UM is an allowed cutset.

31. Isolation of charging flow (by closure of 1-CH-MOV-1289A/B) is not necessary for success of HHSI. This is not a flow diversion, as the flow goes to the RCS.

32. Service water to the lube oil coolers (1-CH-E-5A/B/C) and the gear box coolers is required when the Charging pumps are in the SI mode. Although SW has been lost at Surry, for up to 4 hours in the charging mode, with continued pump operation, there is no evidence that the pumps could operate in the SI mode without service water.

33. Because of the piping configuration of the service water supply headers, the requirement of service water to the gear box cooler will also assure supply of service water to the seal coolers, although it is not known if seal coolers are required.

34. HVAC in the charging pump cubicles is assumed not to be required for successful Charging pump operation throughout the 24 hour mission time.

35. Minimum flow lines were ignored for LOCAs and all transients with scram. For these events, RCS pressure is below 2250 psi and thus there will be flow into the RCS, thus negating the need for mini-flow line operation, if the discharge MOV (1286A/B/C) is open.

36. If 1-CH-MOV-1286A/B/C is closed, mini-flow is assumed required to prevent pump dead head and subsequent failure.

37. Monthly testing per 1-PT-14.1, 1-PT-14.2 and 1-PT-14.3 makes the pump unavailable unless the operator takes action to open the discharge valve.

38. MOV test duration per 1-PT-212.1/2/3 or 213.1/2/3 is so short, it was not considered as an impact on system operation.

39. For recirculation from the sump, either LHSI, injecting through either 1-SI-MOV-1863A or B is sufficient to supply flow to two operating charging pumps. Either check valve 1-SI-47 must close or both MOV-1115D and 1115B must close in order to isolate the RWST. The calculation below is used to justify that sufficient hydraulic force is present to close the check valve. If the check valve operates, the head from the LHSI will keep the valve closed and thus, MOV-1115B and MOV-1115D do not have to close.

    Design flow for 1 LHSI pump is 3250 gpm. Runout flow for a Charging pump is 600 gpm. Under piggyback recirc at high RCS pressure, one LHSI pump could supply up to 2050 gpm surplus flow to reseat check valve 1-SI-47 in the event MOV-1115B or MOV-1115D failed to reclose. 1-SI-47 is in an 8" line. Surplus flow of 2050 gpm would result in a back flow of 13.2 ft/sec.

40. The auxiliary oil pump on each Charging Pump was not modeled. The aux. oil pump is constantly running in the standby pumps to circulate the oil. During normal Charging Pump operation, a shaft driven pump provides lubrication. The aux oil pump is needed for initial start, before the shaft driven pump gets up to speed. It was not included for two reasons; either one is sufficient:

    a) Start of the Charging Pump without the aux oil pump, on a one time basis is not damaging, according to the manufacturer. Repeated dry starts would degrade pump life.

    b) Failure of the aux oil pump would be a revealed fault. The probability of an initiator simultaneous with a failed aux oil pump is very low.

41. Failure of trace heating is a revealed fault (through instrumentation) and thus not included in the fault tree.

42. The standby Charging Pump will start upon failure of the running pump on low discharge header pressure. This is a non-SI signal.

43. Resolution of NRC Information Notice 88-23 - "Potential for Gas Binding of SI Pumps" is as follows: HHSI suction piping is periodically vented. Records show a typical gas volume of $.3ft^3$ - $.4ft^3$. This level is consistent and supports the position that the CHPs can tolerate this amount of gas flow through without any pump damage.

44. 1-CH-MOV-1115C/E will not close unless interlocks from limit switches on 1-CH-MOV-1115B/D are satisfied. The limit switches provide more redundancy and reliability than the MOVs. The interlock was therefore not included in the fault tree.

45. RWST failures and suction failures were assumed to fail all pumps by cavitation before operator action could be taken.

46. 1-QS-38 [2-QS-33 for unit 2] is a manual valve on the discharge of the RWST. Its failure represents a single point failure for the HHSI and LHSI system. Three failure modes have been postulated for this valve, plugging, closed for test or maintenance, and failure to restore after maintenance. Each of these are discussed.

a) Closed for maintenance: No PTs were discovered which require closing of the valve during power operations. Closing of the valve would be on an infrequent, as needed basis to support maintenance activities. The valve could not be closed for more than 4 hours without violating Tech Spec (as it makes both trains of SI unavailable). Therefore, the amount of time the valve could be closed is small and was neglected in the fault tree.

b) Failure to Restore after maintenance: As the valve could be closed during power operation (for whatever reason), there is a probability that it is inadvertently left closed. The valve is vicariously verified open every three months during LHSI pump test, 1-PT-57.1, which requires recirc flow from the LHSI pumps. For the misposition to cause a system failure, an SI demand would have to occur between the time of valve misposition and the next LHSI pump test (this presumes the valve is closed on a far less frequent basis than 1-PT-57.1 is performed). Assuming 1E-3 for failure to restore, 2E-2 for SI demand per year, and LHSI tests every three months, the probability of a valve misposition and a demand prior to the next pump test is:

$$(.001 * .02) / 4 = 5E-6$$

c) The plugging failure probability for a three month test period is 1.3E-4. Plugging therefore seems to be the dominant failure mode for the valve and was the only one included.

47. Pump trips due to interlocks on the breakers being activated by operator errors were not included in the fault tree. These events are revealed faults and are not present at the time of system demand. Modeling these errors during the mission time are errors of commission and are consequently not modeled.

48. Failures of the lube oil heat exchangers 1-CH-E-5A/B/C are included in the component boundary of the charging pump.

49. Failure of the Boron Injection Tank due to flow obstruction is modeled as a TNK-LF (tank-loss of function) failure.

Safety Actuation Fault Tree Modeling Assumptions

1. Contacts were modeled as part of a relay and not modeled as separate components. For example, a device which starts when a contact is open (energized) will be modeled as a relay which fails to energize. The relay and the contact are actually one component, and there is no significant advantage to separating out the contacts from the relay.

2. SI output signals to MOVs were simplified by only including relays required to actuate the valves to the desired position. Other devices such as limit switches, hand control switches, and torque switches were not included.

3. Modeling of the manual initiation of safety injection and recirculation mode transfer was not included within this fault tree. These human interactions will be included in the SI system fault tree.

4. The SI actuation system has input signals to protect against a LOCA or a Steam Line Break (SLB). All input signals were included within the model. A house event, XHOS-SLB, was included to allow the SI actuation fault tree to be used for LOCA or for SLB initiators. The input signals Related to a SLB were included under an "and" gate with XHOS-SLB. When the house event is equal to 1.0 the SLB signals are allowed to contribute to the SI actuation system unavailability. When the house event is 0.0 then only the LOCA signals contribute to SI system unavailability.

5. Based on a review of SI actuation procedures, SI actuation channels which are bypassed for the purposes of testing are not automatically realigned in the event that SI operation is required.

6. Components for SI actuation train B were generally not shown in system drawings. Train B was drawn in the simplified schematic in a configuration identical to that of Train A.

7. The T_{avg} input signal to SI actuation requires temperature signals from both hot <u>and</u> cold leg RCS temperature transmitters; however, only a single temperature instrument channel was modeled for each pair of hot/cold leg transmitters.

8. Relay K647 is a permissive relay that is energized when SI actuation occurs and must be energized for the initiation of recirculation mode (i.e., it is assumed that K647 must be energized in conjunction with K630).

9. Failure of the SI actuation reset permissives were not modeled as they had been in the Surry model for the steamline break portion of the SI actuation system. North Anna has several different reset permissives installed for the various inputs which cause SI actuation. Due to the numerous possible inputs which can lead to SI actuation, failure of more than one reset permissive would be necessary, and this contribution to system unavailability is assumed to be insignificant.

10. SI actuation lock-in relays (discussed in the reactor protection systems training manual) are not modeled. Failure of these relays would be revealed immediately and prompt operator action is highly probable.

11. No periodic tests specific to the logic which transfers SI to recirculation mode were identified. It is assumed that this logic is tested with one train operable and one in trip.

12. Common Cause Failure of instrument lines has been modeled where appropriate. The basic events are listed below:

1RCTIC-CC-TAVG	CCF of 2/3 Tavg channels
1RCPIC-CC-PRSZRP	CCF of 2/3 Pressurizer pressure channels
1MSPIC-CC-STMDPR	CCF of 2/3 Main Steam line pressure channels
1LMPIC-CC-100	CCF of 2 of 3 containment pressure instrument channels
1MSFIC-CC-MSFLOW	Steam line flow instrument channels
1MSPIC-CC-MSLP	CCF of 2 of 3 steam line pressure instrument channels
1SILIC-CC-RWST	RWST Level Instrument Channel common cause failure - 2/4 channels

two AOVs work together to control the cooldown rate of the RCS. The discharge of the flow control valves feeds into the SI/Accumulator piping and is delivered to the RCS loop 2 and loop 3 cold legs. Each path has a normally shut MOV isolating the RHR from the high pressure RCS during normal plant operations. Makeup to the RHR System is provided by the RCS.

The RHR is manually initiated. An interlock prevents opening the Hot Leg RHR isolation MOVs until RCS pressure is below 450 psig. Only one RHR pump and heat exchanger are required for plant cooldown although both pumps and heat exchangers are normally used immediately following a reactor shutdown, to provide a faster cooldown. Following a loss of offsite power, the stub buses powering the RHR pumps are shed from the emergency buses and must be manually reconnected to restore power to the RHR pumps.

The RHR System is dependent on AC power for motive power for the pumps, and the DC buses for control power to the RHR pumps and the heat exchanger throttle valves. Additionally, the RHR System requires the Instrument Air system for motive power to the heat exchanger throttle valves. The RHR System is dependent on the RCS water level to avoid air binding of the pumps.

Prior to placing the RHR System in service, RCS pressure must be below 450 psig and RCS temperature must be below 350°F. Following a loss of offsite power, the stub buses which power the RHR pumps are automatically shed and must be normally reloaded as the main bus by the operator to restore power to the pumps.

3.2.19.2 RHR System Logic Model

The success criterion for the Surry RHR System requires RHR flow to be provided from one of two pumps through one of two heat exchangers to the RCS following reactor shutdown and cooldown to 450 psig, 350°F. This criterion translates into the following top event in the RHR System fault tree:

- Failure to provide cooled RHR flow to the RCS.

3.2.20 Safety Injection Actuation System Model

The Solid Station Protection System (SSPS, SI actuation system) automatically initiates the Safety Injection Systems, following an indication of the need for primary coolant makeup, and automatically initiates the switchover of the suction of the low pressure injection pumps from the Refueling Water Storage Tank (RWST) to the Containment sump and the switchover of the suction of the high pressure injection pumps from the RWST to the low pressure injection pump discharge upon low RWST level.

3.2.20.1 SSPS Description

The North Anna SSPS is composed of two independent trains used to automatically actuate the low and high pressure injection systems and the motor driven AFW Pumps.

The portion of the SSPS which supports recirculation is composed of four independent RWST level sensors, each feeding two separate two out of four relay matrices. These two relay matrices automatically actuate the components required to perform the switchover to the recirculation mode of the low and high pressure systems. The SSPS is dependent on the AC vital instrumentation buses and the DC buses for operation of the relay logic network.

3.2.20.2 SSPS Logic Model

The SSPS was modeled as a support system to be linked into the components which are activated by the SI signals.

3.2.21 Service Water System

The Service Water System is common to both reactor units and is designed for the simultaneous operation of various subsystems and components of both units. SW System provides long term cooling after a loss of coolant accident (LOCA) and supplies cooling water to the following safety-related components during normal plant operations:

1. Component Cooling (CC) heat exchangers;
2. Recirculation Spray (RS) heat exchangers;
3. Control Room/ESGR air conditioning chiller condensers;
4. charging pump seal coolers, gear reducers, lube oil coolers; and
5. Instrument Air compressors.

The SW System also serves as a backup source of water to the Auxiliary Feedwater System.

The sources of cooling water for the SW System are the SW reservoir and Lake Anna. These two, independent sources of water form the ultimate heat sink for the North Anna Power Station.

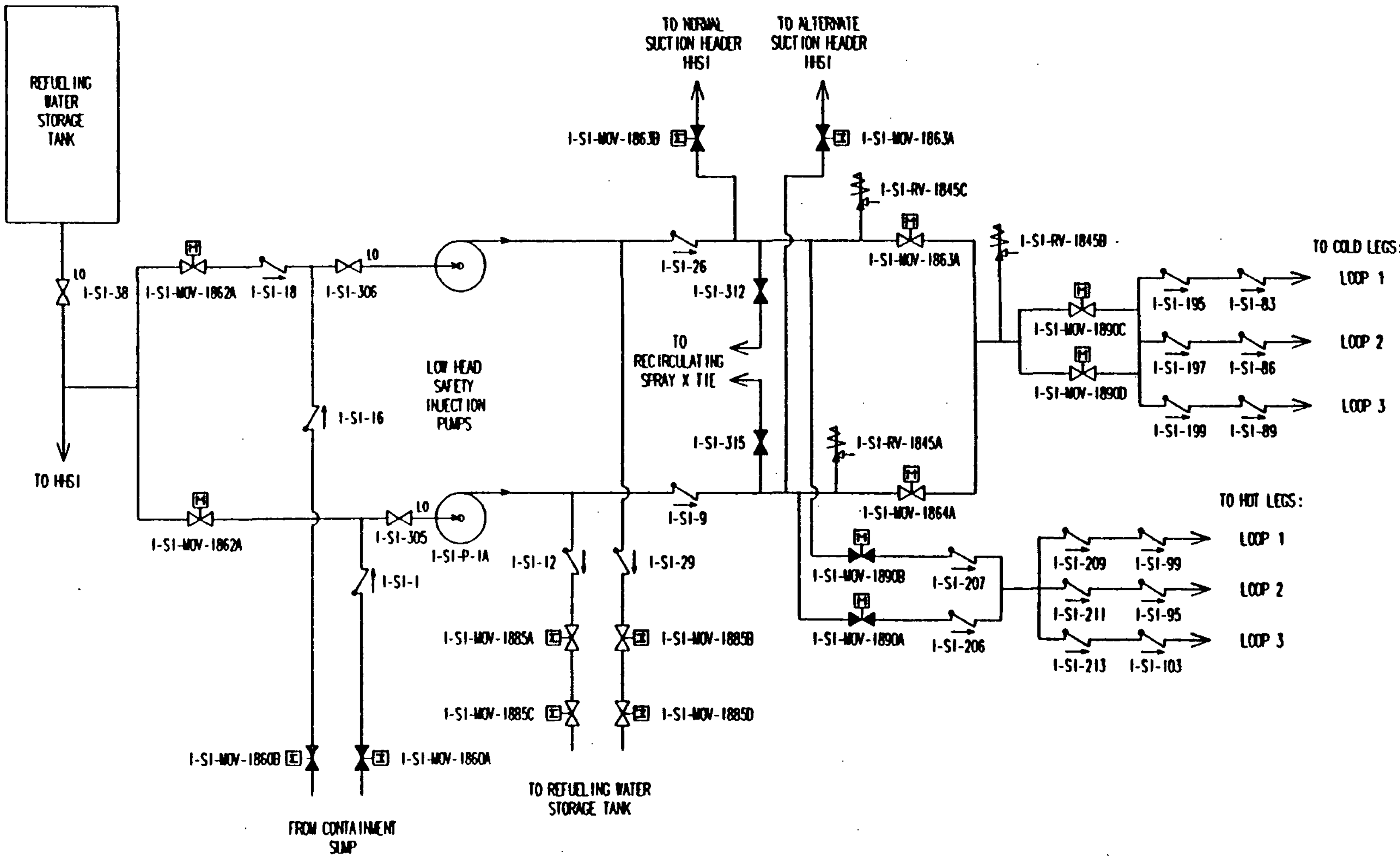


FIGURE A.7-1
LOW HEAD SAFETY INJECTION

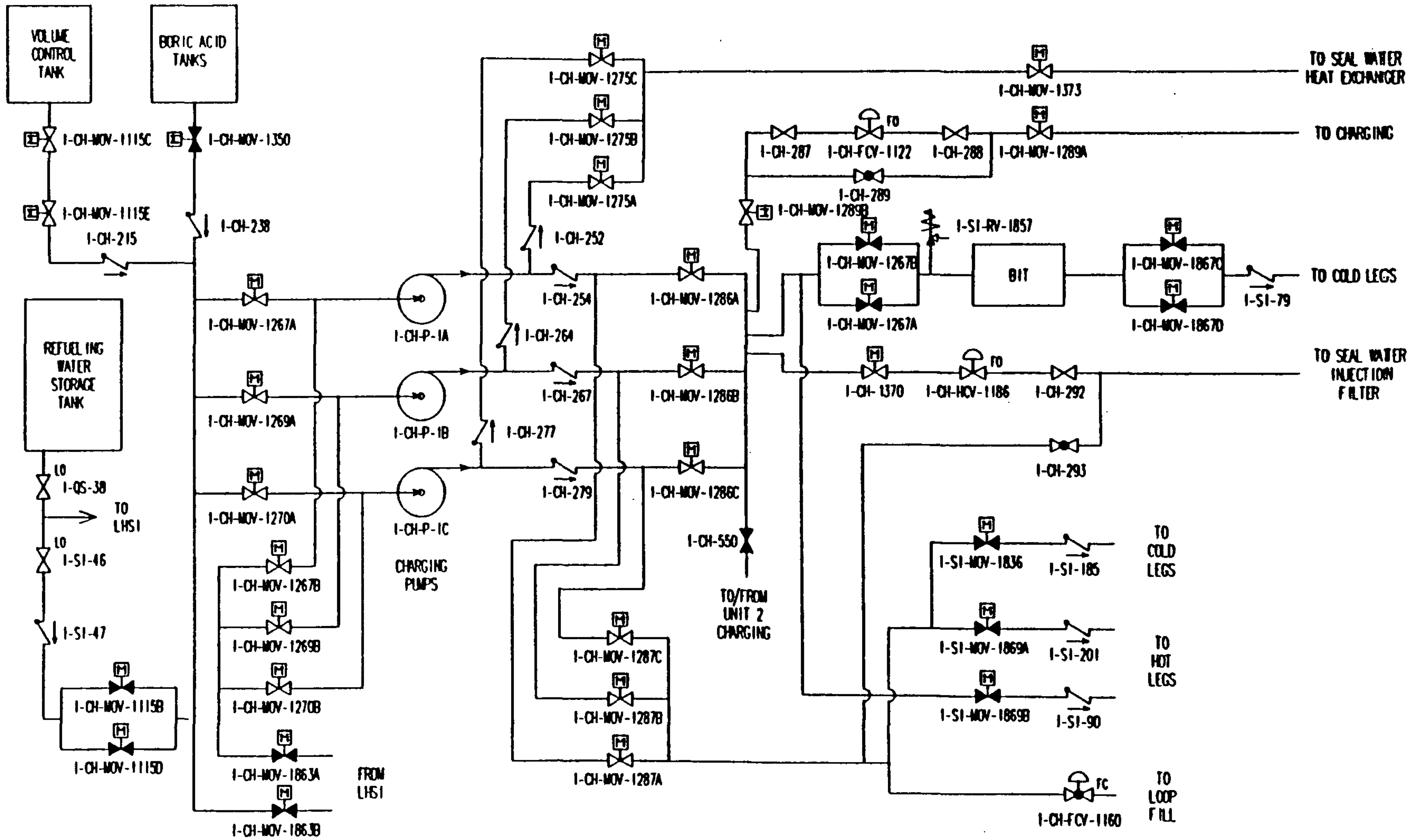


FIGURE A.7-2
HIGH HEAD SAFETY INJECTION

TABLE A.7-4 (Continued)
SAFETY INJECTION ACTUATION DEPENDENCY MATRIX

COMPONENT	MOTIVE FORCE	CONTROL POWER	AUTO ACTUATION	COMPONENT COOLING	ROOM COOLING	INTERLOCKS
1-MS-PT-1496 Main Steamline Pressure	None	120 VAC Vital Bus 1-IV 1-EP-CB-4D	None	None		
RMT Logic & Output Relays Train A	None	120 VAC Vital Bus 1-I 1-EP-CB-4A	RMT Input Signals Train A	None	Emergency Switchgear Room Cooling	
RMT Logic & Output Relays Train B	None	120 VAC Vital Bus 1-III 1-EP-CB-4C	RMT Input Signals Train B	None	Emergency Switchgear Room Cooling	
1-LM-PM-100A RWST Level	None	120 VAC Vital Bus 1-I 1-EP-CB-4A	None	None		
1-LM-PM-100B RWST Level	None	120 VAC Vital Bus 1-II 1-EP-CB-4B	None	None		
1-LM-PM-100C RWST Level	None	120 VAC Vital Bus 1-III 1-EP-CB-4C	None	None		
1-LM-PM-100D RWST Level	None	120 VAC Vital Bus 1-IV 1-EP-CB-4D	None	None		

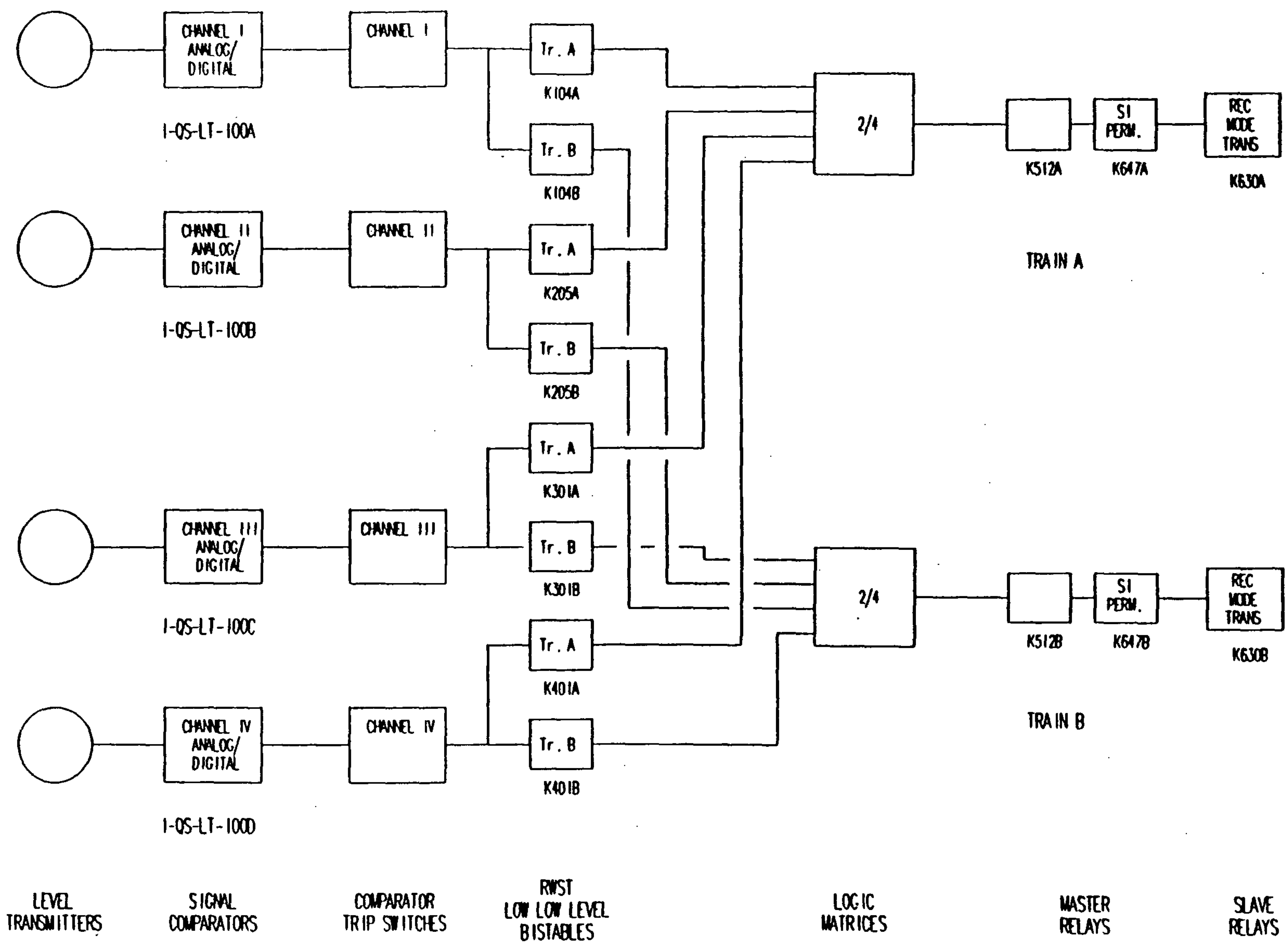
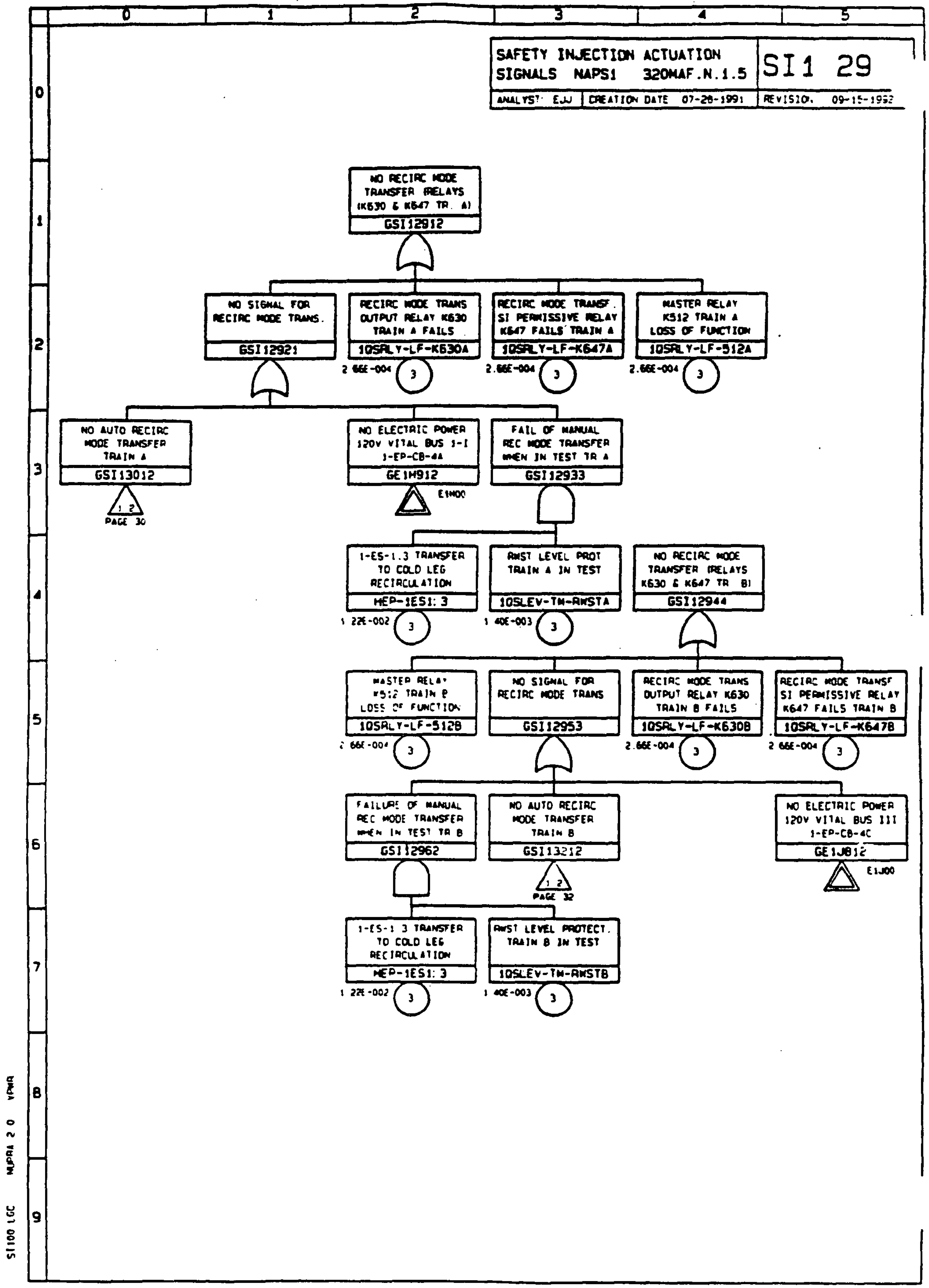
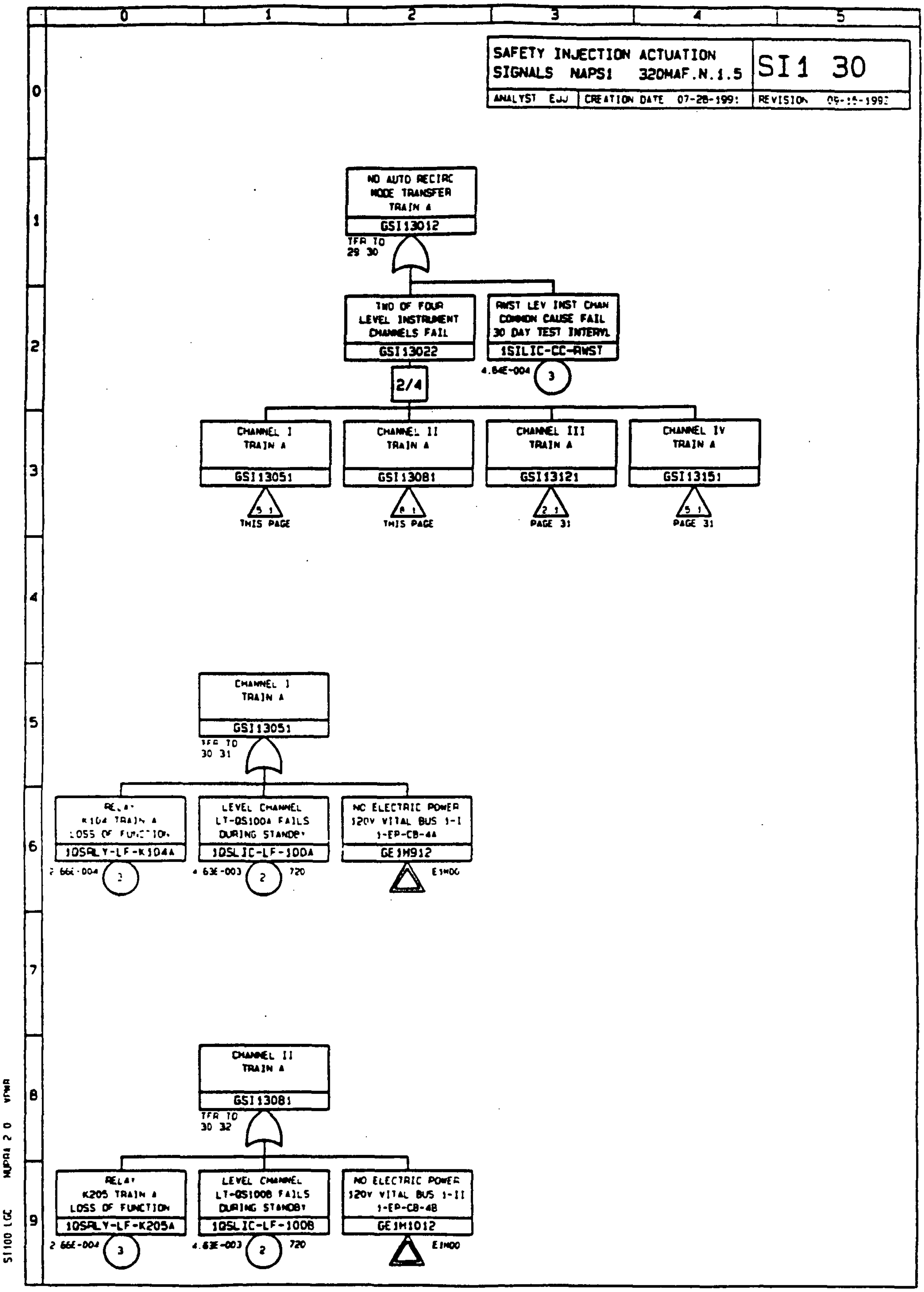


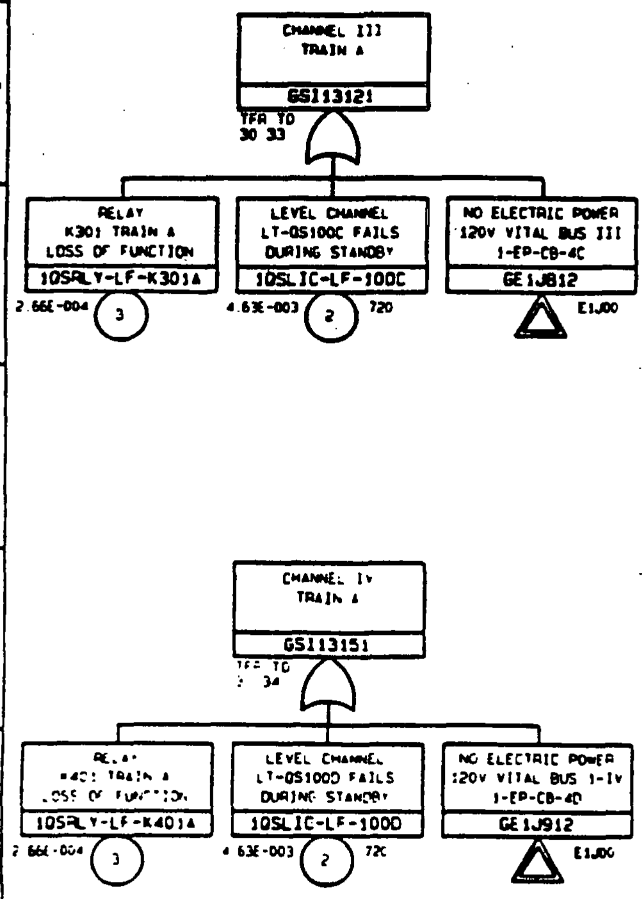
FIGURE A.7-4
RECIRCULATION MODE TRANSFER

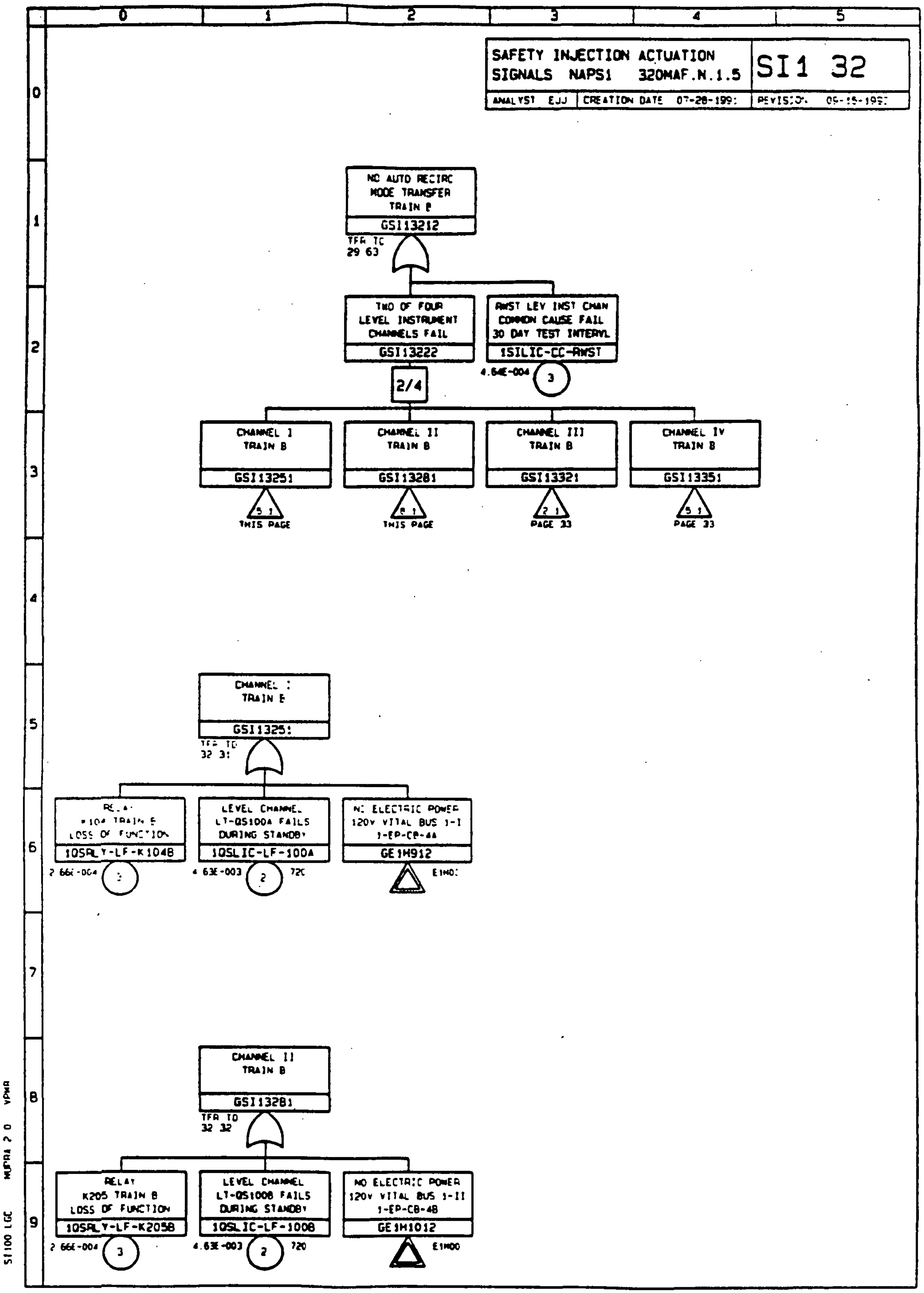


SAFETY INJECTION ACTUATION SIGNALS NAPS1 320MAF.N.1.5
SI1 29
ANALYST: EJJ
CREATION DATE 07-28-1991
REVISION 09-15-1992
NO RECIRC MODE TRANSFER (RELAYS (K630 & K647 TR. A)
GSI12912
NO SIGNAL FOR RECIRC MODE TRANS.
GSI12921
RECIRC MODE TRANS OUTPUT RELAY K630 TRAIN A FAILS
1QSRLY-LF-K630A
2.66E-004
RECIRC MODE TRANSF. SI PERMISSIVE RELAY K647 FAILS TRAIN A
1QSRLY-LF-K647A
2.66E-004
MASTER RELAY K512 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-512A
2.66E-004
NO AUTO RECIRC MODE TRANSFER TRAIN A
GSI13012
PAGE 30
NO ELECTRIC POWER 120V VITAL BUS 1-I 1-EP-CB-4A
GE1H912
E1H00
FAIL OF MANUAL REC MODE TRANSFER WHEN IN TEST TR A
GSI12933
1-ES-1.3 TRANSFER TO COLD LEG RECIRCULATION
HEP-1ES1:3
1.22E-002
RWST LEVEL PROT TRAIN A IN TEST
1QSLEV-TM-RWSTA
1.40E-003
NO RECIRC MODE TRANSFER (RELAYS K630 & K647 TR B)
GSI12944
MASTER RELAY K512 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-512B
2.66E-004
NO SIGNAL FOR RECIRC MODE TRANS
GSI12953
RECIRC MODE TRANS OUTPUT RELAY K630 TRAIN B FAILS
1QSRLY-LF-K630B
2.66E-004
RECIRC MODE TRANSF SI PERMISSIVE RELAY K647 FAILS TRAIN B
1QSRLY-LF-K647B
2.66E-004
FAILURE OF MANUAL REC MODE TRANSFER WHEN IN TEST TR B
GSI12962
NO AUTO RECIRC MODE TRANSFER TRAIN B
GSI13212
PAGE 32
NO ELECTRIC POWER 120V VITAL BUS III 1-EP-CB-4C
GE1J812
E1J00
1-ES-1.3 TRANSFER TO COLD LEG RECIRCULATION
HEP-1ES1:3
1.22E-002
RWST LEVEL PROTECT. TRAIN B IN TEST
1QSLEV-TM-RWSTB
1.40E-003
SI100 LGC NUPRA 2.0 VPWR


SAFETY INJECTION ACTUATION SIGNALS NAPS1 320MAF.N.1.5
SI1 30
ANALYST EJJ
CREATION DATE 07-28-1991
NO AUTO RECIRC MODE TRANSFER TRAIN A
GSI13012
TFR TO 29 30
TWO OF FOUR LEVEL INSTRUMENT CHANNELS FAIL
GSI13022
RWST LEV INST CHAN COMMON CAUSE FAIL 30 DAY TEST INTERVL
1SILIC-CC-RWST
4.84E-004
3
2/4
CHANNEL I TRAIN A
GSI13051
THIS PAGE
CHANNEL II TRAIN A
GSI13081
THIS PAGE
CHANNEL III TRAIN A
GSI13121
PAGE 31
CHANNEL IV TRAIN A
GSI13151
PAGE 31
CHANNEL I TRAIN A
GSI13051
TFR TO 30 31
LEVEL CHANNEL LT-QS100A FAILS DURING STANDBY
1QSLIC-LF-100A
4.63E-003
2
720
NO ELECTRIC POWER 120V VITAL BUS 1-I 1-EP-CB-4A
GE1H912
E1H00
CHANNEL II TRAIN A
GSI13081
TFR TO 30 32
RELAY K205 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-K205A
2.66E-004
3
LEVEL CHANNEL LT-QS100B FAILS DURING STANDBY
1QSLIC-LF-100B
4.63E-003
2
720
NO ELECTRIC POWER 120V VITAL BUS 1-II 1-EP-CB-4B
GE1H1012
E1H00

SAFETY INJECTION ACTUATION SIGNALS NAPS1 320MAF.N.1.5		SI1 31
ANALYST EJJ	CREATION DATE: 07-28-1991	REVISION 09-15-19



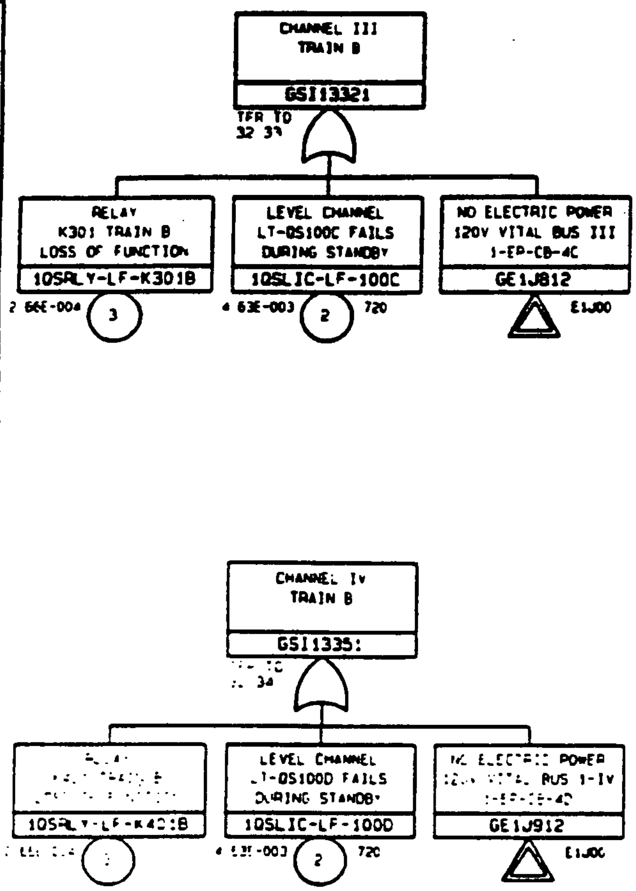


SAFETY INJECTION ACTUATION SIGNALS NAPS1 320MAF.N.1.5
SI1 32
ANALYST EJJ
CREATION DATE 07-28-199:
REVISION 09-15-199:
NO AUTO RECIRC MODE TRANSFER TRAIN B
GSI13212
TFR TO 29 63
TWO OF FOUR LEVEL INSTRUMENT CHANNELS FAIL
GSI13222
2/4
RWST LEV INST CHAN COMMON CAUSE FAIL 30 DAY TEST INTERVL
1SILIC-CC-RWST
4.64E-004
3
CHANNEL I TRAIN B
GSI13251
THIS PAGE
CHANNEL II TRAIN B
GSI13281
THIS PAGE
CHANNEL III TRAIN B
GSI13321
PAGE 33
CHANNEL IV TRAIN B
GSI13351
PAGE 33
CHANNEL I TRAIN B
GSI13251
TFR TO 32 31
RELAY K104 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K104B
LEVEL CHANNEL LT-QS100A FAILS DURING STANDBY
1QSLIC-LF-100A
4.63E-003
2
720
NO ELECTRIC POWER 120V VITAL BUS 1-I 1-EP-CB-4A
GE1H912
CHANNEL II TRAIN B
GSI13281
TFR TO 32 32
RELAY K205 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K205B
2.66E-004
3
LEVEL CHANNEL LT-QS100B FAILS DURING STANDBY
1QSLIC-LF-100B
4.63E-003
2
720
NO ELECTRIC POWER 120V VITAL BUS 1-II 1-EP-CB-4B
GE1H1012
E1H00
SI100 LGC NUPRA 2.0 VPHR

SAFETY INJECTION ACTUATION SIGNALS NAPS1 320MAF.N.1.5

SI1 33

ANALYST EJJ | CREATION DATE 07-28-1991 | REVISION 09-15-199



CORE DAMAGE & DOMINANT CUTSETS RESULTS FROM NORTH ANNA IPE

TABLE 3.4.1-3
SUMMARY OF CORE DAMAGE SEQUENCES WHICH CONTRIBUTE TO THE UPPER 95% OF THE TOTAL CORE DAMAGE FREQUENCY

Sequence	Core Damage Frequency (per year)	Fraction of Total	Functional Failures
S2P35	5.15E-6	7.6%	S2D1D3
S1P38	4.04E-6	5.9%	S1D1Y
T1TrP17	4.00E-6	5.9%	T1TrOD1
T8P22	3.17E-6	4.7%	T8LtRC1
T1AP51	2.99E-6	4.4%	T1ALtBB1
T7P04	2.98E-6	4.4%	T7OO2
T1P10	2.71E-6	4.0%	T1LD1
T8P02	2.52E-6	3.7%	T8RC2
S1P10	2.45E-6	3.6%	S1OH2
S2P04	2.45E-6	3.6%	S2H1
T1TrP21	2.22E-6	3.3%	T1TrOD1Qs
AP15	2.12E-6	3.1%	AD2
T7P03	1.98E-6	2.9%	T7OW
T3TrP11	1.67E-6	2.5%	T3TrOD1
T3TrP03	1.57E-6	2.3%	T3TrRC2Ch
T9ATrP08	1.53E-6	2.2%	T9ATrLtRC1
VXP07	1.52E-6	2.2%	VXFm
T1AP46	1.41E-6	2.1%	T1ALtB
T1AP07	1.38E-6	2.0%	T1ABB1
S2P43	1.19E-6	1.8%	S2D1Y
T7P06	1.10E-6	1.6%	T7SGIW
T1TrP14	1.01E-6	1.5%	T1TrOH1
T1AP67	8.86E-7	1.3%	T1AQBB1
T9ATrP02	8.33E-7	1.2%	T9ATrRC2
AP03	8.26E-7	1.2%	AH1
T2P09	7.22E-7	1.1%	T2LD1
T2ATrP11	6.78E-7	1.0%	T2ATrOD1
T1AP02	6.51E-7	1.0%	T1AB
T2ATrP03	6.40E-7	0.9%	T2ATrRC2Ch
T8P06	6.06E-7	0.9%	T8RC2RC3
AP11	5.88E-7	0.9%	AD3
T1P07	5.66E-7	0.8%	T1LH2H1
S2P39	5.20E-7	0.8%	S2D1D2
AP02	5.17E-7	0.8%	ADh
T1P15	5.16E-7	0.8%	T1LP
T1AP58	4.17E-7	0.6%	T1AQB
T9ATrP14	3.88E-7	0.6%	T9ATrOH1
T7P26	3.85E-7	0.6%	T7D1SGI
S2P47	3.27E-7	0.5%	S2D1L
T9ATrP17	3.07E-7	0.5%	T9ATrOD1
T3TrP06	2.83E-7	0.4%	T3TrRC2RC3
RXP01	2.66E-7	0.4%	RX

TABLE 3.4.1-3 (Continued)
SUMMARY OF CORE DAMAGE SEQUENCES WHICH CONTRIBUTE TO THE UPPER 95% OF THE TOTAL CORE DAMAGE FREQUENCY

Sequence	Core Damage Frequency (per year)	Fraction of Total	Functional Failures
T9BP02	2.37E-7	0.3%	T9BL
THP46	2.14E-7	0.3%	THKMTtQ
T1P14	2.07E-7	0.3%	T1LD1Qs
THP30	2.06E-7	0.3%	THKMPr
T1P19	1.91E-7	0.3%	T1LPQs
T3TrP23	1.84E-7	0.3%	T3TrLtRC1Ch
T7P23	1.80E-7	0.3%	T7D1OD3
T9BP10	1.79E-7	0.3%	T9BQH2
T9AP02	1.72E-7	0.3%	T9AL
T1P06	1.69E-7	0.2%	T1LH2
T9AP10	1.31E-7	0.2%	T9AQH2
T2P14	1.30E-7	0.2%	T2LP
T9BP13	1.30E-7	0.2%	T9BQD1
T3TrP22	1.21E-7	0.2%	T3TrLtRC1
T2ATrP06	1.15E-7	0.2%	T2ATrRC2RC3
T7P07	1.10E-7	0.2%	T7SGIO2
T9ATrP06	1.07E-7	0.2%	T9ATrRC2RC3
T1AP26	1.04E-7	0.2%	T1AS1cBB1
T9AP13	1.02E-7	0.2%	T9AQD1

TABLE B.2-11
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

AP02.MGP 12:20 9/28/1992

Top event unavailability	=	5.169E-7
Number of cut sets in equation	=	76
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	6
Basic Event Data file referenced	=	NAPS1

1	4.2489E-7	IE-A	HEP-1ES1:4		
2	3.1692E-8	IE-A	1SICKV-CC-959903		
3	3.1692E-8	IE-A	1SICKV-CC-206207		
4	6.1749E-9	IE-A	1SIMOV-FO-1864A	REC-1ES1:4-1	1SIMOV-FO-1864B
5	6.1749E-9	IE-A	1SIMOV-FC-1890A	REC-1ES1:4-1	1SIMOV-FO-1864B
6	6.1749E-9	IE-A	1SIMOV-FC-1890B	REC-1ES1:4-1	1SIMOV-FO-1864A
7	6.1749E-9	IE-A	1SIMOV-FC-1890A	REC-1ES1:4-1	1SIMOV-FC-1890B
8	3.5900E-10	IE-A	1SICKV-FC-1SI206	1SIMOV-FO-1864B	REC-1ES1:4-1
9	3.5900E-10	IE-A	1SICKV-FC-1SI206	1SIMOV-FC-1890B	REC-1ES1:4-1
10	3.5900E-10	IE-A	1SICKV-FC-1SI207	1SIMOV-FC-1890A	REC-1ES1:4-1
11	3.5900E-10	IE-A	1SICKV-FC-1SI207	1SIMOV-FO-1864A	REC-1ES1:4-1
12	2.0091E-10	IE-A	1SICKV-FC-1SI207	1SICKV-FC-1SI206	
13	1.1325E-10	IE-A	1EEBUS-UM-1H1-2N	1SIMOV-FO-1864B	REC-1ES1:4-1
14	1.1325E-10	IE-A	1EEBUS-UM-1H1-2N	1SIMOV-FC-1890B	REC-1ES1:4-1
15	6.3376E-11	IE-A	1SICKV-FC-1SI207	1EEBUS-UM-1H1-2N	
16	4.9528E-11	IE-A	1SILMS-LF-1860B	1SIPSB-FR-24HP1A	
17	4.9528E-11	IE-A	1SIPSB-FR-24HP1B	1SILMS-LF-1860A	
18	4.7115E-11	IE-A	1SIPSB-FR-24HP1A	1SIMOV-FO-1885D	1SIMOV-FO-1885B
19	4.7115E-11	IE-A	1SIMOV-FO-1885A	1SIMOV-FO-1885C	1SIPSB-FR-24HP1B
20	4.3070E-11	IE-A	1SIPSB-UM-1SIP1A	1EETFM-LP-1J	
21	4.3070E-11	IE-A	1SIPSB-UM-1SIP1B	1EETFM-LP-1H1	
22	4.3070E-11	IE-A	1SIPSB-UM-1SIP1B	1EETFM-LP-1H	
23	4.2775E-11	IE-A	1SIMV--PG-1SI306	1SICKV-FC-1SI1	
24	4.2775E-11	IE-A	1SICKV-FC-1SI1	1SIMOV-PG-1862B	
25	4.2775E-11	IE-A	1SIMOV-PG-1862A	1SICKV-FC-1SI16	
26	4.2775E-11	IE-A	1SICKV-FC-1SI16	1SIMV--PG-1SI305	
27	4.2154E-11	IE-A	1SICKV-FC-1SI16	HEP-1ES1:3	1SIMOV-FC-1863A
28	4.2154E-11	IE-A	1SICKV-FC-1SI26	HEP-1ES1:3	1SIMOV-FC-1863A
29	4.2154E-11	IE-A	1SICKV-FC-1SI18	HEP-1ES1:3	1SIMOV-FC-1863A
30	4.2154E-11	IE-A	HEP-1ES1:3	1SIMOV-FC-1863B	1SICKV-FC-1SI9

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

AP03.MGP 12:19 9/28/1992

Top event unavailability = 8.253E-7
Number of cut sets in equation = 270
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 5
Basic Event Data file referenced = NAPS1

1	1.9515E-7	IE-A	1SIMOV-CC-1860AB	
2	5.9439E-8	IE-A	1SIMOV-FO-1862B	1SIMOV-FO-1862A
3	5.9439E-8	IE-A	1SIMOV-FC-1860B	1SIMOV-FC-1860A
4	5.9439E-8	IE-A	1SIMOV-FC-1860A	1SIMOV-FO-1862B
5	5.9439E-8	IE-A	1SIMOV-FO-1862A	1SIMOV-FC-1860B
6	3.1692E-8	IE-A	1SICKV-CC-FC116	
7	2.4729E-8	IE-A	1SIPSB-UM-1SIP1B	1SIMOV-FO-1862A
8	2.4729E-8	IE-A	1SIPSB-UM-1SIP1A	1SIMOV-FC-1860B
9	2.4729E-8	IE-A	1SIMOV-FC-1860A	1SIPSB-UM-1SIP1B
10	2.4729E-8	IE-A	1SIMOV-FO-1862B	1SIPSB-UM-1SIP1A
11	2.1903E-8	IE-A	1SIMOV-FO-1862B	1SIPSB-FS-1SIP1A
12	2.1903E-8	IE-A	1SIPSB-FS-1SIP1B	1SIMOV-FO-1862A
13	2.1903E-8	IE-A	1SIMOV-FC-1860A	1SIPSB-FS-1SIP1B
14	2.1903E-8	IE-A	1SIPSB-FS-1SIP1A	1SIMOV-FC-1860B
15	7.3978E-9	IE-A	1SIMOV-PG-1860B	1SIMOV-FO-1862A
16	7.3978E-9	IE-A	1SIMOV-PG-1860A	1SIMOV-FC-1860B
17	7.3978E-9	IE-A	1SIMOV-FC-1860A	1SIMOV-PG-1860B
18	7.3978E-9	IE-A	1SIMOV-FO-1862B	1SIMOV-PG-1860A
19	4.4737E-9	IE-A	1SIMOV-PG-1864B	1SIMOV-FC-1860A
20	4.4737E-9	IE-A	1SIMOV-FC-1860B	1SIMOV-PG-1864A
21	4.4737E-9	IE-A	1SIMOV-FO-1862A	1SIMOV-PG-1864B
22	4.4737E-9	IE-A	1SIMOV-PG-1864A	1SIMOV-FO-1862B
23	4.3209E-9	IE-A	1SIMOV-FO-1862B	1SIPSB-FR-24HP1A
24	4.3209E-9	IE-A	1SIPSB-FR-24HP1B	1SIMOV-FO-1862A
25	4.3209E-9	IE-A	1SIMOV-FC-1860A	1SIPSB-FR-24HP1B
26	4.3209E-9	IE-A	1SIPSB-FR-24HP1A	1SIMOV-FC-1860B
27	3.4557E-9	IE-A	1SICKV-FC-1S126	1SIMOV-FC-1860A
28	3.4557E-9	IE-A	1SICKV-FC-1S118	1SIMOV-FO-1862A
29	3.4557E-9	IE-A	1SICKV-FC-1S19	1SIMOV-FO-1862B
30	3.4557E-9	IE-A	1SICKV-FC-1S116	1SIMOV-FC-1860A

Contribution of equation cut sets not listed = 9.56E-8

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

AP11.MGP 12:20 9/28/1992

Top event unavailability = 5.881E-7
Number of cut sets in equation = 122
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 4
Basic Event Data file referenced = NAPS1

1	2.4666E-7	IE-A	1SIPSB-CC-FS1A1B	
2	1.9515E-7	IE-A	1SIMOV-CC-1890CD	
3	3.3740E-8	IE-A	1QSMV--PG-1QS38	
4	3.1692E-8	IE-A	1SICKV-CC-FC926	
5	3.1692E-8	IE-A	1SICKV-CC-838689	
6	9.1125E-9	IE-A	1SIPSB-FS-1SIP1B	1SIPSB-UM-1SIP1A
7	9.1125E-9	IE-A	1SIPSB-UM-1SIP1B	1SIPSB-FS-1SIP1A
8	8.0709E-9	IE-A	1SIPSB-FS-1SIP1B	1SIPSB-FS-1SIP1A
9	1.8613E-9	IE-A	1SIMOV-PG-1864A	1SIPSB-UM-1SIP1B
10	1.8613E-9	IE-A	1SIPSB-UM-1SIP1A	1SIMOV-PG-1864B
11	1.6485E-9	IE-A	1SIMOV-PG-1864A	1SIPSB-FS-1SIP1B
12	1.6485E-9	IE-A	1SIPSB-FS-1SIP1A	1SIMOV-PG-1864B
13	1.4377E-9	IE-A	1SIPSB-UM-1SIP1B	1SICKV-FC-1SI9
14	1.4377E-9	IE-A	1SICKV-FC-1SI18	1SIPSB-UM-1SIP1A
15	1.4377E-9	IE-A	1SICKV-FC-1SI26	1SIPSB-UM-1SIP1A
16	1.2734E-9	IE-A	1SICKV-FC-1SI26	1SIPSB-FS-1SIP1A
17	1.2734E-9	IE-A	1SICKV-FC-1SI18	1SIPSB-FS-1SIP1A
18	1.2734E-9	IE-A	1SIPSB-FS-1SIP1B	1SICKV-FC-1SI9
19	4.0169E-10	IE-A	1EEBUS-UM-DC-III	1SIPSB-FS-1SIP1A
20	4.0169E-10	IE-A	1SIPSB-FS-1SIP1B	1EEBUS-UM-DC-I
21	3.3672E-10	IE-A	1SIMOV-PG-1864B	1SIMOV-PG-1864A
22	3.0611E-10	IE-A	1SIPSB-UM-1SIP1B	1SIMV--PG-1SI305
23	3.0611E-10	IE-A	1SIPSB-UM-1SIP1B	1SIMOV-PG-1862A
24	3.0611E-10	IE-A	1SIMV--PG-1SI306	1SIPSB-UM-1SIP1A
25	3.0611E-10	IE-A	1SIMOV-PG-1862B	1SIPSB-UM-1SIP1A
26	2.7112E-10	IE-A	1SIMV--PG-1SI306	1SIPSB-FS-1SIP1A
27	2.7112E-10	IE-A	1SIMOV-PG-1862B	1SIPSB-FS-1SIP1A
28	2.7112E-10	IE-A	1SIPSB-FS-1SIP1B	1SIMOV-PG-1862A
29	2.7112E-10	IE-A	1SIPSB-FS-1SIP1B	1SIMV--PG-1SI305
30	2.6010E-10	IE-A	1SIMOV-PG-1864A	1SICKV-FC-1SI26

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

AP15.MGP 12:16 9/28/1992

Top event unavailability	=	2.120E-6
Number of cut sets in equation	=	7
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	2
Basic Event Data file referenced	=	NAPS1

1	4.1029E-7	IE-A	1SIMOV-PG-1865C
2	4.1029E-7	IE-A	1SIMOV-PG-1865A
3	3.1692E-7	IE-A	1SICKV-FC-1SI127
4	3.1692E-7	IE-A	1SICKV-FC-1SI161
5	3.1692E-7	IE-A	1SICKV-FC-1SI125
6	3.1692E-7	IE-A	1SICKV-FC-1SI159
7	3.1692E-8	IE-A	1SICKV-CC-ACCCKV

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    RXP01.MGP         12:22   9/28/1992
Top event unavailability          =   2.664E-7
Number of cut sets in equation    =          1
Cutoff value used last step       =   1.000E-11
Longest cut set (# of events)     =          1
Basic Event Data file referenced  =    NAPS1
--------------------------------------------------------------------------------
1   2.6635E-7   IE-RX
```

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

S1P10.MGP 12:16 9/28/1992

Top event unavailability = 2.451E-6
Number of cut sets in equation = 532
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	4.9333E-7	IE-S1	HEP-1ES1:2-S1	1SIPSB-CC-FS1A1B	
2	3.9029E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-CC-1860AB	
3	1.1888E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1860B	1SIMOV-FC-1860A
4	1.1888E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1860A	1SIMOV-FO-1862B
5	1.1888E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1863B	1SIMOV-FC-1863A
6	1.1888E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-FO-1862A	1SIMOV-FC-1860B
7	1.1888E-7	IE-S1	HEP-1ES1:2-S1	1SIMOV-FO-1862B	1SIMOV-FO-1862A
8	6.3383E-8	IE-S1	HEP-1ES1:2-S1	1SICKV-CC-FC926	
9	6.3383E-8	IE-S1	HEP-1ES1:2-S1	1SICKV-CC-FC116	
10	4.9459E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-UM-1SIP1A	1SIMOV-FC-1860B
11	4.9459E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-UM-1SIP1B	1SIMOV-FO-1862A
12	4.9459E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1860A	1SIPSB-UM-1SIP1B
13	4.9459E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FO-1862B	1SIPSB-UM-1SIP1A
14	4.3805E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1860A	1SIPSB-FS-1SIP1B
15	4.3805E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-FS-1SIP1B	1SIMOV-FO-1862A
16	4.3805E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-FS-1SIP1A	1SIMOV-FC-1860B
17	4.3805E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FO-1862B	1SIPSB-FS-1SIP1A
18	3.7531E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FO-1115D	1SICKV-FO-1S147
19	3.7531E-8	IE-S1	HEP-1ES1:2-S1	1SICKV-FO-1S147	1SIMOV-FO-1115B
20	1.8225E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-FS-1SIP1B	1SIPSB-UM-1SIP1A
21	1.8225E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-UM-1SIP1B	1SIPSB-FS-1SIP1A
22	1.6142E-8	IE-S1	HEP-1ES1:2-S1	1SIPSB-FS-1SIP1B	1SIPSB-FS-1SIP1A
23	1.4796E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-PG-1860B	1SIMOV-FO-1862A
24	1.4796E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-PG-1860A	1SIMOV-FC-1860B
25	1.4796E-8	IE-S1	HEP-1ES1:2-S1	1SIMOV-FC-1860A	1SIMOV-PG-1860B

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    S1P38.MGP          12:13   9/28/1992
Top event unavailability            =   4.038E-6
Number of cut sets in equation      =        248
Cutoff value used last step         =   1.000E-11
Longest cut set (# of events)       =          6
Basic Event Data file referenced    =    NAPS1
```

1	1.1471E-6	IE-S1	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	HEP-1FRC:1-11-S1
2	6.3384E-7	IE-S1	1SICKV-FC-1S147	HEP-1FRC:1-11-S1	
3	4.9671E-7	IE-S1	1CHPAT-CC-FS1ABC	HEP-1FRC:1-11-S1	
4	3.9029E-7	IE-S1	1SIMOV-CC-1115BD	HEP-1FRC:1-11-S1	
5	3.9029E-7	IE-S1	1SIMOV-CC-867836	HEP-1FRC:1-11-S1	
6	3.9029E-7	IE-S1	1SIMOV-CC-1115CE	HEP-1FRC:1-11-S1	
7	1.1888E-7	IE-S1	1SIMOV-FO-1115E	1SIMOV-FO-1115C	HEP-1FRC:1-11-S1
8	1.1888E-7	IE-S1	1SIMOV-FC-1115D	1SIMOV-FC-1115B	HEP-1FRC:1-11-S1
9	6.7479E-8	IE-S1	1QSMV--PG-1QS38	HEP-1FRC:1-11-S1	
10	6.3383E-8	IE-S1	1SICKV-CC-838689	HEP-1FRC:1-11-S1	
11	6.3383E-8	IE-S1	1SICKV-CC-79185	HEP-1FRC:1-11-S1	
12	4.4987E-8	IE-S1	1SIMV--PG-1S146	HEP-1FRC:1-11-S1	
13	1.1741E-8	IE-S1	1CHPAT-FS-1CHP1A	1SWTCV-FC-SW102B	1CHPAT-UM-1CHP1C HEP-1FRC:1-11-S1
14	7.4467E-9	IE-S1	HEP-1E1-25	1SICKV-FC-1S179	HEP-1FRC:1-11-S1
15	6.9113E-9	IE-S1	1SICKV-FC-1S179	1SIMOV-FC-1836	HEP-1FRC:1-11-S1
16	4.6946E-9	IE-S1	1CHPAT-UM-1CHP1C	1SWTCV-FC-SW102B	1CHPAT-FR-24HP1A HEP-1FRC:1-11-S1
17	4.5853E-9	IE-S1	1SIMOV-CC-1867CD	HEP-1E1-25	HEP-1FRC:1-11-S1
18	4.5853E-9	IE-S1	1SIMOV-CC-1867AB	HEP-1E1-25	HEP-1FRC:1-11-S1
19	4.2557E-9	IE-S1	1SIMOV-CC-1867CD	1SIMOV-FC-1836	HEP-1FRC:1-11-S1
20	4.2557E-9	IE-S1	1SIMOV-CC-1867AB	1SIMOV-FC-1836	HEP-1FRC:1-11-S1
21	3.6235E-9	IE-S1	1SWTCV-FC-SW102B	1EEBUS-UM-DC-1	HEP-1FRC:1-11-S1
22	3.5939E-9	IE-S1	1CHPAT-FS-1CHP1A	1SWTCV-CC-102BC	HEP-1FRC:1-11-S1
23	3.2900E-9	IE-S1	1CHPAT-FS-1CHP1A	1CHPAT-FS-1CHP1B	1CHPAT-UM-1CHP1C HEP-1FRC:1-11-S1
24	2.1802E-9	IE-S1	1EEBUS-UM-1H1-2N	1SIMOV-FC-1115B	HEP-1FRC:1-11-S1
25	2.1802E-9	IE-S1	1SIMOV-FO-1115E	1EEBUS-UM-1H1-2N	HEP-1FRC:1-11-S1
26	1.4931E-9	IE-S1	1CHPAT-FS-1CHP1A	1CHPAT-UM-1CHPBC	HEP-1FRC:1-11-S1
27	1.4370E-9	IE-S1	1SWTCV-CC-102BC	1CHPAT-FR-24HP1A	HEP-1FRC:1-11-S1

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

S2P04.MGP 12:16 9/28/1992

Top event unavailability = 2.450E-6
Number of cut sets in equation = 400
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 6
Basic Event Data file referenced = NAPS1

1	4.9727E-7	IE-S2	C-FM01	1SIPSB-CC-FS1A1B	
2	3.9341E-7	IE-S2	C-FM01	1SIMOV-CC-1860AB	
3	1.1983E-7	IE-S2	C-FM01	1SIMOV-FO-1862B	1SIMOV-FO-1862A
4	1.1983E-7	IE-S2	C-FM01	1SIMOV-FC-1860A	1SIMOV-FO-1862B
5	1.1983E-7	IE-S2	C-FM01	1SIMOV-FC-1860B	1SIMOV-FC-1860A
6	1.1983E-7	IE-S2	C-FM01	1SIMOV-FO-1862A	1SIMOV-FC-1860B
7	6.3890E-8	IE-S2	C-FM01	1SICKV-CC-FC116	
8	6.3890E-8	IE-S2	C-FM01	1SICKV-CC-FC1229	
9	6.3890E-8	IE-S2	C-FM01	1SICKV-CC-FC926	
10	4.9854E-8	IE-S2	C-FM01	1SIMOV-FC-1860A	1SIPSB-UM-1SIP1B
11	4.9854E-8	IE-S2	C-FM01	1SIPSB-UM-1SIP1B	1SIMOV-FO-1862A
12	4.9854E-8	IE-S2	C-FM01	1SIMOV-FO-1862B	1SIPSB-UM-1SIP1A
13	4.9854E-8	IE-S2	C-FM01	1SIPSB-UM-1SIP1A	1SIMOV-FC-1860B
14	4.4156E-8	IE-S2	C-FM01	1SIMOV-FC-1860A	1SIPSB-FS-1SIP1B
15	4.4156E-8	IE-S2	C-FM01	1SIMOV-FO-1862B	1SIPSB-FS-1SIP1A
16	4.4156E-8	IE-S2	C-FM01	1SIPSB-FS-1SIP1A	1SIMOV-FC-1860B
17	4.4156E-8	IE-S2	C-FM01	1SIPSB-FS-1SIP1B	1SIMOV-FO-1862A
18	1.8371E-8	IE-S2	C-FM01	1SIPSB-UM-1SIP1B	1SIPSB-FS-1SIP1A
19	1.8371E-8	IE-S2	C-FM01	1SIPSB-FS-1SIP1B	1SIPSB-UM-1SIP1A
20	1.6271E-8	IE-S2	C-FM01	1SIPSB-FS-1SIP1B	1SIPSB-FS-1SIP1A
21	1.4914E-8	IE-S2	C-FM01	1SIMOV-FC-1860A	1SIMOV-PG-1860B
22	1.4914E-8	IE-S2	C-FM01	1SIMOV-FO-1862B	1SIMOV-PG-1860A
23	1.4914E-8	IE-S2	C-FM01	1SIMOV-PG-1860B	1SIMOV-FO-1862A
24	1.4914E-8	IE-S2	C-FM01	1SIMOV-PG-1860A	1SIMOV-FC-1860B
25	9.0191E-9	IE-S2	C-FM01	1SIMOV-FC-1860B	1SIMOV-PG-1864A

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

S2P35.MGP 12:13 9/28/1992

Top event unavailability = 5.152E-6
Number of cut sets in equation = 974
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	1.3887E-6	IE-S2	1QSMV--PG-1QS38	C-Y02		
2	1.3044E-6	IE-S2	1SICKV-CC-838689	C-Y02		
3	1.0710E-7	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIPSB-UM-1SIP1A
4	1.0710E-7	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIPSB-UM-1SIP1B
5	9.4855E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIPSB-FS-1SIP1B
6	9.4855E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIPSB-FS-1SIP1A
7	7.4572E-8	IE-S2	1SWTCV-FC-SW102B	1EEBUS-UM-DC-I	C-Y02	
8	5.9176E-8	IE-S2	1SICKV-FC-1SI47	C-Y02	1SIPSB-UM-1SIP1A	
9	5.9176E-8	IE-S2	1SICKV-FC-1SI47	C-Y02	1SIPSB-UM-1SIP1B	
10	5.2412E-8	IE-S2	1SICKV-FC-1SI47	C-Y02	1SIPSB-FS-1SIP1A	
11	5.2412E-8	IE-S2	1SICKV-FC-1SI47	C-Y02	1SIPSB-FS-1SIP1B	
12	4.6374E-8	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIPSB-UM-1SIP1B	
13	4.6374E-8	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIPSB-UM-1SIP1A	
14	4.1073E-8	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIPSB-FS-1SIP1A	
15	4.1073E-8	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIPSB-FS-1SIP1B	
16	3.6438E-8	IE-S2	1SIMOV-CC-1115BD	C-Y02	1SIPSB-UM-1SIP1A	
17	3.6438E-8	IE-S2	1SIMOV-CC-1115CE	C-Y02	1SIPSB-UM-1SIP1B	
18	3.6438E-8	IE-S2	1SIMOV-CC-867836	C-Y02	1SIPSB-UM-1SIP1A	
19	3.6438E-8	IE-S2	1SIMOV-CC-1115CE	C-Y02	1SIPSB-UM-1SIP1A	
20	3.6438E-8	IE-S2	1SIMOV-CC-1115BD	C-Y02	1SIPSB-UM-1SIP1B	
21	3.6438E-8	IE-S2	1SIMOV-CC-867836	C-Y02	1SIPSB-UM-1SIP1B	
22	3.2273E-8	IE-S2	1SIMOV-CC-867836	C-Y02	1SIPSB-FS-1SIP1A	
23	3.2273E-8	IE-S2	1SIMOV-CC-1115BD	C-Y02	1SIPSB-FS-1SIP1B	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

S2P39.MGP 12:20 9/28/1992

Top event unavailability	=	5.200E-7
Number of cut sets in equation	=	261
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	6
Basic Event Data file referenced	=	NAPS1

1	1.9375E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIMOV-PG-1865A
2	1.9375E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIMOV-PG-1865B
3	1.9375E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SIMOV-PG-1865C
4	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI125
5	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI142
6	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI127
7	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI161
8	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI159
9	1.4966E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-Y02	1SICKV-FC-1SI144
10	1.0706E-8	IE-S2	1SICKV-FC-1SI147	C-Y02	1SIMOV-PG-1865A	
11	1.0706E-8	IE-S2	1SICKV-FC-1SI147	C-Y02	1SIMOV-PG-1865B	
12	1.0706E-8	IE-S2	1SICKV-FC-1SI147	C-Y02	1SIMOV-PG-1865C	
13	8.3894E-9	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIMOV-PG-1865A	
14	8.3894E-9	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIMOV-PG-1865B	
15	8.3894E-9	IE-S2	1CHPAT-CC-FS1ABC	C-Y02	1SIMOV-PG-1865C	
16	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI161	
17	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI125	
18	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI159	
19	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI127	
20	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI144	
21	8.2693E-9	IE-S2	1SICKV-FC-1SI147	C-Y02	1SICKV-FC-1SI142	
22	6.5920E-9	IE-S2	1SIMOV-CC-1115CE	C-Y02	1SIMOV-PG-1865A	
23	6.5920E-9	IE-S2	1SIMOV-CC-1115BD	C-Y02	1SIMOV-PG-1865C	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    S2P43.MGP              12:18   9/28/1992
Top event unavailability              =    1.188E-6
Number of cut sets in equation        =         589
Cutoff value used last step           =    1.000E-11
Longest cut set (# of events)         =           8
Basic Event Data file referenced      =     NAPS1
```

1	2.5592E-7	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	HEP-1FRC:1-11-S2	
2	1.4141E-7	IE-S2	1SICKV-FC-1S147	HEP-1FRC:1-11-S2		
3	1.1081E-7	IE-S2	1CHPAT-CC-FS1ABC	HEP-1FRC:1-11-S2		
4	8.7072E-8	IE-S2	1SIMOV-CC-867836	HEP-1FRC:1-11-S2		
5	8.7072E-8	IE-S2	1SIMOV-CC-1115BD	HEP-1FRC:1-11-S2		
6	8.7072E-8	IE-S2	1SIMOV-CC-1115CE	HEP-1FRC:1-11-S2		
7	2.6521E-8	IE-S2	1SIMOV-FO-1115E	1SIMOV-FO-1115C	HEP-1FRC:1-11-S2	
8	2.6521E-8	IE-S2	1SIMOV-FC-1115D	1SIMOV-FC-1115B	HEP-1FRC:1-11-S2	
9	2.4061E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	1MSRV--CC-101ABC	
10	1.5054E-8	IE-S2	1QSMV--PG-1QS38	HEP-1FRC:1-11-S2		
11	1.4141E-8	IE-S2	1SICKV-CC-838689	HEP-1FRC:1-11-S2		
12	1.4141E-8	IE-S2	1SICKV-CC-79185	HEP-1FRC:1-11-S2		
13	1.3295E-8	IE-S2	1SICKV-FC-1S147	1MSRV--CC-101ABC		
14	1.2770E-8	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-1-2HR	1EEBKR-SO-15H8	1EE-BAT-II-2HR
15	1.2770E-8	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-I-2HR	1EEBKR-SO-14H1	1EE-BAT-II-2HR
16	1.2770E-8	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-I-2HR	1EEBKR-SO-14H2	1EE-BAT-II-2HR
17	1.0419E-8	IE-S2	1CHPAT-CC-FS1ABC	1MSRV--CC-101ABC		
18	1.0036E-8	IE-S2	1SIMV--PG-1S146	HEP-1FRC:1-11-S2		
19	8.1865E-9	IE-S2	1SIMOV-CC-1115BD	1MSRV--CC-101ABC		
20	8.1865E-9	IE-S2	1SIMOV-CC-867836	1MSRV--CC-101ABC		
21	8.1865E-9	IE-S2	1SIMOV-CC-1115CE	1MSRV--CC-101ABC		
22	7.6835E-9	IE-S2	1EEBKR-SO-15H8	1SIMOV-FC-1115B	1EE-BAT-II-2HR	1EE-BAT-I-2HR
23	7.6835E-9	IE-S2	1SIMOV-FO-1115E	1EEBKR-SO-15H8	1EE-BAT-II-2HR	1EE-BAT-I-2HR
24	7.6835E-9	IE-S2	1SIMOV-FC-1115B	1EEBKR-SO-14H1	1EE-BAT-II-2HR	1EE-BAT-I-2HR
25	7.6835E-9	IE-S2	1EEBKR-SO-14H1	1SIMOV-FO-1115E	1EE-BAT-II-2HR	1EE-BAT-I-2HR
26	7.2263E-9	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-1-2HR	1EETFM-LP-1H	1EE-BAT-II-2HR
27	4.6216E-9	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-1-2HR	1EEBUS-LU-1H1	1EE-BAT-II-2HR
28	4.6216E-9	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-1-2HR	1EEBUS-LU-1H1-4	1EE-BAT-II-2HR
29	4.6216E-9	IE-S2	1SWTCV-FC-SW102B	1EE-BAT-I-2HR	1EEBUS-LU-1H-480	1EE-BAT-II-2HR
30	4.6216E-9	IE-S2	1EEBUS-LU-1H	1SWTCV-FC-SW102B	1EE-BAT-1-2HR	1EE-BAT-II-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

S2P47.MGP 12:22 9/28/1992

Top event unavailability = 3.248E-7
Number of cut sets in equation = 1081
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 6
Basic Event Data file referenced = NAPS1

1	1.3926E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2
2	1.3926E-8	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2
3	8.4872E-9	IE-S2	1SWTCV-FC-SW102B	1EEBUS-UM-DC-I		1FWTRB-FR-24HP2	
4	7.6949E-9	IE-S2	1SICKV-FC-1S147	1FWPSB-UM-1FWP3B		1FWTRB-FR-24HP2	
5	7.6949E-9	IE-S2	1SICKV-FC-1S147	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	
6	6.0301E-9	IE-S2	1CHPAT-CC-FS1ABC	1FWPSB-UM-1FWP3B		1FWTRB-FR-24HP2	
7	6.0301E-9	IE-S2	1CHPAT-CC-FS1ABC	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	
8	4.7381E-9	IE-S2	1SIMOV-CC-867836	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	
9	4.7381E-9	IE-S2	1SIMOV-CC-1115BD	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	
10	4.7381E-9	IE-S2	1SIMOV-CC-867836	1FWPSB-UM-1FWP3B		1FWTRB-FR-24HP2	
11	4.7381E-9	IE-S2	1SIMOV-CC-1115CE	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	
12	4.7381E-9	IE-S2	1SIMOV-CC-1115CE	1FWPSB-UM-1FWP3B		1FWTRB-FR-24HP2	
13	4.7381E-9	IE-S2	1SIMOV-CC-1115BD	1FWPSB-UM-1FWP3B		1FWTRB-FR-24HP2	
14	4.2542E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3A
15	4.2542E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3B
16	4.2151E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		HEP-1AP22:5	
17	3.4161E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWPSB-CC-MDP3AB	
18	2.3782E-9	IE-S2	1EEBUS-UM-DC-I	1CHPAT-FS-1CHP1B		1FWTRB-FR-24HP2	
19	2.3507E-9	IE-S2	1SICKV-FC-1S147	1FWTRB-FR-24HP2		1FWPSB-FS-1FWP3A	
20	2.3507E-9	IE-S2	1SICKV-FC-1S147	1FWTRB-FR-24HP2		1FWPSB-FS-1FWP3B	
21	2.3291E-9	IE-S2	1SICKV-FC-1S147	HEP-1AP22:5			
22	2.3154E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWTRB-FS-1FWP2	1FWPSB-UM-1FWP3A
23	2.3154E-9	IE-S2	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254		1FWTRB-FS-1FWP2	1FWPSB-UM-1FWP3B

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T1AP02.MGP              12:19   9/28/1992
Top event unavailability              =   6.511E-7
Number of cut sets in equation        =         43
Cutoff value used last step           =   1.000E-11
Longest cut set (# of events)         =          5
Basic Event Data file referenced      =    NAPS1
```

1	7.2787E-8	IE-T1	1EGEDG-CC-1H-1J	NON-REC-B16	C-B117	
2	6.9783E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	NON-REC-B16	C-B117
3	6.9783E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	NON-REC-B16	C-B117
4	6.4757E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	NON-REC-B16	C-B117
5	6.4757E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	NON-REC-B16	C-B117
6	5.6168E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	NON-REC-B16	C-B117
7	5.2123E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	NON-REC-B16	C-B117
8	5.2123E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	NON-REC-B16	C-B117
9	4.8368E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	NON-REC-B16	C-B117
10	2.6174E-8	IE-T1	1EGEDG-CC-1H1J2H	NON-REC-B16	C-B117	
11	2.6174E-8	IE-T1	1EGEDG-CC-1H1J2J	NON-REC-B16	C-B117	
12	1.6645E-8	IE-T1	1EGEDG-CC-ALL	NON-REC-B16	C-B117	
13	2.2365E-9	IE-T1	1EGEDG-TM-1H	1EGEDG-FS-1J	NON-REC-B16	C-B117
14	2.2365E-9	IE-T1	1EGEDG-FS-1H	1EGEDG-TM-1J	NON-REC-B16	C-B117
15	2.0754E-9	IE-T1	1EGEDG-TM-1H	1EGEDG-FR-1J	NON-REC-B16	C-B117
16	2.0754E-9	IE-T1	1EGEDG-FR-1H	1EGEDG-TM-1J	NON-REC-B16	C-B117
17	1.3314E-9	IE-T1	1EEBKR-FO-15H2	1EGEDG-UM-1J	NON-REC-B16	C-B117
18	1.3314E-9	IE-T1	1EGEDG-UM-1H	1EEBKR-FO-15J2	NON-REC-B16	C-B117
19	1.2963E-9	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2H	NON-REC-B16	C-B117
20	1.2963E-9	IE-T1	1EGEDG-CC-1H-2J	1EGEDG-UM-1J	NON-REC-B16	C-B117
21	1.2963E-9	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2J	NON-REC-B16	C-B117
22	1.2963E-9	IE-T1	1EGEDG-CC-1H-2H	1EGEDG-UM-1J	NON-REC-B16	C-B117
23	1.0717E-9	IE-T1	1EEBKR-FO-15H2	1EGEDG-FS-1J	NON-REC-B16	C-B117

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T1AP07.MGP             12:17   9/28/1992
Top event unavailability             =    1.385E-6
Number of cut sets in equation       =          59
Cutoff value used last step          =    1.000E-11
Longest cut set (# of events)        =           5
Basic Event Data file referenced     =     NAPS1
```

1	1.5465E-7	IE-T1	1EGEDG-CC-1H-1J	NON-REC-B16	NON-REC-B117	
2	1.4827E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	NON-REC-B16	NON-REC-B117
3	1.4827E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	NON-REC-B16	NON-REC-B117
4	1.3759E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	NON-REC-B16	NON-REC-B117
5	1.3759E-7	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	NON-REC-B16	NON-REC-B117
6	1.1934E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	NON-REC-B16	NON-REC-B117
7	1.1075E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	NON-REC-B16	NON-REC-B117
8	1.1075E-7	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	NON-REC-B16	NON-REC-B117
9	1.0277E-7	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	NON-REC-B16	NON-REC-B117
10	5.5612E-8	IE-T1	1EGEDG-CC-1H1J2J	NON-REC-B16	NON-REC-B117	
11	5.5612E-8	IE-T1	1EGEDG-CC-1H1J2H	NON-REC-B16	NON-REC-B117	
12	3.5366E-8	IE-T1	1EGEDG-CC-ALL	NON-REC-B16	NON-REC-B117	
13	4.7519E-9	IE-T1	1EGEDG-TM-1H	1EGEDG-FS-1J	NON-REC-B16	NON-REC-B117
14	4.7519E-9	IE-T1	1EGEDG-FS-1H	1EGEDG-TM-1J	NON-REC-B16	NON-REC-B117
15	4.4096E-9	IE-T1	1EGEDG-TM-1H	1EGEDG-FR-1J	NON-REC-B16	NON-REC-B117
16	4.4096E-9	IE-T1	1EGEDG-FR-1H	1EGEDG-TM-1J	NON-REC-B16	NON-REC-B117
17	2.8289E-9	IE-T1	1EGEDG-UM-1H	1EEBKR-FO-15J2	NON-REC-B16	NON-REC-B117
18	2.8289E-9	IE-T1	1EEBKR-FO-15H2	1EGEDG-UM-1J	NON-REC-B16	NON-REC-B117
19	2.7544E-9	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2J	NON-REC-B16	NON-REC-B117
20	2.7544E-9	IE-T1	1EGEDG-CC-1H-2H	1EGEDG-UM-1J	NON-REC-B16	NON-REC-B117
21	2.7544E-9	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2H	NON-REC-B16	NON-REC-B117
22	2.7544E-9	IE-T1	1EGEDG-CC-1H-2J	1EGEDG-UM-1J	NON-REC-B16	NON-REC-B117
23	2.2770E-9	IE-T1	1EEBKR-FO-15H2	1EGEDG-FS-1J	NON-REC-B16	NON-REC-B117

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1AP26.MGP = 12:24 9/28/1992

Top event unavailability = 1.038E-7
Number of cut sets in equation = 43
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 6
Basic Event Data file referenced = NAPS1

1	1.1608E-8	IE-T1	1EGEDG-CC-1H-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111	
2	1.1129E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
3	1.1129E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
4	1.0327E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
5	1.0327E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
6	8.9574E-9	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
7	8.3122E-9	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
8	8.3122E-9	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
9	7.7135E-9	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
10	4.1740E-9	IE-T1	1EGEDG-CC-1H1J2H	HEP-1AP15-6	NON-REC-B10	NON-REC-B111	
11	4.1740E-9	IE-T1	1EGEDG-CC-1H1J2J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111	
12	2.6545E-9	IE-T1	1EGEDG-CC-ALL	HEP-1AP15-6	NON-REC-B10	NON-REC-B111	
13	3.5666E-10	IE-T1	1EGEDG-TM-1H	1EGEDG-FS-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
14	3.5666E-10	IE-T1	1EGEDG-FS-1H	1EGEDG-TM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
15	3.3097E-10	IE-T1	1EGEDG-FR-1H	1EGEDG-TM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
16	3.3097E-10	IE-T1	1EGEDG-TM-1H	1EGEDG-FR-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
17	2.1233E-10	IE-T1	1EEBKR-FO-15H2	1EGEDG-UM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
18	2.1233E-10	IE-T1	1EGEDG-UM-1H	1EEBKR-FO-15J2	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
19	2.0673E-10	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2H	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
20	2.0673E-10	IE-T1	1EGEDG-CC-1H-2J	1EGEDG-UM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
21	2.0673E-10	IE-T1	1EGEDG-UM-1H	1EGEDG-CC-1J-2J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
22	2.0673E-10	IE-T1	1EGEDG-CC-1H-2H	1EGEDG-UM-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111
23	1.7090E-10	IE-T1	1EEBKR-FO-15H2	1EGEDG-FS-1J	HEP-1AP15-6	NON-REC-B10	NON-REC-B111

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T1AP46.MGP           12:17   9/28/1992
Top event unavailability          =  1.407E-6
Number of cut sets in equation    =       344
Cutoff value used last step       =  1.000E-11
Longest cut set (# of events)     =         7
Basic Event Data file referenced  =   NAPS1
```

1	6.1189E-8	IE-T1	1EGEDG-CC-1H-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103	
2	5.8842E-8	IE-T1	1EGEDG-CC-1H-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE	
3	5.8663E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
4	5.8663E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
5	5.6413E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
6	5.6413E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
7	5.4438E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
8	5.4438E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
9	5.2350E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
10	5.2350E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
11	4.7218E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
12	4.5407E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
13	4.5076E-8	IE-T1	1EGEDG-CC-1H-1J	1FWTRB-UM-1FWP2	NON-REC-B02	C-B103	
14	4.3817E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
15	4.3817E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
16	4.2137E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
17	4.2137E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
18	4.0661E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	C-B103
19	3.9102E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	C-B103	1FWTRB-FR-12HP2	REC-B12AVE
20	3.4784E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1FWTRB-UM-1FWP2	NON-REC-B02	C-B103
21	3.2279E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1FWTRB-UM-1FWP2	NON-REC-B02	C-B103
22	3.2279E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1FWTRB-UM-1FWP2	NON-REC-B02	C-B103
23	2.9954E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	1FWTRB-UM-1FWP2	NON-REC-B02	C-B103

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1AP51.MGP 12:15 9/28/1992

Top event unavailability = 2.990E-6
Number of cut sets in equation = 401
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	1.3001E-7	IE-T1	1EGEDG-CC-1H-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103	
2	1.2502E-7	IE-T1	1EGEDG-CC-1H-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE	
3	1.2464E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
4	1.2464E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
5	1.1986E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
6	1.1986E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
7	1.1567E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
8	1.1567E-7	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
9	1.1123E-7	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
10	1.1123E-7	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
11	1.0033E-7	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
12	9.6477E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
13	9.5773E-8	IE-T1	1EGEDG-CC-1H-1J	1FWTRB-UM-1FWP2	NON-REC-B02	NON-REC-B103	
14	9.3099E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
15	9.3099E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
16	8.9528E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
17	8.9528E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
18	8.6394E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	1FWTRB-FS-1FWP2	NON-REC-B02	NON-REC-B103
19	8.3080E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	NON-REC-B103	1FWTRB-FR-12HP2	REC-B12AVE
20	7.3906E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1FWTRB-UM-1FWP2	NON-REC-B02	NON-REC-B103
21	6.8583E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1FWTRB-UM-1FWP2	NON-REC-B02	NON-REC-B103
22	6.8583E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1FWTRB-UM-1FWP2	NON-REC-B02	NON-REC-B103
23	6.3644E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FR-1J	1FWTRB-UM-1FWP2	NON-REC-B02	NON-REC-B103

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                  T1AP58.MGP          12:21   9/28/1992
Top event unavailability           =  4.171E-7
Number of cut sets in equation     =        114
Cutoff value used last step        =  1.000E-11
Longest cut set (# of events)      =          7
Basic Event Data file referenced   =   NAPS1
```

1	2.3289E-8	IE-T1	1EGEDG-CC-1H-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102	
2	2.3289E-8	IE-T1	1EGEDG-CC-1H-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102	
3	2.2327E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
4	2.2327E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
5	2.2327E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
6	2.2327E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
7	2.0719E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
8	2.0719E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
9	2.0719E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
10	2.0719E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
11	1.7971E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
12	1.7971E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
13	1.6677E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
14	1.6677E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102
15	1.6677E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	C-B102
16	1.6677E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	C-B102

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T1AP67.MGP          12:19   9/28/1992
Top event unavailability            =   8.864E-7
Number of cut sets in equation      =        132
Cutoff value used last step         =   1.000E-11
Longest cut set (# of events)       =          7
Basic Event Data file referenced    =    NAPS1
```

1	4.9482E-8	IE-T1	1EGEDG-CC-1H-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102	
2	4.9482E-8	IE-T1	1EGEDG-CC-1H-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102	
3	4.7440E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
4	4.7440E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
5	4.7440E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
6	4.7440E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-UM-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
7	4.4023E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
8	4.4023E-8	IE-T1	1EGEDG-UM-1H	1EGEDG-FR-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
9	4.4023E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
10	4.4023E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-UM-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
11	3.8184E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
12	3.8184E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
13	3.5434E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
14	3.5434E-8	IE-T1	1EGEDG-FS-1H	1EGEDG-FR-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
15	3.5434E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1RCRV--FO-1456	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102
16	3.5434E-8	IE-T1	1EGEDG-FR-1H	1EGEDG-FS-1J	1RCRV--FO-1455C	1RCPORV-DMDSBO	NON-REC-B01	NON-REC-B102

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1P06.MGP 12:23 9/28/1992

Top event unavailability = 1.690E-7
Number of cut sets in equation = 187
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	9.5488E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H		1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1863B
2	9.5488E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1863A
3	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A		1EGEDG-FR-1J	C-P02	C-D102	1SIMOV-FC-1863A
4	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H		1FWPSB-UM-1FWP3B	C-P02	C-D102	1SIMOV-FC-1863B
5	3.6241E-9	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-UM-1H		1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1863B
6	3.6241E-9	IE-T1	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A		1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1863A
7	3.5908E-9	IE-T1	HEP-1AP22:5	C-P02	C-D102	1EGEDG-UM-1H	1SIMOV-FC-1863B		
8	3.5908E-9	IE-T1	HEP-1AP22:5	C-P02	C-D102	1EGEDG-UM-1J	1SIMOV-FC-1863A		
9	3.0146E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H		1FWTRB-FR-24HP2	C-P02	C-D102	1SICKV-FO-1S147
10	3.0146E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A		1FWTRB-FR-24HP2	C-P02	C-D102	1SICKV-FO-1S147
11	2.9170E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3A		1EGEDG-FS-1J	C-P02	C-D102	1SIMOV-FC-1863A
12	2.9170E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FS-1H		1FWPSB-FS-1FWP3B	C-P02	C-D102	1SIMOV-FC-1863B
13	2.8902E-9	IE-T1	HEP-1AP22:5	C-P02	C-D102	1EGEDG-FS-1H	1SIMOV-FC-1863B		
14	2.8902E-9	IE-T1	HEP-1AP22:5	C-P02	C-D102	1EGEDG-FS-1J	1SIMOV-FC-1863A		
15	2.7975E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	C-D102	1SICKV-FO-1S147	
16	2.7975E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	C-D102	1SICKV-FO-1S147	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                          T1P07.MGP          12:20   9/28/1992
Top event unavailability            =    5.657E-7
Number of cut sets in equation      =         714
Cutoff value used last step         =    1.000E-11
Longest cut set (# of events)       =           9
Basic Event Data file referenced    =     NAPS1
```

1	1.0682E-8	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	C-D102	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR
2	1.0682E-8	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	C-D102	HEP-1ES1:3	1EE-BAT-IV-2HR	1EE-BAT-III-2HR
3	9.9131E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	C-D102	1EE-BAT-III-2HR	1EE-BAT-IV-2HR	HEP-1ES1:3
4	9.9131E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	C-D102	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1ES1:3
5	9.5488E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1860B		
6	9.5488E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FO-1862B		
7	9.5488E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FO-1862A		
8	9.5488E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	C-D102	1SIMOV-FC-1860A		
9	9.1229E-9	IE-T1	HEP-1AP22:5	C-P02	C-D102	1SIPSB-CC-FS1A1B				
10	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	C-D102	1SIMOV-FC-1860A		
11	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	C-D102	1SIMOV-FO-1862A		
12	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	C-D102	1SIMOV-FO-1862B		
13	8.8610E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	C-D102	1SIMOV-FC-1860B		
14	7.2176E-9	IE-T1	HEP-1AP22:5	C-P02		C-D102	1SIMOV-CC-1860AB			
15	4.0543E-9	IE-T1	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-P02	C-D102	1EE-BAT-III-2HR	1EE-BAT-IV-2HR	HEP-1ES1:3
16	4.0543E-9	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-UM-1H	1FWTRB-FR-24HP2	C-P02	C-D102	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1ES1:3

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1P10.MGP		12:15 9/28/1992
Top event unavailability	=	2.705E-6
Number of cut sets in equation	=	1031
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	7
Basic Event Data file referenced	=	NAPS1

1	9.4898E-7	IE-T1	HEP-1AP22:5	C-P02	HEP-1FRH:1-11		
2	3.4380E-7	IE-T1	1FWCKV-CC-ALLAFW	C-P02	HEP-1FRH:1-11		
3	8.5780E-8	IE-T1	1FWTRB-FR-24HP2	1FWPSB-CC-MDP3AB	C-P02	HEP-1FRH:1-11	
4	5.4228E-8	IE-T1	1FWCKV-LEAKAGE	C-P02	HEP-1FRH:1-11		
5	4.4945E-8	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
6	4.4945E-8	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
7	4.1708E-8	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	HEP-1FRH:1-11
8	4.1708E-8	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	HEP-1FRH:1-11
9	2.2567E-8	IE-T1	HEP-1AP22:5	C-P02	1CHCKV-FO-1CH254	HEP-NO-PROCEDURE	
10	1.7058E-8	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-UM-1H	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
11	1.7058E-8	IE-T1	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
12	1.6883E-8	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	1SWTCV-FC-SW102B
13	1.5667E-8	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	1SWTCV-FC-SW102B
14	1.4262E-8	IE-T1	1FWPSB-CC-MDP3AB	1FWTRB-FS-1FWP2	C-P02	HEP-1FRH:1-11	
15	1.3730E-8	IE-T1	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3A	1EGEDG-FS-1J	C-P02	HEP-1FRH:1-11
16	1.3730E-8	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FS-1H	1FWPSB-FS-1FWP3B	C-P02	HEP-1FRH:1-11
17	1.2741E-8	IE-T1	1EGEDG-FR-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
18	1.2741E-8	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-FR-1H	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11
19	1.2470E-8	IE-T1	HEP-1AP22:5	C-P02	1SICKV-FC-1SI47		
20	1.0506E-8	IE-T1	1FWTRB-UM-1FWP2	1FWPSB-CC-MDP3AB	C-P02	HEP-1FRH:1-11	
21	1.0158E-8	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	1SIMOV-FO-1115E
22	1.0158E-8	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	1SIMOV-FC-1115B
23	1.0158E-8	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	1SIMOV-FO-1115C

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1P14.MGP 12:22 9/28/1992

Top event unavailability = 2.070E-7
Number of cut sets in equation = 200
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	3.5944E-8	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02		
2	3.5944E-8	IE-T1	1EGEDG-FS-1J	1EEBUS-UM-DC-I	1FWTRB-FR-24HP2	C-P02		
3	3.3355E-8	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-UM-DC-III	C-P02		
4	3.3355E-8	IE-T1	1FWTRB-FR-24HP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	C-P02		
5	5.9761E-9	IE-T1	1FWTRB-FS-1FWP2	1EEBUS-UM-DC-I	1EGEDG-FS-1J	C-P02		
6	5.9761E-9	IE-T1	1FWTRB-FS-1FWP2	1EGEDG-FS-1H	1EEBUS-UM-DC-III	C-P02		
7	5.5457E-9	IE-T1	1FWTRB-FS-1FWP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	C-P02		
8	5.5457E-9	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FR-1H	1FWTRB-FS-1FWP2	C-P02		
9	2.7123E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-UM-1H	1EEBUS-LU-DC-III	C-P02		
10	2.7123E-9	IE-T1	1EGEDG-UM-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	C-P02		
11	2.1831E-9	IE-T1	1EGEDG-FS-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	C-P02		
12	2.1831E-9	IE-T1	1EEBUS-LU-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02		
13	2.0259E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-LU-DC-III	C-P02		
14	2.0259E-9	IE-T1	1EGEDG-FR-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	C-P02		
15	1.2684E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11	1QSSTR-PG-1FL1B
16	1.2684E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11	1QSSTR-PG-1FL1A
17	1.1771E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	C-P02	HEP-1FRH:1-11	1QSSTR-PG-1FL1B
18	1.1771E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	C-P02	HEP-1FRH:1-11	1QSSTR-PG-1FL1A
19	7.5585E-10	IE-T1	HEP-1AP22:5	C-P02	HEP-1FRH:1-11	1QSSTR-PG-1FL1B	1QSSTR-PG-1FL1A	
20	4.9007E-10	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	C-P02	HEP-1FRH:1-11	1QSMOV-FC-101B

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1P15.MGP 12:21 9/28/1992

Top event unavailability	=	5.158E-7
Number of cut sets in equation	=	461
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	7
Basic Event Data file referenced	=	NAPS1

1	1.6440E-7	IE-T1	HEP-1AP22:5	HEP-1FRH:1-15			
2	5.9559E-8	IE-T1	1FWCKV-CC-ALLAFW	HEP-1FRH:1-15			
3	1.9906E-8	IE-T1	HEP-1AP22:5	1RCRV--CC-RCPORV			
4	1.4860E-8	IE-T1	1FWTRB-FR-24HP2	1FWPSB-CC-MDP3AB	HEP-1FRH:1-15		
5	9.4278E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	1RCRV--FC-1456	1EE-BAT-I-2HR
6	9.4278E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	1EE-BAT-III-2HR	1RCRV--FC-1455C
7	9.3943E-9	IE-T1	1FWCKV-LEAKAGE	HEP-1FRH:1-15			
8	8.7488E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	1RCRV--FC-1455C	1EE-BAT-III-2HR
9	8.7488E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	1EE-BAT-I-2HR	1RCRV--FC-1456
10	7.7861E-9	IE-T1	1FWPSB-UM-1FWP3B	1EGEDG-FS-1H	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
11	7.7861E-9	IE-T1	1EGEDG-FS-1J	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
12	7.2253E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1EGEDG-FR-1J	HEP-1FRH:1-15	
13	7.2253E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1FWPSB-UM-1FWP3B	HEP-1FRH:1-15	
14	7.2117E-9	IE-T1	1FWCKV-CC-ALLAFW	1RCRV--CC-RCPORV			
15	3.5782E-9	IE-T1	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	1RCRV--FC-1455C	1EE-BAT-III-2HR
16	3.5782E-9	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-UM-1H	1FWTRB-FR-24HP2	1EE-BAT-I-2HR	1RCRV--FC-1456
17	3.5453E-9	IE-T1	HEP-1AP22:5	1RCRV--FC-1455C	1EGEDG-UM-1J	1EE-BAT-III-2HR	
18	3.5453E-9	IE-T1	HEP-1AP22:5	1EGEDG-UM-1H	1EE-BAT-I-2HR	1RCRV--FC-1456	
19	2.9551E-9	IE-T1	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
20	2.9551E-9	IE-T1	1FWPSB-FS-1FWP3B	1EGEDG-UM-1H	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
21	2.8801E-9	IE-T1	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3A	1EGEDG-FS-1J	1EE-BAT-III-2HR	1RCRV--FC-1455C
22	2.8801E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FS-1H	1FWPSB-FS-1FWP3B	1RCRV--FC-1456	1EE-BAT-I-2HR
23	2.8536E-9	IE-T1	HEP-1AP22:5	1RCRV--FC-1456	1EE-BAT-I-2HR	1EGEDG-FS-1H	
24	2.8536E-9	IE-T1	HEP-1AP22:5	1EE-BAT-III-2HR	1EGEDG-FS-1J	1RCRV--FC-1455C	
25	2.6726E-9	IE-T1	1EGEDG-FR-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	1RCRV--FC-1455C	1EE-BAT-III-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1P19.MGP 12:22 9/28/1992

Top event unavailability = 1.908E-7
Number of cut sets in equation = 181
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	3.6417E-8	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	1EE-BAT-I-2HR
2	3.6417E-8	IE-T1	1EGEDG-FS-1J	1EEBUS-UM-DC-I	1FWTRB-FR-24HP2	1EE-BAT-III-2HR
3	3.3795E-8	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-UM-DC-III	1EE-BAT-I-2HR
4	3.3795E-8	IE-T1	1FWTRB-FR-24HP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	1EE-BAT-III-2HR
5	6.0548E-9	IE-T1	1FWTRB-FS-1FWP2	1EGEDG-FS-1H	1EEBUS-UM-DC-III	1EE-BAT-I-2HR
6	6.0548E-9	IE-T1	1FWTRB-FS-1FWP2	1EEBUS-UM-DC-I	1EGEDG-FS-1J	1EE-BAT-III-2HR
7	5.6187E-9	IE-T1	1FWTRB-FS-1FWP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	1EE-BAT-III-2HR
8	5.6187E-9	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FR-1H	1FWTRB-FS-1FWP2	1EE-BAT-I-2HR
9	2.7480E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-UM-1H	1EEBUS-LU-DC-III	1EE-BAT-I-2HR
10	2.7480E-9	IE-T1	1EGEDG-UM-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	1EE-BAT-III-2HR
11	2.2118E-9	IE-T1	1EGEDG-FS-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	1EE-BAT-III-2HR
12	2.2118E-9	IE-T1	1EEBUS-LU-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	1EE-BAT-I-2HR
13	2.0525E-9	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-LU-DC-III	1EE-BAT-I-2HR
14	2.0525E-9	IE-T1	1EGEDG-FR-1J	1EEBUS-LU-DC-I	1FWTRB-FR-24HP2	1EE-BAT-III-2HR
15	9.1032E-10	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	1RCMOV-LK-1536
16	9.1032E-10	IE-T1	1EGEDG-FS-1J	1EEBUS-UM-DC-I	1FWTRB-FR-24HP2	1RCMOV-LK-1535
17	8.4475E-10	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-UM-DC-III	1RCMOV-LK-1536
18	8.4475E-10	IE-T1	1FWTRB-FR-24HP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	1RCMOV-LK-1535
19	3.6374E-10	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	1RCRV--FC-1455C
20	3.6374E-10	IE-T1	1EGEDG-FS-1J	1EEBUS-UM-DC-I	1FWTRB-FR-24HP2	1RCRV--FC-1456
21	3.3755E-10	IE-T1	1FWTRB-FR-24HP2	1EGEDG-FR-1H	1EEBUS-UM-DC-III	1RCRV--FC-1455C
22	3.3755E-10	IE-T1	1FWTRB-FR-24HP2	1EEBUS-UM-DC-I	1EGEDG-FR-1J	1RCRV--FC-1456
23	3.0040E-10	IE-T1	1EEBUS-UM-DC-III	1EGEDG-FS-1H	1FWTRB-FR-24HP2	HEP-1FRH:1-15

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                  T1TRP14.MGP              12:18   9/28/1992
Top event unavailability              =    1.014E-6
Number of cut sets in equation        =         345
Cutoff value used last step           =    1.000E-11
Longest cut set (# of events)         =           9
Basic Event Data file referenced      =      NAPS1
```

1	1.7653E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1MSRV--FC-101C	C-D102	HEP-1ES1:3
2	1.7653E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--FC-1456	1EE-BAT-I-2HR	C-D102	HEP-1ES1:3	1EE-BAT-II-2HR
3	1.6381E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1MSRV--FC-101C	1EE-BAT-II-2HR	1EE-BAT-I-2HR	C-D102	HEP-1ES1:3
4	1.6381E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1RCRV--FC-1456	C-D102	1EE-BAT-II-2HR	HEP-1ES1:3
5	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--FC-1456	1EE-BAT-I-2HR	C-D102	1SIMOV-FO-1862B	
6	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1MSRV--FC-101C	C-D102	1SIMOV-FC-1863B
7	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1MSRV--FC-101C	C-D102	1SIMOV-FC-1860B
8	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--FC-1456	1EE-BAT-I-2HR	C-D102	1SIMOV-FC-1860B	
9	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--FC-1456	1EE-BAT-I-2HR	C-D102	1SIMOV-FC-1863B	
10	1.5779E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1MSRV--FC-101C	C-D102	1SIMOV-FO-1862B
11	1.4643E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1MSRV--FC-101C	1EE-BAT-II-2HR	1EE-BAT-I-2HR	C-D102	1SIMOV-FC-1860B
12	1.4643E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1MSRV--FC-101C	1EE-BAT-II-2HR	1EE-BAT-I-2HR	C-D102	1SIMOV-FC-1863B
13	1.4643E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1RCRV--FC-1456	C-D102	1SIMOV-FC-1860B	
14	1.4643E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1RCRV--FC-1456	C-D102	1SIMOV-FC-1863B	
15	1.4643E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1RCRV--FC-1456	C-D102	1SIMOV-FO-1862B	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                T1TRP17.MGP          12:14   9/28/1992
Top event unavailability          =  4.003E-6
Number of cut sets in equation    =        543
Cutoff value used last step       =  1.000E-11
Longest cut set (# of events)     =          8
Basic Event Data file referenced  =    NAPS1
```

1	2.9740E-7	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-II-2HR	1EE-BAT-I-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
2	2.7598E-7	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
3	1.7791E-7	IE-T1	1EGEDG-UM-1H	1HVCHU-FS-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
4	1.4320E-7	IE-T1	1EGEDG-FS-1H	1HVCHU-FS-1HVE4B	1EE-BAT-II-2HR	1EE-BAT-I-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
5	1.4078E-7	IE-T1	HEP-1FRH:1-11	1IAIAS-LF-OUTIA	REC-1AP28			
6	1.3289E-7	IE-T1	1EGEDG-FR-1H	1HVCHU-FS-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
7	7.4272E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--FC-1456	1EE-BAT-I-2HR	HEP-1FRH:1-11	
8	7.4272E-8	IE-T1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1MSRV--FC-101C	HEP-1FRH:1-11
9	7.0932E-8	IE-T1	1EGEDG-UM-1H	1HVPCV-FC-1235B1	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
10	7.0932E-8	IE-T1	1EGEDG-UM-1H	1HVTCV-FC-TCV167	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
11	6.8923E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1MSRV--FC-101C	1EE-BAT-II-2HR	1EE-BAT-I-2HR	HEP-1FRH:1-11
12	6.8923E-8	IE-T1	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1EE-BAT-I-2HR	1RCRV--FC-1456	HEP-1FRH:1-11	
13	5.7093E-8	IE-T1	1EGEDG-FS-1H	1HVTCV-FC-TCV167	1EE-BAT-II-2HR	1EE-BAT-I-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
14	5.7093E-8	IE-T1	1EGEDG-FS-1H	1HVPCV-FC-1235B1	1EE-BAT-II-2HR	1EE-BAT-I-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
15	5.2981E-8	IE-T1	1EGEDG-FR-1H	1HVTCV-FC-TCV167	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97
16	5.2981E-8	IE-T1	1EGEDG-FR-1H	1HVPCV-FC-1235B1	1EE-BAT-I-2HR	1EE-BAT-II-2HR	HEP-1FRH:1-11	1MSMV--LK-1MS97

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T1TRP21.MGP 12:16 9/28/1992
Top event unavailability = 2.224E-6
Number of cut sets in equation = 180
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	6.8077E-8	1E-T1	1EEBKR-SO-15H8	1EGEDG-UM-1J	1EE-BAT-I-2HR	1EE-BAT-III-2HR
2	6.8077E-8	1E-T1	1EEBKR-SO-14H2	1EGEDG-UM-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
3	6.8077E-8	1E-T1	1EEBKR-SO-14H1	1EGEDG-UM-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
4	6.8077E-8	1E-T1	1EGEDG-UM-1H	1EEBKR-SO-14J4	1EE-BAT-III-2HR	1EE-BAT-I-2HR
5	6.8077E-8	1E-T1	1EGEDG-UM-1H	1EEBKR-SO-14J1	1EE-BAT-III-2HR	1EE-BAT-I-2HR
6	6.8077E-8	1E-T1	1EGEDG-UM-1H	1EEBKR-SO-15J8	1EE-BAT-III-2HR	1EE-BAT-I-2HR
7	5.4795E-8	1E-T1	1EEBKR-SO-15H8	1EGEDG-FS-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
8	5.4795E-8	1E-T1	1EEBKR-SO-14H1	1EGEDG-FS-1J	1EE-BAT-I-2HR	1EE-BAT-III-2HR
9	5.4795E-8	1E-T1	1EEBKR-SO-14H2	1EGEDG-FS-1J	1EE-BAT-I-2HR	1EE-BAT-III-2HR
10	5.4795E-8	1E-T1	1EGEDG-FS-1H	1EEBKR-SO-15J8	1EE-BAT-I-2HR	1EE-BAT-III-2HR
11	5.4795E-8	1E-T1	1EGEDG-FS-1H	1EEBKR-SO-14J1	1EE-BAT-I-2HR	1EE-BAT-III-2HR
12	5.4795E-8	1E-T1	1EGEDG-FS-1H	1EEBKR-SO-14J4	1EE-BAT-I-2HR	1EE-BAT-III-2HR
13	5.0849E-8	1E-T1	1EEBKR-SO-15H8	1EGEDG-FR-1J	1EE-BAT-I-2HR	1EE-BAT-III-2HR
14	5.0849E-8	1E-T1	1EEBKR-SO-14H2	1EGEDG-FR-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
15	5.0849E-8	1E-T1	1EEBKR-SO-14H1	1EGEDG-FR-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
16	5.0849E-8	1E-T1	1EGEDG-FR-1H	1EEBKR-SO-14J4	1EE-BAT-III-2HR	1EE-BAT-I-2HR
17	5.0849E-8	1E-T1	1EGEDG-FR-1H	1EEBKR-SO-15J8	1EE-BAT-III-2HR	1EE-BAT-I-2HR
18	5.0849E-8	1E-T1	1EGEDG-FR-1H	1EEBKR-SO-14J1	1EE-BAT-III-2HR	1EE-BAT-I-2HR
19	3.8523E-8	1E-T1	1EETFM-LP-1H	1EGEDG-UM-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
20	3.8523E-8	1E-T1	1EGEDG-UM-1H	1EETFM-LP-1J	1EE-BAT-III-2HR	1EE-BAT-I-2HR
21	3.4899E-8	1E-T1	1EGEDG-FS-1H	1EEBUS-UM-DC-III	2EGEDG-UM-2J	1EE-BAT-I-2HR
22	3.2386E-8	1E-T1	1EGEDG-FR-1H	2EGEDG-UM-2J	1EEBUS-UM-DC-III	1EE-BAT-I-2HR
23	3.1007E-8	1E-T1	1EETFM-LP-1H	1EGEDG-FS-1J	1EE-BAT-I-2HR	1EE-BAT-III-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T2ATRP03.MGP 12:19 9/28/1992

Top event unavailability	=	6.403E-7
Number of cut sets in equation	=	4
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	6
Basic Event Data file referenced	=	NAPS1

1	3.6988E-7	IE-T2A	HEP-1OP49:1	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
2	2.3124E-7	IE-T2A	1SWPSB-UM-1SWP-4	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
3	3.0414E-8	IE-T2A	1SWMOV-FC-1SW117	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
4	8.7911E-9	IE-T2A	1SWPSB-FS-1SWP-4	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

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               T2ATRP06.MGP              12:24   9/28/1992
Top event unavailability            =    1.144E-7
Number of cut sets in equation      =          81
Cutoff value used last step         =    1.000E-11
Longest cut set (# of events)       =           8
Basic Event Data file referenced    =     NAPS1
```

1	5.2833E-8	IE-T2A	HEP-10P49:1	C-LT01		HEP-0AP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
2	3.3029E-8	IE-T2A	1SWPSB-UM-1SWP-4	C-LT01		HEP-0AP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
3	6.4926E-9	IE-T2A	1SW-HOTWEA-9MO	1SWPIP-UM-HDRA	C-LT01	HEP-0AP55-40HR	1HVSTR-PL-1HVS1A	2HVSTR-PG-2HVS1B
4	6.4926E-9	IE-T2A	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	C-LT01	HEP-0AP55-40HR	1HVSTR-PG-1HVS1B	
5	4.3442E-9	IE-T2A	1SWMOV-FC-1SW117	C-LT01		HEP-0AP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
6	2.6412E-9	IE-T2A	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR	1HVSTR-PG-1HVS1B
7	2.1642E-9	IE-T2A	1SW-COLDWEA-3MO	1SWPIP-UM-HDRB	C-LT01	HEP-0AP55-40HR	1HVSTR-PG-1HVS1B	2HVSTR-PL-2HVS1A
8	2.1642E-9	IE-T2A	1SWPIP-UM-HDRA	1SW-COLDWEA-3MO	C-LT01	HEP-0AP55-40HR	1HVSTR-PL-1HVS1A	2HVSTR-PG-2HVS1B
9	1.2557E-9	IE-T2A	1SWPSB-FS-1SWP-4	C-LT01	HEP-0AP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
10	8.8041E-10	IE-T2A	1SW-COLDWEA-3MO	1SWPIP-UM-HDRB	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR	1HVSTR-PG-1HVS1B
11	1.1094E-10	IE-T2A	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR	
12	1.0470E-10	IE-T2A	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR
13	1.0470E-10	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR
14	5.8427E-11	IE-T2A	1HVPAT-FR-HVP22A	1HVCHU-CC-HVE4	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR	
15	5.8427E-11	IE-T2A	1HVPAT-FR-HVP20A	1HVCHU-CC-HVE4	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR	
16	5.5141E-11	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVPAT-FR-HVP20A	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR
17	5.5141E-11	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVPAT-FR-HVP22A	C-LT01	HEP-0AP55-20HR	HEP-0AP55-40HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T2ATRP11.MGP 12:19 9/28/1992

Top event unavailability = 6.773E-7
Number of cut sets in equation = 380
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	6.1646E-7	IE-T2A	C-LT01	HEP-1FRH:1-11	1IAIAS-LF-OUTIA	REC-1AP28			
2	1.4660E-8	IE-T2A	C-LT01	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	1IAIAS-LF-OUTIA	REC-1AP28		
3	8.1004E-9	IE-T2A	C-LT01	1SICKV-FC-1S147	1IAIAS-LF-OUTIA	REC-1AP28			
4	6.3479E-9	IE-T2A	C-LT01	1CHPAT-CC-FS1ABC	1IAIAS-LF-OUTIA	REC-1AP28			
5	4.9879E-9	IE-T2A	C-LT01	1SIMOV-CC-867836	1IAIAS-LF-OUTIA	REC-1AP28			
6	4.9879E-9	IE-T2A	C-LT01	1SIMOV-CC-1115CE	1IAIAS-LF-OUTIA	REC-1AP28			
7	4.9879E-9	IE-T2A	C-LT01	1SIMOV-CC-1115BD	1IAIAS-LF-OUTIA	REC-1AP28			
8	1.5192E-9	IE-T2A	C-LT01	1SIMOV-FO-1115E	1SIMOV-FO-1115C	1IAIAS-LF-OUTIA	REC-1AP28		
9	1.5192E-9	IE-T2A	C-LT01	1SIMOV-FC-1115D	1SIMOV-FC-1115B	1IAIAS-LF-OUTIA	REC-1AP28		
10	8.1002E-10	IE-T2A	C-LT01	1SICKV-CC-79185	1IAIAS-LF-OUTIA	REC-1AP28			
11	5.7492E-10	IE-T2A	C-LT01	1SIMV--PG-1S146	1IAIAS-LF-OUTIA	REC-1AP28			
12	1.6453E-10	IE-T2A	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	1RCRV--CC-RCPORV	HEP-1FRH:1-11		
13	1.6453E-10	IE-T2A	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	1MSRV--CC-101ABC	HEP-1FRH:1-11		
14	1.5527E-10	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1MSRV--CC-101ABC		HEP-1FRH:1-11
15	1.5527E-10	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1RCRV--CC-RCPORV	HEP-1FRH:1-11	
16	1.5527E-10	IE-T2A	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1 RCRV--CC-RCPORV	HEP-1FRH:1-11	
17	1.5527E-10	IE-T2A	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1MSRV--CC-101ABC	HEP-1FRH:1-11	
18	1.5005E-10	IE-T2A	C-LT01	1CHPAT-FS-1CHP1A	1SWTCV-FC-SW102B	1CHPAT-UM-1CHP1C	1IAIAS-LF-OUTIA	REC-1AP28	
19	1.3999E-10	IE-T2A	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	HEP-1ES1:2-S2	HEP-1FRH:1-11		
20	1.3212E-10	IE-T2A	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-1ES1:2-S2	HEP-1FRH:1-11	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T2P09.MGP 12:19 9/28/1992

Top event unavailability = 7.222E-7
Number of cut sets in equation = 125
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	4.2208E-7	IE-T2	HEP-1AP22:5	C-P01	HEP-1FRH:1-11		
2	1.5291E-7	IE-T2	1FWCKV-CC-ALLAFW	C-P01	HEP-1FRH:1-11		
3	3.8152E-8	IE-T2	1FWTRB-FR-24HP2	1FWPSB-CC-MDP3AB	C-P01	HEP-1FRH:1-11	
4	2.4119E-8	IE-T2	1FWCKV-LEAKAGE	C-P01	HEP-1FRH:1-11		
5	1.0037E-8	IE-T2	HEP-1AP22:5	C-P01	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	
6	6.3432E-9	IE-T2	1FWPSB-CC-MDP3AB	1FWTRB-FS-1FWP2	C-P01	HEP-1FRH:1-11	
7	5.5461E-9	IE-T2	HEP-1AP22:5	C-P01	1SICKV-FC-1SI47		
8	4.6728E-9	IE-T2	1FWTRB-UM-1FWP2	1FWPSB-CC-MDP3AB	C-P01	HEP-1FRH:1-11	
9	4.3463E-9	IE-T2	HEP-1AP22:5	C-P01	1CHPAT-CC-FS1ABC		
10	3.6820E-9	IE-T2	1FWTRB-FR-24HP2	1FWPCV-CC-159AB	C-P01	HEP-1FRH:1-11	
11	3.6364E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	
12	3.4151E-9	IE-T2	HEP-1AP22:5	C-P01	1SIMOV-CC-1115CE		
13	3.4151E-9	IE-T2	HEP-1AP22:5	C-P01	1SIMOV-CC-1115BD		
14	3.4151E-9	IE-T2	HEP-1AP22:5	C-P01	1SIMOV-CC-867836		
15	2.2079E-9	IE-T2	1FWPSB-UM-1FWP3B	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-P01	HEP-1FRH:1-11
16	2.2079E-9	IE-T2	1FWPSB-FS-1FWP3B	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	C-P01	HEP-1FRH:1-11
17	2.0093E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	1SICKV-FC-1SI47		
18	1.5746E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	1CHPAT-CC-FS1ABC		
19	1.2372E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	1SIMOV-CC-1115BD		
20	1.2372E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	1SIMOV-CC-867836		
21	1.2372E-9	IE-T2	1FWCKV-CC-ALLAFW	C-P01	1SIMOV-CC-1115CE		
22	1.1053E-9	IE-T2	1FWTRB-FR-24HP2	1FWPSB-FR-24HP3A	1FWPSB-UM-1FWP3B	C-P01	HEP-1FRH:1-11
23	1.1053E-9	IE-T2	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1FWPSB-FR-24HP3B	C-P01	HEP-1FRH:1-11

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T2P14.MGP 12:23 9/28/1992

Top event unavailability	=	1.298E-7
Number of cut sets in equation	=	64
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	6
Basic Event Data file referenced	=	NAPS1

1	7.2168E-8	IE-T2	HEP-1AP22:5	HEP-1FRH:1-15			
2	2.6146E-8	IE-T2	1FWCKV-CC-ALLAFW	HEP-1FRH:1-15			
3	8.7385E-9	IE-T2	HEP-1AP22:5	1RCRV--CC-RCPORV			
4	6.5234E-9	IE-T2	1FWTRB-FR-24HP2	1FWPSB-CC-MDP3AB	HEP-1FRH:1-15		
5	4.1240E-9	IE-T2	1FWCKV-LEAKAGE	HEP-1FRH:1-15			
6	3.1658E-9	IE-T2	1FWCKV-CC-ALLAFW	1RCRV--CC-RCPORV			
7	1.0846E-9	IE-T2	1FWPSB-CC-MDP3AB	1FWTRB-FS-1FWP2	HEP-1FRH:1-15		
8	8.7282E-10	IE-T2	HEP-1AP22:5	1RCRV--FC-1456	1RCRV--FC-1455C		
9	7.9898E-10	IE-T2	1FWTRB-UM-1FWP2	1FWPSB-CC-MDP3AB	HEP-1FRH:1-15		
10	7.8989E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-CC-MDP3AB	1RCRV--CC-RCPORV		
11	6.2957E-10	IE-T2	1FWTRB-FR-24HP2	1FWPCV-CC-159AB	HEP-1FRH:1-15		
12	4.9935E-10	IE-T2	1FWCKV-LEAKAGE	1RCRV--CC-RCPORV			
13	3.7752E-10	IE-T2	1FWPSB-UM-1FWP3B	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
14	3.7752E-10	IE-T2	1FWPSB-FS-1FWP3B	1FWPSB-UM-1FWP3A	1FWTRB-FR-24HP2	HEP-1FRH:1-15	
15	3.1621E-10	IE-T2	1FWCKV-CC-ALLAFW	1RCRV--FC-1456	1RCRV--FC-1455C		
16	1.8900E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-FR-24HP3A	1FWPSB-UM-1FWP3B	HEP-1FRH:1-15	
17	1.8900E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1FWPSB-FR-24HP3B	HEP-1FRH:1-15	
18	1.7880E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1FWHEP-1FW546	HEP-1FRH:1-15	
19	1.7880E-10	IE-T2	1FWTRB-FR-24HP2	1FWHEP-1FW548	1FWPSB-UM-1FWP3B	HEP-1FRH:1-15	
20	1.6660E-10	IE-T2	1EGEDG-CC-1H1J2J	1EP-LOOP-24	1FWTRB-FR-24HP2	1EE-BAT-III-2HR	1EE-BAT-I-2HR
21	1.5115E-10	IE-T2	1FWTRB-FR-24HP2	1FWCKV-FC-1FW165	1FWPSB-UM-1FWP3B	HEP-1FRH:1-15	
22	1.5115E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	1FWCKV-FC-1FW183	HEP-1FRH:1-15	
23	1.3133E-10	IE-T2	1FWPSB-CC-MDP3AB	1FWTRB-FS-1FWP2	1RCRV--CC-RCPORV		
24	1.1533E-10	IE-T2	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3A	1FWPSB-FS-1FWP3B	HEP-1FRH:1-15	
25	1.0599E-10	IE-T2	1FWPSB-CC-MDP3AB	1MSAOV-CC-111AB	HEP-1FRH:1-15		
26	1.0595E-10	IE-T2	1EGEDG-CC-ALL	1EP-LOOP-24	1FWTRB-FR-24HP2	1EE-BAT-III-2HR	1EE-BAT-I-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

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              T3TRP03.MGP                 12:17   9/28/1992
   Top event unavailability           =   1.572E-6
   Number of cut sets in equation     =          4
   Cutoff value used last step        =   1.000E-11
   Longest cut set (# of events)      =          6
   Basic Event Data file referenced   =    NAPS1
```

1	9.0788E-7	IE-T3	HEP-1OP49:1	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
2	5.6758E-7	IE-T3	1SWPSB-UM-1SWP-4	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
3	7.4652E-8	IE-T3	1SWMOV-FC-1SW117	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
4	2.1578E-8	IE-T3	1SWPSB-FS-1SWP-4	C-LT01	C-RC303	1SWSCN-CC-SWRES	REC-SCREEN-TURNS

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T3TRP06.MGP 12:22 9/28/1992

Top event unavailability = 2.825E-7
Number of cut sets in equation = 160
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	1.2968E-7	IE-T3	HEP-10P49:1	C-LT01	HEP-OAP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS		
2	8.1072E-8	IE-T3	1SWPSB-UM-1SWP-4	C-LT01	HEP-OAP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS		
3	1.5936E-8	IE-T3	1SW-HOTWEA-9MO	1SWPIP-UM-HDRA	C-LT01	HEP-OAP55-40HR	1HVSTR-PL-1HVS1A	2HVSTR-PG-2HVS1B	
4	1.5936E-8	IE-T3	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	C-LT01	HEP-OAP55-40HR	1HVSTR-PG-1HVS1B	2HVSTR-PL-2HVS1A	
5	1.0663E-8	IE-T3	1SWMOV-FC-1SW117	C-LT01	HEP-OAP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS		
6	6.4830E-9	IE-T3	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR	1HVSTR-PG-1HVS1B	
7	5.3121E-9	IE-T3	1SW-COLDWEA-3MO	1SWPIP-UM-HDRB	C-LT01	HEP-OAP55-40HR	1HVSTR-PG-1HVS1B	2HVSTR-PL-2HVS1A	
8	5.3121E-9	IE-T3	1SWPIP-UM-HDRA	1SW-COLDWEA-3MO	C-LT01	HEP-OAP55-40HR	1HVSTR-PL-1HVS1A	2HVSTR-PG-2HVS1B	
9	3.0822E-9	IE-T3	1SWPSB-FS-1SWP-4	C-LT01	HEP-OAP55-40HR	1SWSCN-CC-SWRES	REC-SCREEN-TURNS		
10	2.1610E-9	IE-T3	1SW-COLDWEA-3MO	1SWPIP-UM-HDRB	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR	1HVSTR-PG-1HVS1B	
11	6.3893E-10	IE-T3	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	C-LT01	HEP-OAP55-40HR	1HVSTR-PG-1HVS1B	2IAIAS-LF-OUTIA	REC-2AP28
12	2.7230E-10	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
13	2.5698E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR	
14	2.5698E-10	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR	
15	1.4341E-10	IE-T3	1HVPAT-FR-HVP20A	1HVCHU-CC-HVE4	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
16	1.4341E-10	IE-T3	1HVPAT-FR-HVP22A	1HVCHU-CC-HVE4	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
17	1.3535E-10	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVPAT-FR-HVP20A	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T3TRP11.MGP 12:17 9/28/1992

Top event unavailability = 1.669E-6
Number of cut sets in equation = 776
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 9
Basic Event Data file referenced = NAPS1

1	1.5131E-6	IE-T3	C-LT01	HEP-1FRH:1-11	1IAIAS-LF-OUTIA	REC-1AP28		
2	3.5984E-8	IE-T3	C-LT01	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	1IAIAS-LF-OUTIA	REC-1AP28	
3	1.9883E-8	IE-T3	C-LT01	1SICKV-FC-1S147	1IAIAS-LF-OUTIA	REC-1AP28		
4	1.5581E-8	IE-T3	C-LT01	1CHPAT-CC-FS1ABC	1IAIAS-LF-OUTIA	REC-1AP28		
5	1.2243E-8	IE-T3	C-LT01	1SIMOV-CC-867836	1IAIAS-LF-OUTIA	REC-1AP28		
6	1.2243E-8	IE-T3	C-LT01	1SIMOV-CC-1115CE	1IAIAS-LF-OUTIA	REC-1AP28		
7	1.2243E-8	IE-T3	C-LT01	1SIMOV-CC-1115BD	1IAIAS-LF-OUTIA	REC-1AP28		
8	3.7290E-9	IE-T3	C-LT01	1SIMOV-FO-1115E	1SIMOV-FO-1115C	1IAIAS-LF-OUTIA	REC-1AP28	
9	3.7290E-9	IE-T3	C-LT01	1SIMOV-FC-1115D	1SIMOV-FC-1115B	1IAIAS-LF-OUTIA	REC-1AP28	
10	1.9882E-9	IE-T3	C-LT01	1SICKV-CC-79185	1IAIAS-LF-OUTIA	REC-1AP28		
11	1.4112E-9	IE-T3	C-LT01	1SIMV--PG-1S146	1IAIAS-LF-OUTIA	REC-1AP28		
12	4.0383E-10	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	1RCRV--CC-RCPORV	HEP-1FRH:1-11	
13	4.0383E-10	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	1MSRV--CC-101ABC	HEP-1FRH:1-11	
14	3.8112E-10	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1RCRV--CC-RCPORV	HEP-1FRH:1-11
15	3.8112E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1RCRV--CC-RCPORV	HEP-1FRH:1-11
16	3.8112E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1MSRV--CC-101ABC	HEP-1FRH:1-11
17	3.8112E-10	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	1MSRV--CC-101ABC	HEP-1FRH:1-11
18	3.6831E-10	IE-T3	C-LT01	1CHPAT-FS-1CHP1A	1SWTCV-FC-SW102B	1CHPAT-UM-1CHP1C	1IAIAS-LF-OUTIA	REC-1AP28
19	3.4362E-10	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	C-LT01	HEP-1ES1:2-S2	HEP-1FRH:1-11	
20	3.2429E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	C-LT01	HEP-1ES1:2-S2	HEP-1FRH:1-11

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

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                    T3TRP22.MGP              12:24   9/28/1992
Top event unavailability               =     1.196E-7
Number of cut sets in equation         =          827
Cutoff value used last step            =     1.000E-11
Longest cut set (# of events)          =            7
Basic Event Data file referenced       =      NAPS1
```

1	9.8289E-9	IE-T3	1FWTRB-FR-12HP2	HEP-OAP55-10HR	1IAIAS-LF-OUTIA	REC-1AP28	
2	3.1745E-9	IE-T3	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	1IAIAS-LF-OUTIA	REC-1AP28	
3	2.6263E-9	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
4	2.4786E-9	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
5	2.4786E-9	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
6	2.3385E-9	IE-T3	1FWTRB-UM-1FWP2	HEP-OAP55-10HR	1IAIAS-LF-OUTIA	REC-1AP28	
7	1.3832E-9	IE-T3	1HVPAT-FR-HVP20A	1HVCHU-CC-HVE4	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
8	1.3832E-9	IE-T3	1HVPAT-FR-HVP22A	1HVCHU-CC-HVE4	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
9	1.3054E-9	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVPAT-FR-HVP20A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
10	1.3054E-9	IE-T3	1HVCHU-FS-1HVE4C	1HVCHU-UM-1HVE4B	1HVPAT-FR-HVP22A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
11	1.3054E-9	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVPAT-FR-HVP20A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
12	1.3054E-9	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVPAT-FR-HVP22A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
13	1.3051E-9	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-UM-HVE4BC	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
14	1.2154E-9	IE-T3	1EEBKR-SO-14H4	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
15	1.2154E-9	IE-T3	1EEBKR-SO-15H8	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
16	1.2154E-9	IE-T3	1EEBKR-SO-14H1	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
17	1.1935E-9	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-FS-1HVE4B	1HVCHU-FS-1HVE4C	1FWTRB-FR-12HP2	HEP-OAP55-10HR
18	1.0468E-9	IE-T3	1HVCHU-FR-1HVE4A	1HVPCV-CC-1235	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
19	9.8820E-10	IE-T3	1HVPCV-FC-1235C1	1HVCHU-UM-1HVE4B	1HVCHU-FR-1HVE4A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
20	9.8820E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVPCV-FC-1235B1	1HVCHU-FR-1HVE4A	1FWTRB-FR-12HP2	HEP-OAP55-10HR
21	9.4329E-10	IE-T3	1HVFAN-FR-1FM06	1HVTCV-FC-TCV167	1FWTRB-FR-12HP2	HEP-OAP55-10HR	
22	8.4823E-10	IE-T3	1HVCHU-FR-1HVE4A	1HVCHU-CC-HVE4	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	
23	8.0053E-10	IE-T3	1HVCHU-UM-1HVE4C	1HVCHU-FS-1HVE4B	1HVCHU-FR-1HVE4A	1FWTRB-FS-1FWP2	HEP-OAP55-10HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T3TRP23.MGP             12:22   9/28/1992
Top event unavailability            =    1.842E-7
Number of cut sets in equation      =          21
Cutoff value used last step         =    1.000E-11
Longest cut set (# of events)       =           6
Basic Event Data file referenced    =     NAPS1
```

1	6.5697E-8	IE-T3	HEP-10P49:1	1FWTRB-FR-12HP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
2	4.1071E-8	IE-T3	1SWPSB-UM-1SWP-4	1FWTRB-FR-12HP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
3	2.1218E-8	IE-T3	HEP-10P49:1	1FWTRB-FS-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
4	1.5631E-8	IE-T3	HEP-10P49:1	1FWTRB-UM-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
5	1.3265E-8	IE-T3	1SWPSB-UM-1SWP-4	1FWTRB-FS-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
6	9.7719E-9	IE-T3	1SWPSB-UM-1SWP-4	1FWTRB-UM-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
7	5.4020E-9	IE-T3	1SWMOV-FC-1SW117	1FWTRB-FR-12HP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
8	2.0736E-9	IE-T3	HEP-10P49:1	1MSAOV-CC-111AB	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
9	1.7447E-9	IE-T3	1SWMOV-FC-1SW117	1FWTRB-FS-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
10	1.5614E-9	IE-T3	1SWPSB-FS-1SWP-4	1FWTRB-FR-12HP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
11	1.2964E-9	IE-T3	1SWPSB-UM-1SWP-4	1MSAOV-CC-111AB	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
12	1.2853E-9	IE-T3	1SWMOV-FC-1SW117	1FWTRB-UM-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
13	8.5805E-10	IE-T3	HEP-10P49:1	1FWHEP-1FW543	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
14	7.2536E-10	IE-T3	HEP-10P49:1	1FWCKV-FC-1FW148	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
15	5.3643E-10	IE-T3	1SWPSB-UM-1SWP-4	1FWHEP-1FW543	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
16	5.0431E-10	IE-T3	1SWPSB-FS-1SWP-4	1FWTRB-FS-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
17	4.5347E-10	IE-T3	1SWPSB-UM-1SWP-4	1FWCKV-FC-1FW148	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
18	3.7579E-10	IE-T3	HEP-10P49:1	1MSAOV-FC-TV111B	1MSAOV-FC-TV111A	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
19	3.7151E-10	IE-T3	1SWPSB-FS-1SWP-4	1FWTRB-UM-1FWP2	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	
20	2.3493E-10	IE-T3	1SWPSB-UM-1SWP-4	1MSAOV-FC-TV111B	1MSAOV-FC-TV111A	1SWSCN-CC-SWRES	REC-SCREEN-TURNS
21	1.7051E-10	IE-T3	1SWMOV-FC-1SW117	1MSAOV-CC-111AB	1SWSCN-CC-SWRES	REC-SCREEN-TURNS	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T7P03.MGP 12:16 9/28/1992

Top event unavailability = 1.983E-6
Number of cut sets in equation = 276
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	4.0739E-7	IE-T7	C-SG101	HEP-1E3-13	1RHHCV-FC-1758	REC-10P14:1	
2	2.4512E-7	IE-T7	C-SG101	HEP-1E3-13	1RHMOV-FC-1700	REC-10P14:1	
3	2.4512E-7	IE-T7	C-SG101	HEP-1E3-13	1RHMOV-FC-1701	REC-10P14:1	
4	1.6988E-7	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE1B	1RHHEX-LF-1RHE1A	
5	1.6988E-7	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE2B	1RHHEX-LF-1RHE2A	
6	8.8478E-8	IE-T7	C-SG101	HEP-1E3-13	1RHFEL-PG-1605		
7	8.4769E-8	IE-T7	C-SG101	HEP-1E3-13	1RHPSB-CC-1RHP1		
8	6.7246E-8	IE-T7	C-SG101	HEP-1E3-13	1EP-LOOP-24		
9	3.7859E-8	IE-T7	C-SG101	HEP-1E3-13	HEP-10P14:1-5:13	1RCPIC-LF-PC403	
10	3.7859E-8	IE-T7	C-SG101	HEP-1E3-13	HEP-10P14:1-5:13	1RCPIC-LF-PC402	
11	2.3798E-8	IE-T7	C-SG101	HEP-1E3-13	1RHPSB-FS-1RHP1A	1RHHEX-LF-1RHE2B	
12	2.3798E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE2A	1RHPSB-FS-1RHP1B	
13	2.2690E-8	IE-T7	C-SG101	HEP-1E3-13	1RHPSB-UM-1RHP1B	1RHHEX-LF-1RHE2A	
14	2.2690E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE2B	1RHPSB-UM-1RHP1A	
15	1.3665E-8	IE-T7	C-SG101	HEP-1E3-13	1SICKV-CC-144161		
16	1.3665E-8	IE-T7	C-SG101	HEP-1E3-13	1RHCKV-CC-1RH715		
17	1.1437E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE1B	1CCAOV-FC-TV103A	REC-10P14:1
18	1.1437E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE2A	1CCAOV-FC-TV103B	REC-10P14:1
19	1.1437E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE2B	1CCAOV-FC-TV103A	REC-10P14:1
20	1.1437E-8	IE-T7	C-SG101	HEP-1E3-13	1RHHEX-LF-1RHE1A	1CCAOV-FC-TV103B	REC-10P14:1
21	8.7749E-9	IE-T7	C-SG101	HEP-1E3-13	1CCMOV-CC-100AB	REC-10P14:1	
22	8.7749E-9	IE-T7	C-SG101	HEP-1E3-13	1RHMOV-CC-1720	REC-10P14:1	
23	7.3829E-9	IE-T7	C-SG101	HEP-1E3-13	1CCAOV-FC-TV103A	REC-10P14:1	1CCAOV-FC-TV103B

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T7P04.MGP 12:15 9/28/1992

Top event unavailability = 2.983E-6
Number of cut sets in equation = 424
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	6.5198E-7	IE-T7	C-SG101	HEP-1E3-13	HEP-1ECA3:1-16			
2	3.3188E-7	IE-T7	C-SG101	1EEBKR-SO-14H1	1EE-BAT-11-2HR	1EE-BAT-1-2HR		
3	3.3188E-7	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBKR-SO-15H8		
4	3.3188E-7	IE-T7	C-SG101	1EEBKR-SO-14H2	1EE-BAT-11-2HR	1EE-BAT-1-2HR		
5	1.8781E-7	IE-T7	C-SG101	1EETFM-LP-1H	1EE-BAT-11-2HR	1EE-BAT-1-2HR		
6	1.7901E-7	IE-T7	C-SG101	1RCPCV-FC-1455A	1RCRV--CC-RCPORV			
7	1.2011E-7	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBUS-LU-1H		
8	1.2011E-7	IE-T7	C-SG101	1EEBUS-LU-1H1-4	1EE-BAT-11-2HR	1EE-BAT-1-2HR		
9	1.2011E-7	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBUS-LU-1H-480		
10	1.2011E-7	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBUS-LU-1H1		
11	9.8880E-8	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBUS-UM-1H-480		
12	9.8880E-8	IE-T7	C-SG101	1EEBUS-UM-1H	1EE-BAT-11-2HR	1EE-BAT-1-2HR		
13	9.8880E-8	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EEBUS-UM-1H1-4		
14	1.9753E-8	IE-T7	C-SG101	1EEBUS-UM-DC-III	1RCRV--FC-1455C			
15	1.7901E-8	IE-T7	C-SG101	1MSRV--CC-101ABC	1MSTCV-CC-1408AB			
16	1.7901E-8	IE-T7	C-SG101	1RCPCV-CC-1455AB	1RCRV--CC-RCPORV			
17	1.7880E-8	IE-T7	C-SG101	1RCPCV-FC-1455A	1RCRV--FC-1455C	1RCRV--FC-1456		
18	7.8332E-9	IE-T7	C-SG101	1RCRV--CC-RCPORV	1RCPAT-FR-1RCP1A			
19	5.8729E-9	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EGEDG-UM-1H	2EGEDG-UM-2J	1EP-LOOP-24
20	4.7271E-9	IE-T7	C-SG101	1EP-LOOP-24	2EGEDG-UM-2J	1EGEDG-FS-1H	1EE-BAT-11-2HR	1EE-BAT-1-2HR
21	4.3866E-9	IE-T7	C-SG101	1EE-BAT-1-2HR	1EE-BAT-11-2HR	1EGEDG-FR-1H	2EGEDG-UM-2J	1EP-LOOP-24

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T7P06.MGP 12:18 9/28/1992

Top event unavailability = 1.103E-6
Number of cut sets in equation = 1082
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 6
Basic Event Data file referenced = NAPS1

1	6.8969E-8	IE-T7	HEP-1E3-3	1RHHCV-FC-1758	REC-10P14:1	
2	6.5055E-8	IE-T7	1MSCKV-FO-1MS58	1RHHCV-FC-1758	REC-10P14:1	
3	6.5055E-8	IE-T7	1MSCKV-FO-1MS19	1RHHCV-FC-1758	REC-10P14:1	
4	5.6531E-8	IE-T7	1MSAOV-FO-TV101C	1EP-LOOP-24		
5	4.1497E-8	IE-T7	HEP-1E3-3	1RHMOV-FC-1700	REC-10P14:1	
6	4.1497E-8	IE-T7	HEP-1E3-3	1RHMOV-FC-1701	REC-10P14:1	
7	3.9142E-8	IE-T7	1MSCKV-FO-1MS19	1RHMOV-FC-1701	REC-10P14:1	
8	3.9142E-8	IE-T7	1MSCKV-FO-1MS19	1RHMOV-FC-1700	REC-10P14:1	
9	3.9142E-8	IE-T7	1MSCKV-FO-1MS58	1RHMOV-FC-1701	REC-10P14:1	
10	3.9142E-8	IE-T7	1MSCKV-FO-1MS58	1RHMOV-FC-1700	REC-10P14:1	
11	2.8760E-8	IE-T7	HEP-1E3-3	1RHHEX-LF-1RHE2B	1RHHEX-LF-1RHE2A	
12	2.8760E-8	IE-T7	HEP-1E3-3	1RHHEX-LF-1RHE1B	1RHHEX-LF-1RHE1A	
13	2.7128E-8	IE-T7	1MSCKV-FO-1MS19	1RHHEX-LF-1RHE1B	1RHHEX-LF-1RHE1A	
14	2.7128E-8	IE-T7	1MSCKV-FO-1MS58	1RHHEX-LF-1RHE2B	1RHHEX-LF-1RHE2A	
15	2.7128E-8	IE-T7	1MSCKV-FO-1MS58	1RHHEX-LF-1RHE1B	1RHHEX-LF-1RHE1A	
16	2.7128E-8	IE-T7	1MSCKV-FO-1MS19	1RHHEX-LF-1RHE2B	1RHHEX-LF-1RHE2A	
17	1.4979E-8	IE-T7	HEP-1E3-3	1RHFEL-PG-1605		
18	1.4351E-8	IE-T7	HEP-1E3-3	1RHPSB-CC-1RHP1		
19	1.4129E-8	IE-T7	1MSCKV-FO-1MS19	1RHFEL-PG-1605		
20	1.4129E-8	IE-T7	1MSCKV-FO-1MS58	1RHFEL-PG-1605		
21	1.3537E-8	IE-T7	1MSCKV-FO-1MS58	1RHPSB-CC-1RHP1		
22	1.3537E-8	IE-T7	1MSCKV-FO-1MS19	1RHPSB-CC-1RHP1		
23	1.1384E-8	IE-T7	HEP-1E3-3	1EP-LOOP-24		
24	1.0738E-8	IE-T7	1MSCKV-FO-1MS19	1EP-LOOP-24		
25	1.0738E-8	IE-T7	1MSCKV-FO-1MS58	1EP-LOOP-24		
26	9.4465E-9	IE-T7	1MSSRV-DMD17	1MSSV--FO-101C	1RHHCV-FC-1758	REC-10P14:1
27	6.4092E-9	IE-T7	HEP-1E3-3	HEP-10P14:1-5:13	1RCPIC-LF-PC403	
28	6.4092E-9	IE-T7	HEP-1E3-3	HEP-10P14:1-5:13	1RCPIC-LF-PC402	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                    T7P07.MGP             12:24   9/28/1992
 Top event unavailability           =   1.094E-7
 Number of cut sets in equation     =        164
 Cutoff value used last step        =   1.000E-11
 Longest cut set (# of events)      =          7
 Basic Event Data file referenced   =    NAPS1
```

1	2.6454E-8	IE-T7	HEP-1E3-3	HEP-1ECA3:2-5		
2	2.4953E-8	IE-T7	1MSCKV-FO-1MS19	HEP-1ECA3:2-5		
3	2.4953E-8	IE-T7	1MSCKV-FO-1MS58	HEP-1ECA3:2-5		
4	3.6233E-9	IE-T7	1MSSRV-DMDT7	1MSSV--FO-101C	HEP-1ECA3:2-5	
5	1.4323E-9	IE-T7	1MSAOV-FO-TV101C	1MSMOV-FO-NRV101	HEP-1ECA3:2-5	
6	1.2247E-9	IE-T7	HEP-1E3-3	1EEBKR-SO-14H1	1EE-BAT-II-2HR	1EE-BAT-I-2HR
7	1.2247E-9	IE-T7	HEP-1E3-3	1EEBKR-SO-14H2	1EE-BAT-II-2HR	1EE-BAT-I-2HR
8	1.2247E-9	IE-T7	HEP-1E3-3	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBKR-SO-15H8
9	1.1552E-9	IE-T7	1MSCKV-FO-1MS19	1EEBKR-SO-14H1	1EE-BAT-II-2HR	1EE-BAT-I-2HR
10	1.1552E-9	IE-T7	1MSCKV-FO-1MS19	1EEBKR-SO-14H2	1EE-BAT-II-2HR	1EE-BAT-I-2HR
11	1.1552E-9	IE-T7	1MSCKV-FO-1MS19	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBKR-SO-15H8
12	1.1552E-9	IE-T7	1MSCKV-FO-1MS58	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBKR-SO-15H8
13	1.1552E-9	IE-T7	1MSCKV-FO-1MS58	1EEBKR-SO-14H1	1EE-BAT-II-2HR	1EE-BAT-I-2HR
14	1.1552E-9	IE-T7	1MSCKV-FO-1MS58	1EEBKR-SO-14H2	1EE-BAT-II-2HR	1EE-BAT-I-2HR
15	9.0595E-10	IE-T7	1MSMV--FO-1MS95	HEP-1ECA3:2-5		
16	6.9302E-10	IE-T7	HEP-1E3-3	1EETFM-LP-1H	1EE-BAT-II-2HR	1EE-BAT-I-2HR
17	6.6056E-10	IE-T7	HEP-1E3-3	1RCPCV-FC-1455A	1RCRV--CC-RCPORV	
18	6.5370E-10	IE-T7	1MSCKV-FO-1MS58	1EETFM-LP-1H	1EE-BAT-II-2HR	1EE-BAT-I-2HR
19	6.5370E-10	IE-T7	1MSCKV-FO-1MS19	1EETFM-LP-1H	1EE-BAT-II-2HR	1EE-BAT-I-2HR
20	6.2307E-10	IE-T7	1MSCKV-FO-1MS58	1RCPCV-FC-1455A	1RCRV--CC-RCPORV	
21	6.2307E-10	IE-T7	1MSCKV-FO-1MS19	1RCPCV-FC-1455A	1RCRV--CC-RCPORV	
22	4.4323E-10	IE-T7	HEP-1E3-3	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBUS-LU-1H
23	4.4323E-10	IE-T7	HEP-1E3-3	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBUS-LU-1H-480
24	4.4323E-10	IE-T7	HEP-1E3-3	1EE-BAT-I-2HR	1EE-BAT-II-2HR	1EEBUS-LU-1H1
25	4.4323E-10	IE-T7	HEP-1E3-3	1EEBUS-LU-1H1-4	1EE-BAT-II-2HR	1EE-BAT-I-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T7P23.MGP 12:23 9/28/1992

Top event unavailability = 1.796E-7
Number of cut sets in equation = 319
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	5.0370E-8	IE-T7	1QSMV--PG-1QS38 C-L08	C-SGI01	HEP-1ECA3:3-27		
2	4.7312E-8	IE-T7	1SICKV-CC-838689 C-L08	C-SGI01	HEP-1ECA3:3-27		
3	3.8844E-9	IE-T7	HEP-NO-PROCEDURE 1CHCKV-FO-1CH254	C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A
4	3.8844E-9	IE-T7	HEP-NO-PROCEDURE 1CHCKV-FO-1CH254	C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B
5	3.4404E-9	IE-T7	HEP-NO-PROCEDURE 1CHCKV-FO-1CH254	C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1A
6	3.4404E-9	IE-T7	HEP-NO-PROCEDURE 1CHCKV-FO-1CH254	C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1B
7	2.7048E-9	IE-T7	1SWTCV-FC-SW102B 1EEBUS-UM-DC-I	C-L08	C-SGI01	HEP-1ECA3:3-27	
8	2.1464E-9	IE-T7	1SICKV-FC-1SI47 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A	
9	2.1464E-9	IE-T7	1SICKV-FC-1SI47 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B	
10	1.9010E-9	IE-T7	1SICKV-FC-1SI47 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1B	
11	1.9010E-9	IE-T7	1SICKV-FC-1SI47 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1A	
12	1.6820E-9	IE-T7	1CHPAT-CC-FS1ABC C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A	
13	1.6820E-9	IE-T7	1CHPAT-CC-FS1ABC C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B	
14	1.4897E-9	IE-T7	1CHPAT-CC-FS1ABC C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1B	
15	1.4897E-9	IE-T7	1CHPAT-CC-FS1ABC C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-FS-1SIP1A	
16	1.3216E-9	IE-T7	1SIMOV-CC-1115BD C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A	
17	1.3216E-9	IE-T7	1SIMOV-CC-1115BD C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B	
18	1.3216E-9	IE-T7	1SIMOV-CC-1115CE C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B	
19	1.3216E-9	IE-T7	1SIMOV-CC-1115CE C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A	
20	1.3216E-9	IE-T7	1SIMOV-CC-867836 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1B	
21	1.3216E-9	IE-T7	1SIMOV-CC-867836 C-L08	C-SGI01	HEP-1ECA3:3-27	1SIPSB-UM-1SIP1A	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T7P26.MGP		12:21 9/28/1992
Top event unavailability	=	3.848E-7
Number of cut sets in equation	=	310
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	7
Basic Event Data file referenced	=	NAPS1

1	3.5210E-8	IE-T7	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-L08	HEP-1E3-3	
2	3.3212E-8	IE-T7	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-L08	1MSCKV-FO-1MS58	
3	3.3212E-8	IE-T7	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-L08	1MSCKV-FO-1MS19	
4	1.9456E-8	IE-T7	1SICKV-FC-1S147	C-L08	HEP-1E3-3		
5	1.8352E-8	IE-T7	1SICKV-FC-1S147	C-L08	1MSCKV-FO-1MS58		
6	1.8352E-8	IE-T7	1SICKV-FC-1S147	C-L08	1MSCKV-FO-1MS19		
7	1.5246E-8	IE-T7	1CHPAT-CC-FS1ABC	C-L08	HEP-1E3-3		
8	1.4381E-8	IE-T7	1CHPAT-CC-FS1ABC	C-L08	1MSCKV-FO-1MS58		
9	1.4381E-8	IE-T7	1CHPAT-CC-FS1ABC	C-L08	1MSCKV-FO-1MS19		
10	1.1980E-8	IE-T7	1SIMOV-CC-1115BD	C-L08	HEP-1E3-3		
11	1.1980E-8	IE-T7	1SIMOV-CC-867836	C-L08	HEP-1E3-3		
12	1.1980E-8	IE-T7	1SIMOV-CC-1115CE	C-L08	HEP-1E3-3		
13	1.1300E-8	IE-T7	1SIMOV-CC-867836	C-L08	1MSCKV-FO-1MS19		
14	1.1300E-8	IE-T7	1SIMOV-CC-867836	C-L08	1MSCKV-FO-1MS58		
15	1.1300E-8	IE-T7	1SIMOV-CC-1115BD	C-L08	1MSCKV-FO-1MS19		
16	1.1300E-8	IE-T7	1SIMOV-CC-1115BD	C-L08	1MSCKV-FO-1MS58		
17	1.1300E-8	IE-T7	1SIMOV-CC-1115CE	C-L08	1MSCKV-FO-1MS19		
18	1.1300E-8	IE-T7	1SIMOV-CC-1115CE	C-L08	1MSCKV-FO-1MS58		
19	4.8227E-9	IE-T7	HEP-NO-PROCEDURE	1CHCKV-FO-1CH254	C-L08	1MSSRV-DMDT7	1MSSV--FO-101C
20	3.6489E-9	IE-T7	1SIMOV-FC-1115D	1SIMOV-FC-1115B	C-L08	HEP-1E3-3	
21	3.6489E-9	IE-T7	1SIMOV-FO-1115E	1SIMOV-FO-1115C	C-L08	HEP-1E3-3	
22	3.4418E-9	IE-T7	1SIMOV-FO-1115E	1SIMOV-FO-1115C	C-L08	1MSCKV-FO-1MS58	
23	3.4418E-9	IE-T7	1SIMOV-FC-1115D	1SIMOV-FC-1115B	C-L08	1MSCKV-FO-1MS19	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T8P02.MGP 12:16 9/28/1992

Top event unavailability = 2.518E-6
Number of cut sets in equation = 353
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	1.3570E-6	IE-T8	C-LT01	HEP-OAP55-20HR	C-RC303		
2	1.3374E-7	IE-T8	C-LT01	C-RC303	2IAIAS-LF-OUTIA	REC-2AP28	
3	1.8917E-8	IE-T8	C-LT01	2EEBUS-UM-2H-480	2HVTCV-FC-TCV266	C-RC303	
4	1.8917E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVTCV-FC-TCV266	C-RC303	
5	1.8917E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVPCV-FC-2235B1	C-RC303	
6	1.8917E-8	IE-T8	C-LT01	2EEBUS-UM-2H-480	2HVPCV-FC-2235B1	C-RC303	
7	1.8917E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-4	2HVPCV-FC-2235B1	C-RC303	
8	1.8917E-8	IE-T8	C-LT01	2HVTCV-FC-TCV266	2EEBUS-UM-2H	C-RC303	
9	1.8917E-8	IE-T8	C-LT01	2HVPCV-FC-2235B1	2EEBUS-UM-2H	C-RC303	
10	1.8821E-8	IE-T8	C-LT01	2HVPAT-FR-HVP22A	2HVCHU-CC-HVE4	C-RC303	
11	1.8821E-8	IE-T8	C-LT01	2HVPAT-FR-HVP20A	2HVCHU-CC-HVE4	C-RC303	
12	1.6537E-8	IE-T8	C-LT01	2HVCHU-UM-2HVE4B	2EEBKR-SO-25H8	C-RC303	
13	1.6537E-8	IE-T8	C-LT01	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H1	C-RC303	
14	1.6537E-8	IE-T8	C-LT01	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H4	C-RC303	
15	1.6537E-8	IE-T8	C-LT01	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H2	C-RC303	
16	1.2835E-8	IE-T8	C-LT01	2HVTCV-FC-TCV266	2HVFAN-FR-2FMO7	C-RC303	
17	1.1908E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-1	C-RC303	2HVCHU-FS-2HVE4B	REC-MMP-C-MR-2
18	1.1908E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-4	C-RC303	2HVCHU-FS-2HVE4B	REC-MMP-C-MR-2
19	1.1908E-8	IE-T8	C-LT01	2EEBUS-UM-2H	C-RC303	2HVCHU-FS-2HVE4B	REC-MMP-C-MR-2
20	1.1908E-8	IE-T8	C-LT01	2EEBUS-UM-2H-480	C-RC303	2HVCHU-FS-2HVE4B	REC-MMP-C-MR-2
21	1.1382E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVMOV-FC-211B	C-RC303	
22	1.1382E-8	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVMOD-FO-MOD238	C-RC303	
23	1.1382E-8	IE-T8	C-LT01	2EEBUS-UM-2H-480	2HVMOD-FO-MOD238	C-RC303	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

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                    T8P06.MGP               12:20   9/28/1992
Top event unavailability              =    6.059E-7
Number of cut sets in equation        =         357
Cutoff value used last step           =    1.000E-11
Longest cut set (# of events)         =           6
Basic Event Data file referenced      =     NAPS1
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1	1.9384E-7	IE-T8	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
2	1.2153E-7	IE-T8	C-LT01	1SW-HOTWEA-9MO	1SWPIP-UM-HDRA	HEP-OAP55-40HR	2HVSTR-PG-2HVS1B
3	4.0510E-8	IE-T8	C-LT01	1SWPIP-UM-HDRA	1SW-COLDWEA-3MO	HEP-OAP55-40HR	2HVSTR-PG-2HVS1B
4	1.9103E-8	IE-T8	C-LT01	HEP-OAP55-40HR	2IAIAS-LF-OUTIA	REC-2AP28	
5	8.1512E-9	IE-T8	C-LT01	1SW-HOTWEA-9MO	1SWPIP-UM-HDRB	HEP-OAP55-40HR	2HVSTR-PL-2HVS1A
6	6.7774E-9	IE-T8	C-LT01	2EEBUS-UM-2H-480	HEP-OAP55-40HR	2HVCHU-FS-2HVE4B	
7	6.7774E-9	IE-T8	C-LT01	2EEBUS-UM-2H	HEP-OAP55-40HR	2HVCHU-FS-2HVE4B	
8	6.7774E-9	IE-T8	C-LT01	2EEBUS-UM-2H1-4	HEP-OAP55-40HR	2HVCHU-FS-2HVE4B	
9	6.7774E-9	IE-T8	C-LT01	2EEBUS-UM-2H1-1	HEP-OAP55-40HR	2HVCHU-FS-2HVE4B	
10	5.1044E-9	IE-T8	C-LT01	2HVCHU-CC-HVE4	HEP-OAP55-40HR	2HVCHU-FR-2HVE4A	
11	4.8174E-9	IE-T8	C-LT01	2HVCHU-UM-2HVE4C	HEP-OAP55-40HR	2HVCHU-FR-2HVE4A	2HVCHU-FS-2HVE4B
12	4.8174E-9	IE-T8	C-LT01	2HVCHU-UM-2HVE4B	HEP-OAP55-40HR	2HVCHU-FR-2HVE4A	2HVCHU-FS-2HVE4C
13	2.7171E-9	IE-T8	C-LT01	1SW-COLDWEA-3MO	1SWPIP-UM-HDRB	HEP-OAP55-40HR	2HVSTR-PL-2HVS1A
14	2.7021E-9	IE-T8	C-LT01	2EEBUS-UM-2H1-4	2HVPCV-FC-2235B1	HEP-OAP55-40HR	
15	2.7021E-9	IE-T8	C-LT01	2EEBUS-UM-2H-480	2HVTCV-FC-TCV266	HEP-OAP55-40HR	
16	2.7021E-9	IE-T8	C-LT01	2HVTCV-FC-TCV266	2EEBUS-UM-2H	HEP-OAP55-40HR	
17	2.7021E-9	IE-T8	C-LT01	2EEBUS-UM-2H-480	2HVPCV-FC-2235B1	HEP-OAP55-40HR	
18	2.7021E-9	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVPCV-FC-2235B1	HEP-OAP55-40HR	
19	2.7021E-9	IE-T8	C-LT01	2HVPCV-FC-2235B1	2EEBUS-UM-2H	HEP-OAP55-40HR	
20	2.7021E-9	IE-T8	C-LT01	2EEBUS-UM-2H1-1	2HVTCV-FC-TCV266	HEP-OAP55-40HR	
21	2.6884E-9	IE-T8	C-LT01	2HVPAT-FR-HVP20A	2HVCHU-CC-HVE4	HEP-OAP55-40HR	
22	2.6884E-9	IE-T8	C-LT01	2HVPAT-FR-HVP22A	2HVCHU-CC-HVE4	HEP-OAP55-40HR	
23	2.5372E-9	IE-T8	C-LT01	2HVPAT-FR-HVP20A	2HVCHU-UM-2HVE4B	HEP-OAP55-40HR	2HVCHU-FS-2HVE4C

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

	T8P22.MGP		12:14 9/28/1992
Top event unavailability		=	3.169E-6
Number of cut sets in equation		=	1069
Cutoff value used last step		=	1.000E-11
Longest cut set (# of events)		=	6
Basic Event Data file referenced		=	NAPS1

1	1.8695E-6	IE-T8	1FWTRB-FR-12HP2	HEP-OAP55-10HR		
2	6.0381E-7	IE-T8	1FWTRB-FS-1FWP2	HEP-OAP55-10HR		
3	4.4481E-7	IE-T8	1FWTRB-UM-1FWP2	HEP-OAP55-10HR		
4	5.9009E-8	IE-T8	1MSAOV-CC-111AB	HEP-OAP55-10HR		
5	2.4418E-8	IE-T8	1FWHEP-1FW543	HEP-OAP55-10HR		
6	2.0641E-8	IE-T8	1FWCKV-FC-1FW148	HEP-OAP55-10HR		
7	1.0694E-8	IE-T8	1MSAOV-FC-TV111B	1MSAOV-FC-TV111A	HEP-OAP55-10HR	
8	9.6778E-9	IE-T8	1FWTRB-FR-12HP2	2IAIAS-LF-OUTIA	REC-2AP28	
9	3.1257E-9	IE-T8	1FWTRB-FS-1FWP2	2IAIAS-LF-OUTIA	REC-2AP28	
10	2.3026E-9	IE-T8	1FWTRB-UM-1FWP2	2IAIAS-LF-OUTIA	REC-2AP28	
11	2.0641E-9	IE-T8	1FWCKV-CC-ALLAFW	HEP-OAP55-10HR		
12	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2HVTCV-FC-TCV266	2EEBUS-UM-2H	
13	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2HVPCV-FC-2235B1	2EEBUS-UM-2H	
14	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H1-1	2HVTCV-FC-TCV266	
15	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H1-4	2HVPCV-FC-2235B1	
16	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H-480	2HVTCV-FC-TCV266	
17	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H1-1	2HVPCV-FC-2235B1	
18	1.3689E-9	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H-480	2HVPCV-FC-2235B1	
19	1.3619E-9	IE-T8	1FWTRB-FR-12HP2	2HVPAT-FR-HVP20A	2HVCHU-CC-HVE4	
20	1.3619E-9	IE-T8	1FWTRB-FR-12HP2	2HVPAT-FR-HVP22A	2HVCHU-CC-HVE4	
21	1.1967E-9	IE-T8	1FWTRB-FR-12HP2	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H2	
22	1.1967E-9	IE-T8	1FWTRB-FR-12HP2	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H4	
23	1.1967E-9	IE-T8	1FWTRB-FR-12HP2	2HVCHU-UM-2HVE4B	2EEBKR-SO-25H8	
24	1.1967E-9	IE-T8	1FWTRB-FR-12HP2	2HVCHU-UM-2HVE4B	2EEBKR-SO-24H1	
25	9.2879E-10	IE-T8	1FWTRB-FR-12HP2	2HVTCV-FC-TCV266	2HVFAN-FR-2FM07	
26	8.6169E-10	IE-T8	1FWTRB-FR-12HP2	2EEBUS-UM-2H1-1	2HVCHU-FS-2HVE4B	REC-MMP-C-MR-2

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9AP02.MGP 12:23 9/28/1992

Top event unavailability = 1.719E-7
Number of cut sets in equation = 113
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	2.6372E-8	C-HV05	1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	
2	1.1253E-8	1EGEDG-FS-1H	C-HV05	1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4
3	1.0442E-8	1EGEDG-FR-1H	C-HV05	1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4
4	8.0561E-9	C-HV05	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3B	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	
5	7.9821E-9	C-HV05	HEP-1AP22:5	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4		
6	4.5011E-9	1EGEDG-FS-1H	C-HV05	1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-RSST-C	REC-1FRH:1-4
7	4.3846E-9	C-HV05	1FWTRB-FS-1FWP2	1FWPSB-UM-1FWP3B	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	
8	4.2708E-9	1EGEDG-UM-1H	C-HV05	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3B	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4
9	4.2316E-9	1EGEDG-UM-1H	C-HV05	HEP-1AP22:5	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4	
10	4.1770E-9	1EGEDG-FR-1H	C-HV05	1FWPSB-UM-1FWP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-RSST-C	REC-1FRH:1-4
11	4.0331E-9	C-HV05	1FWPSB-FR-24HP3B	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	
12	3.8155E-9	C-HV05	1FWHEP-1FW546	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	
13	3.4376E-9	1EGEDG-FS-1H	C-HV05	1FWTRB-FR-24HP2	1FWPSB-FS-1FWP3B	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4
14	3.4060E-9	1EGEDG-FS-1H	C-HV05	HEP-1AP22:5	C-OS05	C-H105	T9A-FREQ-500KV-1	REC-1FRH:1-4	
15	3.2254E-9	C-HV05	1FWCKV-FC-1FW183	1FWTRB-FR-24HP2	C-OS05	C-H105	T9A-FREQ-4160-1H	REC-1FRH:1-4	

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9AP10.MGP 12:23 9/28/1992

Top event unavailability = 1.311E-7
Number of cut sets in equation = 87
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	9.1124E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
2	8.1454E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1860B			
3	8.1454E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1862B			
4	8.1454E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1863B			
5	4.8308E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR
6	4.3181E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1862B		
7	4.3181E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1860B		
8	4.3181E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1863B		
9	3.8883E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR
10	3.6083E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR
11	3.4757E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1862B		
12	3.4757E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1863B		
13	3.4757E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1860B		
14	3.3889E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIPSB-UM-1SIP1B			
15	3.2253E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1860B		
16	3.2253E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1862B		
17	3.2253E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1863B		
18	3.0015E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIPSB-FS-1SIP1B			
19	2.5716E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SICKV-FO-1SI47			
20	1.9323E-9	T9A-FREQ-RSST-C	1EGEDG-UM-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9AP13.MGP 12:24 9/28/1992

Top event unavailability = 1.022E-7
Number of cut sets in equation = 84
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 9
Basic Event Data file referenced = NAPS1

1	1.2154E-8	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105	
2	7.3125E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1115B	C-QS05	C-H105	
3	7.3125E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1115E	C-QS05	C-H105	
4	6.4431E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105
5	5.1860E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105
6	4.8125E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105
7	3.8766E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1115E	C-QS05	C-H105
8	3.8766E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1115B	C-QS05	C-H105
9	3.4055E-9	T9A-FREQ-4160-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1CHPAT-FS-1CHP1B	C-QS05	C-H105	
10	3.1203E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1115E	C-QS05	C-H105
11	3.1203E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1115B	C-QS05	C-H105
12	2.8956E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FC-1115B	C-QS05	C-H105
13	2.8956E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SIMOV-FO-1115E	C-QS05	C-H105
14	2.5772E-9	T9A-FREQ-RSST-C	1EGEDG-UM-1H	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105
15	2.0744E-9	1EGEDG-FS-1H	T9A-FREQ-RSST-C	C-HV05	1RCPORV-T3	1RCRV--FO-1455C	1SWTCV-FC-SW102B	C-QS05	C-H105

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9ATRP02.MGP 12:19 9/28/1992
Top event unavailability = 8.327E-7
Number of cut sets in equation = 235
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 10
Basic Event Data file referenced = NAPS1

1	1.1051E-7	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
2	5.3211E-8	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
3	4.7154E-8	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
4	4.3758E-8	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
5	2.8209E-8	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
6	2.2705E-8	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
7	2.1215E-8	T9A-FREQ-4160-1H	1HVTCV-FC-TCV167	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
8	2.1215E-8	T9A-FREQ-4160-1H	1HVPCV-FC-1235B1	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
9	2.1070E-8	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
10	1.8862E-8	1EGEDG-FS-1H	T9A-FREQ-RSST-C	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
11	1.7503E-8	T9A-FREQ-RSST-C	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
12	1.2764E-8	T9A-FREQ-4160-1H	1HVMOD-FO-MOD137	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
13	1.2764E-8	T9A-FREQ-4160-1H	1HVMOD-FC-MOD138	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
14	1.2764E-8	T9A-FREQ-4160-1H	1HVMOV-FC-111B	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
15	1.2764E-8	T9A-FREQ-4160-1H	1HVMOV-FC-113B	C-LT01		HEP-OAP55-20HR	C-RC303	C-QS05	
16	1.1283E-8	T9A-FREQ-RSST-C	1EGEDG-UM-1H	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
17	1.1247E-8	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVPCV-FC-1235B1		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05
18	1.1247E-8	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVTCV-FC-TCV167		C-LT01	HEP-OAP55-20HR	C-RC303	C-QS05

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9ATRP06.MGP 12:24 9/28/1992

Top event unavailability = 1.066E-7
Number of cut sets in equation = 79
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 7
Basic Event Data file referenced = NAPS1

1	1.6686E-8	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
2	8.0344E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
3	7.1199E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
4	6.6071E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
5	4.2593E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
6	3.4283E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
7	3.2033E-9	T9A-FREQ-4160-1H	1HVPCV-FC-1235B1	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
8	3.2033E-9	T9A-FREQ-4160-1H	1HVTCV-FC-TCV167	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
9	3.1814E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
10	2.8480E-9	1EGEDG-FS-1H	T9A-FREQ-RSST-C	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
11	2.6428E-9	T9A-FREQ-RSST-C	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
12	1.9273E-9	T9A-FREQ-4160-1H	1HVMOV-FC-113B	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
13	1.9273E-9	T9A-FREQ-4160-1H	1HVMOV-FC-111B	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
14	1.9273E-9	T9A-FREQ-4160-1H	1HVMOD-FO-MOD137	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
15	1.9273E-9	T9A-FREQ-4160-1H	1HVMOD-FC-MOD138	C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR		
16	1.7037E-9	T9A-FREQ-RSST-C	1EGEDG-UM-1H	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
17	1.6982E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVTCV-FC-TCV167		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
18	1.6982E-9	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVPCV-FC-1235B1		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
19	1.6445E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	C-LT01	HEP-OAP55-40HR	21AIAS-LF-OUT1A	REC-2AP28	
20	1.3713E-9	1EGEDG-FS-1H	T9A-FREQ-RSST-C	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
21	1.3668E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVPCV-FC-1235B1		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
22	1.3668E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVTCV-FC-TCV167		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR
23	1.2726E-9	T9A-FREQ-RSST-C	1EGEDG-FR-1H	1HVCHU-FS-1HVE4B		C-LT01	HEP-OAP55-20HR	HEP-OAP55-40HR

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9ATRP08.MGP 12:17 9/28/1992

Top event unavailability	=	1.526E-6
Number of cut sets in equation	=	246
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	7
Basic Event Data file referenced	=	NAPS1

1	1.5224E-7	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
2	7.3306E-8	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
3	6.4963E-8	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
4	6.0284E-8	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
5	4.9171E-8	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	C-QS05	
6	3.8862E-8	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
7	3.6222E-8	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1FWTRB-UM-1FWP2	HEP-OAP55-10HR	C-QS05	
8	3.1280E-8	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-FS-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
9	2.9227E-8	T9A-FREQ-4160-1H	1HVPCV-FC-1235B1	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
10	2.9227E-8	T9A-FREQ-4160-1H	1HVTCV-FC-TCV167	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
11	2.9027E-8	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-FS-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
12	2.5985E-8	1EGEDG-FS-1H	T9A-FREQ-RSST-C	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
13	2.4114E-8	T9A-FREQ-RSST-C	1EGEDG-FR-1H	1HVCHU-UM-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
14	2.3676E-8	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	C-QS05	
15	2.0981E-8	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	C-QS05
16	1.9470E-8	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B	1FWTRB-FS-1FWP2	HEP-OAP55-10HR	C-QS05
17	1.7585E-8	T9A-FREQ-4160-1H	1HVMOD-FC-MOD138	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
18	1.7585E-8	T9A-FREQ-4160-1H	1HVMOV-FC-113B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
19	1.7585E-8	T9A-FREQ-4160-1H	1HVMOD-FO-MOD137	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
20	1.7585E-8	T9A-FREQ-4160-1H	1HVMOV-FC-111B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05	
21	1.7441E-8	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1FWTRB-UM-1FWP2	HEP-OAP55-10HR	C-QS05	
22	1.5545E-8	T9A-FREQ-RSST-C	1EGEDG-UM-1H	1HVCHU-FS-1HVE4B	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05
23	1.5494E-8	1EGEDG-UM-1H	T9A-FREQ-500KV-1	1HVTCV-FC-TCV167	1FWTRB-FR-12HP2	HEP-OAP55-10HR	C-QS05

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                 T9ATRP14.MGP           12:21   9/28/1992
Top event unavailability           =    3.881E-7
Number of cut sets in equation     =         257
Cutoff value used last step        =    1.000E-11
Longest cut set (# of events)      =           8
Basic Event Data file referenced   =     NAPS1
```

1	6.9001E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
2	6.9001E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
3	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FC-1863B			
4	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FC-1860B			
5	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FO-1862B			
6	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FC-1860B			
7	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FC-1863B			
8	6.1678E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FO-1862B			
9	5.8712E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
10	5.2481E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SIMOV-FC-1863B			
11	5.2481E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SIMOV-FO-1862B			
12	5.2481E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SIMOV-FC-1860B			
13	4.3165E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR
14	3.8584E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SIMOV-FO-1862B		
15	3.8584E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SIMOV-FC-1860B		
16	3.8584E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SIMOV-FC-1863B		
17	3.3225E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1RCRV--CC-RCPORV	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
18	3.3225E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1MSRV--CC-101ABC	HEP-1ES1:3	1EE-BAT-II-2HR	1EE-BAT-I-2HR	
19	2.9699E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FO-1862B			
20	2.9699E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FC-1863B			
21	2.9699E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FC-1860B			
22	2.9699E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FC-1863B			

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9ATRP17.MGP 12:22 9/28/1992

Top event unavailability	=	3.066E-7
Number of cut sets in equation	=	191
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	8
Basic Event Data file referenced	=	NAPS1

1	9.2029E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SWTCV-FC-SW102B	C-QS05	C-H105	
2	9.2029E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SWTCV-FC-SW102B	C-QS05	C-H105	
3	7.8307E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SWTCV-FC-SW102B	C-QS05	C-H105	
4	5.7571E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SWTCV-FC-SW102B	C-QS05	C-H105
5	5.5372E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FO-1115E	C-QS05	C-H105	
6	5.5372E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FC-1115B	C-QS05	C-H105	
7	5.5372E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SIMOV-FO-1115E	C-QS05	C-H105	
8	5.5372E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SIMOV-FC-1115B	C-QS05	C-H105	
9	4.7115E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SIMOV-FC-1115B	C-QS05	C-H105	
10	4.7115E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	HEP-1ES1:2-S2	1SIMOV-FO-1115E	C-QS05	C-H105	
11	4.4313E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1MSRV--CC-101ABC	1SWTCV-FC-SW102B	C-QS05	C-H105	
12	4.4313E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	1RCRV--CC-RCPORV	1SWTCV-FC-SW102B	C-QS05	C-H105	
13	3.9269E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SWTCV-FC-SW102B	C-QS05	C-H105
14	3.9269E-9	T9A-FREQ-500KV-1	1EGEDG-FS-1H	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SWTCV-FC-SW102B	C-QS05	C-H105
15	3.7706E-9	T9A-FREQ-4160-1H	1HVCHU-FS-1HVE4B	HEP-1ES1:2-S2	1SWTCV-FC-SW102B	C-QS05	C-H105	
16	3.6441E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B	1RCRV--CC-RCPORV	1SWTCV-FC-SW102B	C-QS05	C-H105
17	3.6441E-9	1EGEDG-FR-1H	T9A-FREQ-500KV-1	1HVCHU-UM-1HVE4B	1MSRV--CC-101ABC	1SWTCV-FC-SW102B	C-QS05	C-H105
18	3.4639E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SIMOV-FO-1115E	C-QS05	C-H105
19	3.4639E-9	T9A-FREQ-4160-1H	1HVCHU-UM-1HVE4B	1RCMOV-LK-1535	1RCMOV-LK-1536	1SIMOV-FC-1115B	C-QS05	C-H105

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9BP02.MGP		12:22 9/28/1992
Top event unavailability	=	2.358E-7
Number of cut sets in equation	=	357
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	8
Basic Event Data file referenced	=	NAPS1

1	3.4712E-8	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
2	1.4812E-8	1EGEDG-FS-1J	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4
3	1.3745E-8	1EGEDG-FR-1J	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4
4	1.0604E-8	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
5	1.0507E-8	HEP-1AP22:5	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4		
6	5.9247E-9	1EGEDG-FS-1J	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	C-QS06	C-H106	T9B-FREQ-RSST-A	REC-1FRH:1-4
7	5.7712E-9	1FWPSB-UM-1FWP3A	1FWTRB-FS-1FWP2	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
8	5.6215E-9	1EGEDG-UM-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4
9	5.5699E-9	1EGEDG-UM-1J	HEP-1AP22:5	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4	
10	5.4980E-9	1EGEDG-FR-1J	1FWTRB-FR-24HP2	1FWPSB-UM-1FWP3A	C-QS06	C-H106	T9B-FREQ-RSST-A	REC-1FRH:1-4
11	5.3086E-9	1FWTRB-FR-24HP2	1FWPSB-FR-24HP3A	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
12	5.0222E-9	1FWTRB-FR-24HP2	1FWHEP-1FW548	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
13	4.5248E-9	1EGEDG-FS-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4
14	4.4832E-9	1EGEDG-FS-1J	HEP-1AP22:5	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4	
15	4.2455E-9	1FWTRB-FR-24HP2	1FWCKV-FC-1FW165	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4	
16	4.1989E-9	1EGEDG-FR-1J	1FWPSB-FS-1FWP3A	1FWTRB-FR-24HP2	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4
17	4.1603E-9	1EGEDG-FR-1J	HEP-1AP22:5	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4	
18	3.8064E-9	1FWCKV-CC-ALLAFW	C-QS06	C-H106	T9B-FREQ-4160-1J	REC-1FRH:1-4		
19	2.8143E-9	1EGEDG-UM-1J	1FWTRB-FR-24HP2	1FWPSB-FR-24HP3A	C-QS06	C-H106	T9B-FREQ-500KV-2	REC-1FRH:1-4

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

T9BP13.MGP 12:23 9/28/1992

Top event unavailability = 1.296E-7
Number of cut sets in equation = 139
Cutoff value used last step = 1.000E-11
Longest cut set (# of events) = 8
Basic Event Data file referenced = NAPS1

1	9.6252E-9	T9B-FREQ-4160-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1115D	C-QS06	C-H106	
2	9.6252E-9	T9B-FREQ-4160-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FO-1115C	C-QS06	C-H106	
3	9.6252E-9	T9B-FREQ-4160-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867C	C-QS06	C-H106	
4	9.6252E-9	T9B-FREQ-4160-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867A	C-QS06	C-H106	
5	5.1027E-9	1EGEDG-UM-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FO-1115C	C-QS06	C-H106
6	5.1027E-9	1EGEDG-UM-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867A	C-QS06	C-H106
7	5.1027E-9	1EGEDG-UM-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1115D	C-QS06	C-H106
8	5.1027E-9	1EGEDG-UM-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867C	C-QS06	C-H106
9	4.1071E-9	T9B-FREQ-500KV-2	1EGEDG-FS-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867A	C-QS06	C-H106
10	4.1071E-9	T9B-FREQ-500KV-2	1EGEDG-FS-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1115D	C-QS06	C-H106
11	4.1071E-9	T9B-FREQ-500KV-2	1EGEDG-FS-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FO-1115C	C-QS06	C-H106
12	4.1071E-9	T9B-FREQ-500KV-2	1EGEDG-FS-1J	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867C	C-QS06	C-H106
13	3.8113E-9	1EGEDG-FR-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867C	C-QS06	C-H106
14	3.8113E-9	1EGEDG-FR-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1867A	C-QS06	C-H106
15	3.8113E-9	1EGEDG-FR-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FO-1115C	C-QS06	C-H106
16	3.8113E-9	1EGEDG-FR-1J	T9B-FREQ-500KV-2	1RCPORV-T3	1RCRV--FO-1456	1SIMOV-FC-1115D	C-QS06	C-H106

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                  THP30.MGP          12:22   9/28/1992
Top event unavailability         =   2.058E-7
Number of cut sets in equation   =          1
Cutoff value used last step      =   1.000E-11
Longest cut set (# of events)    =          5
Basic Event Data file referenced =    NAPS1
```

1	2.0577E-7	IE-TH	1RPROD-LF-CRODS	PROB-M03	C-TT01	PROB-PR01

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

THP46.MGP 12:22 9/28/1992

Top event unavailability	=	2.141E-7
Number of cut sets in equation	=	6
Cutoff value used last step	=	1.000E-11
Longest cut set (# of events)	=	6
Basic Event Data file referenced	=	NAPS1

1	7.4330E-8	IE-TH	1RPROD-LF-CRODS	PROB-M03	1MSPIC-LF-1447	PROB-Q08	
2	7.4330E-8	IE-TH	1RPROD-LF-CRODS	PROB-M03	1MSPIC-LF-1446	PROB-Q08	
3	1.6793E-8	IE-TH	1RPROD-LF-CRODS	PROB-M03	1TMSOV-FC-20-ET	PROB-Q08	
4	1.6793E-8	IE-TH	1RPROD-LF-CRODS	PROB-M03	1TMSOV-FC-ASO	PROB-Q08	
5	1.5941E-8	IE-TH	1MSPIC-LF-1446	HEP-1FRS:1-5	1RPBKR-CC-RTARTB	PROB-M03	PROB-Q08
6	1.5941E-8	IE-TH	1MSPIC-LF-1447	HEP-1FRS:1-5	1RPBKR-CC-RTARTB	PROB-M03	PROB-Q08

TABLE B.2-11 (Continued)
"TOP CUT SETS FOR SEQUENCES GREATER THAN 1.0E-7"

```
                     VXP07.MGP           12:17   9/28/1992
Top event unavailability           =   1.524E-6
Number of cut sets in equation     =          1
Cutoff value used last step        =   1.000E-11
Longest cut set (# of events)      =          2
Basic Event Data file referenced   =    NAPS1
------------------------------------------------------------------------------
  1   1.5236E-6   IE-VX          PROB-FM01
```

RISK IMPORTANCE INFORMATION FROM NORTH ANNA IPE

TABLE 3.4.1-6
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
1	IE-T1	1.139E-1	2.923E-1	3.27	1.413
2	IE-S2	2.100E-2	1.479E-1	7.90	1.174
3	1EE-BAT-I-2HR	1.000E+0	1.442E-1	1.00	1.169
4	C-LT01	9.068E-1	1.436E-1	1.01	1.168
5	HEP-1FRH:1-11	4.824E-2	1.163E-1	3.29	1.132
6	IE-T7	1.000E-2	1.033E-1	11.23	1.115
7	IE-S1	1.000E-3	9.785E-2	98.77	1.108
8	IE-T8	6.579E-3	9.665E-2	15.59	1.107
9	1EGEDG-FS-1H	1.434E-2	8.702E-2	6.98	1.095
10	C-Y02	9.800E-1	8.556E-2	1.00	1.094
11	C-RC303	8.750E-1	8.554E-2	1.01	1.094
12	1EE-BAT-II-2HR	1.000E+0	8.499E-2	1.00	1.093
13	1EGEDG-FR-1H	1.330E-2	8.029E-2	6.96	1.087
14	C-SGI01	9.890E-1	7.934E-2	1.00	1.086
15	1FWTRB-FR-12HP2	5.742E-2	7.282E-2	2.20	1.079
16	HEP-0AP55-10HR	4.949E-3	7.078E-2	15.23	1.076
17	1EGEDG-UM-1H	1.781E-2	6.081E-2	4.35	1.065
18	IE-T3	1.350E+0	6.078E-2	0.98	1.065
19	IE-A	4.999E-4	6.027E-2	121.49	1.064
20	HEP-1FRC:1-11-S1	1.000E+0	5.962E-2	1.00	1.063
21	C-P02	9.870E-1	5.411E-2	1.00	1.057
22	1EGEDG-FS-1J	1.434E-2	4.804E-2	4.30	1.050
23	1FWTRB-FS-1FWP2	1.854E-2	4.678E-2	3.48	1.049
24	1HVCHU-UM-1HVE4B	9.440E-2	4.579E-2	1.44	1.048
25	1EGEDG-FR-1J	1.330E-2	4.455E-2	4.30	1.047
26	NON-REC-B103	6.799E-1	4.431E-2	1.02	1.046
27	C-QS05	9.460E-1	4.416E-2	1.00	1.046
28	REC-SCREEN-TURNS	1.000E-1	4.348E-2	1.39	1.045
29	1SWSCN-CC-SWRES	6.392E-5	4.318E-2	676.43	1.045
30	1IAIAS-LF-OUTIA	2.520E-4	4.257E-2	169.90	1.044
31	REC-1AP28	1.017E-1	4.257E-2	1.38	1.044
32	1FWTRB-FR-24HP2	1.115E-1	4.127E-2	1.33	1.043
33	NON-REC-B02	3.400E-1	4.072E-2	1.08	1.042
34	1CHCKV-FO-1CH254	1.147E-3	3.956E-2	35.44	1.041
35	HEP-NO-PROCEDURE	1.000E+0	3.910E-2	1.00	1.041
36	HEP-1E3-13	2.180E-2	3.881E-2	2.74	1.040
37	C-FM01	4.800E-2	3.866E-2	1.77	1.040
38	HEP-1ES1:2-S1	1.000E+0	3.860E-2	1.00	1.040
39	HEP-0AP55-20HR	2.600E-4	3.677E-2	142.42	1.038
40	1EE-BAT-III-2HR	1.000E+0	3.614E-2	1.00	1.037
41	1EGEDG-UM-1J	1.781E-2	3.391E-2	2.87	1.035

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
42	HEP-1AP22:5	1.750E-4	3.367E-2	193.37	1.035
43	1HVCHU-FS-1HVE4B	4.545E-2	3.016E-2	1.63	1.031
44	NON-REC-B16	7.499E-3	3.005E-2	4.98	1.031
45	C-D102	9.400E-1	2.601E-2	1.00	1.027
46	IE-T2A	5.500E-1	2.510E-2	1.02	1.026
47	HEP-1OP49:1	1.326E-1	2.497E-2	1.16	1.026
48	1RCRV--FC-1456	9.988E-3	2.474E-2	3.45	1.025
49	REC-B12AVE	1.056E-1	2.441E-2	1.21	1.025
50	PROB-FM01	9.522E-1	2.383E-2	1.00	1.024
51	IE-VX	1.600E-6	2.358E-2	14737.41	1.024
52	1QSMV--PG-1QS38	6.749E-5	2.352E-2	349.45	1.024
53	T9A-FREQ-500KV-1	1.786E-1	2.330E-2	1.11	1.024
54	1MSRV--FC-101C	9.988E-3	2.310E-2	3.29	1.024
55	1MSMV--LK-1MS97	3.999E-2	2.305E-2	1.55	1.024
56	REC-1OP14:1	1.043E-1	2.288E-2	1.20	1.023
57	1FWTRB-UM-1FWP2	1.366E-2	2.267E-2	2.64	1.023
58	T9A-FREQ-4160-1H	5.999E-3	2.248E-2	4.73	1.023
59	1SICKV-CC-838689	6.339E-5	2.208E-2	349.26	1.023
60	1SICKV-FC-1SI47	6.339E-4	2.155E-2	34.97	1.022
61	1SIMOV-FO-1862B	1.090E-2	2.153E-2	2.95	1.022
62	1SIMOV-FC-1860B	1.090E-2	2.153E-2	2.95	1.022
63	C-B103	3.200E-1	2.081E-2	1.04	1.021
64	NON-REC-B117	6.799E-1	2.045E-2	1.01	1.021
65	1SIPSB-CC-FS1A1B	4.934E-4	2.025E-2	42.03	1.021
66	1RCPORV-DMDSBO	2.000E-1	1.928E-2	1.08	1.020
67	NON-REC-B01	4.799E-1	1.928E-2	1.02	1.020
68	1SIMOV-FC-1860A	1.090E-2	1.771E-2	2.61	1.018
69	1SIMOV-FO-1862A	1.090E-2	1.771E-2	2.61	1.018
70	1CHPAT-CC-FS1ABC	4.968E-4	1.692E-2	35.04	1.017
71	HEP-0AP55-40HR	1.250E-1	1.656E-2	1.12	1.017
72	1SIMOV-CC-1860AB	3.903E-4	1.598E-2	41.92	1.016
73	1SWTCV-FC-SW102B	1.812E-2	1.589E-2	1.86	1.016
74	1SWPSB-UM-1SWP-4	8.290E-2	1.560E-2	1.17	1.016
75	1RCRV--FO-1456	2.500E-2	1.548E-2	1.60	1.016
76	IE-T2	5.000E-2	1.515E-2	1.29	1.015
77	1RCRV--FO-1455C	2.500E-2	1.514E-2	1.59	1.015
78	1EGEDG-CC-1H-1J	2.663E-4	1.411E-2	53.96	1.014
79	C-P01	1.000E+0	1.347E-2	1.00	1.014
80	HEP-1FRC:1-11-S2	1.062E-2	1.332E-2	2.24	1.013
81	1SIMOV-CC-867836	3.903E-4	1.327E-2	34.99	1.013
82	1SIMOV-CC-1115CE	3.903E-4	1.323E-2	34.88	1.013

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
83	1SIMOV-CC-1115BD	3.903E-4	1.323E-2	34.88	1.013
84	NON-REC-B102	6.799E-1	1.313E-2	1.01	1.013
85	1SIPSB-UM-1SIP1B	4.536E-3	1.246E-2	3.73	1.013
86	1FWCKV-CC-ALLAFW	6.339E-5	1.210E-2	191.93	1.012
87	1SIPSB-FS-1SIP1B	4.018E-3	1.210E-2	4.00	1.012
88	1SIPSB-UM-1SIP1A	4.536E-3	1.166E-2	3.56	1.012
89	1SIMOV-FO-1115E	1.090E-2	1.134E-2	2.03	1.011
90	1SIMOV-FC-1115B	1.090E-2	1.134E-2	2.03	1.011
91	1RCPORV-T3	6.651E-3	1.133E-2	2.69	1.011
92	1SIPSB-FS-1SIP1A	4.018E-3	1.122E-2	3.78	1.011
93	REC-1FRH:1-4	1.131E-2	1.065E-2	1.93	1.011
94	1HVPCV-FC-1235B1	1.812E-2	1.051E-2	1.57	1.011
95	1HVTCV-FC-TCV167	1.812E-2	1.040E-2	1.56	1.011
96	C-L08	8.410E-1	1.027E-2	1.00	1.010
97	HEP-1ECA3:1-16	3.025E-3	9.604E-3	4.17	1.010
98	C-B117	3.200E-1	9.597E-3	1.02	1.010
99	1EEBKR-SO-15H8	3.356E-5	9.561E-3	285.88	1.010
100	HEP-1ES1:3	1.220E-2	9.378E-3	1.76	1.009
101	1EEBKR-SO-14H1	3.356E-5	9.332E-3	279.06	1.009
102	1FWPSB-UM-1FWP3A	5.183E-3	9.273E-3	2.78	1.009
103	1RHHCV-FC-1758	1.812E-2	9.258E-3	1.50	1.009
104	1RCRV--CC-RCPORV	9.988E-4	9.040E-3	10.04	1.009
105	1FWPSB-UM-1FWP3B	5.183E-3	9.027E-3	2.73	1.009
106	C-H105	9.490E-1	8.554E-3	1.00	1.009
107	1EEBKR-SO-14H2	3.356E-5	8.525E-3	255.01	1.009
108	T9A-FREQ-RSST-C	7.143E-2	8.311E-3	1.11	1.008
109	HEP-1FRH:1-15	8.249E-3	8.273E-3	1.99	1.008
110	1SIMOV-FC-1863B	1.090E-2	7.688E-3	1.70	1.008
111	1MSRV--CC-101ABC	9.988E-4	7.573E-3	8.57	1.008
112	HEP-1E3-3	3.650E-3	7.421E-3	3.03	1.007
113	1SIMOV-PG-1865C	8.207E-4	7.166E-3	9.72	1.007
114	1SIMOV-PG-1865A	8.207E-4	7.166E-3	9.72	1.007
115	1EEBUS-UM-DC-III	2.000E-4	7.079E-3	36.39	1.007
116	1MSCKV-FO-1MS58	3.442E-3	6.998E-3	3.03	1.007
117	1MSCKV-FO-1MS19	3.442E-3	6.998E-3	3.03	1.007
118	HEP-1ES1:4	8.499E-4	6.308E-3	8.42	1.006
119	1SIMOV-FO-1115C	1.090E-2	6.306E-3	1.57	1.006
120	1SIMOV-FC-1115D	1.090E-2	6.306E-3	1.57	1.006
121	PROB-M03	2.942E-1	6.187E-3	1.01	1.006
122	IE-TH	1.750E+0	6.187E-3	1.00	1.006
123	C-B102	3.200E-1	6.155E-3	1.01	1.006

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
124	C-HV05	7.490E-1	6.120E-3	1.00	1.006
125	C-QS06	9.460E-1	6.112E-3	1.00	1.006
126	1RPROD-LF-CRODS	1.800E-6	5.718E-3	3178.03	1.006
127	1RHHEX-LF-1RHE2B	2.807E-2	5.675E-3	1.20	1.006
128	C-H106	9.356E-1	5.643E-3	1.00	1.006
129	1RHHEX-LF-1RHE2A	2.807E-2	5.640E-3	1.20	1.006
130	1RHMOV-FC-1700	1.090E-2	5.570E-3	1.51	1.006
131	1RHMOV-FC-1701	1.090E-2	5.570E-3	1.51	1.006
132	1SICKV-FC-1SI161	6.339E-4	5.540E-3	9.73	1.006
133	1SICKV-FC-1SI159	6.339E-4	5.534E-3	9.72	1.006
134	1SICKV-FC-1SI127	6.339E-4	5.534E-3	9.72	1.006
135	1SICKV-FC-1SI125	6.339E-4	5.534E-3	9.72	1.006
136	1EEBUS-UM-DC-I	2.000E-4	5.508E-3	28.54	1.006
137	1EGEDG-CC-1H1J2J	9.576E-5	5.252E-3	55.84	1.005
138	1EETFM-LP-1H	1.899E-5	5.134E-3	271.32	1.005
139	1EGEDG-CC-1H1J2H	9.576E-5	5.043E-3	53.66	1.005
140	1HVMOV-FC-111B	1.090E-2	4.928E-3	1.45	1.005
141	1HVMOV-FC-113B	1.090E-2	4.928E-3	1.45	1.005
142	1HVMOD-FO-MOD137	1.090E-2	4.870E-3	1.44	1.005
143	1HVMOD-FC-MOD138	1.090E-2	4.870E-3	1.44	1.005
144	HEP-1ES1:2-S2	8.499E-4	4.624E-3	6.44	1.005
145	1RHHEX-LF-1RHE1B	2.807E-2	4.620E-3	1.16	1.005
146	1RHHEX-LF-1RHE1A	2.807E-2	4.546E-3	1.16	1.005
147	1FWPSB-FS-1FWP3A	1.583E-3	4.395E-3	3.77	1.004
148	T9B-FREQ-500KV-2	1.786E-1	4.317E-3	1.02	1.004
149	1FWPSB-FS-1FWP3B	1.583E-3	4.280E-3	3.70	1.004
150	1MSAOV-CC-111AB	1.812E-3	4.077E-3	3.25	1.004
151	2IAIAS-LF-OUTIA	2.520E-4	3.980E-3	16.79	1.004
152	IE-RX	2.664E-7	3.946E-3	14814.19	1.004
153	1EP-LOOP-24	3.120E-4	3.850E-3	13.34	1.004
154	1FWPSB-CC-MDP3AB	1.418E-4	3.839E-3	28.07	1.004
155	REC-2AP28	1.017E-1	3.809E-3	1.03	1.004
156	1SIMOV-FC-1863A	1.090E-2	3.673E-3	1.33	1.004
157	1EEBKR-SO-15J8	3.356E-5	3.646E-3	109.63	1.004
158	1EEBKR-SO-14J1	3.356E-5	3.646E-3	109.63	1.004
159	HEP-1ECA3:3-27	8.974E-2	3.578E-3	1.04	1.004
160	2HVCHU-UM-2HVE4B	9.440E-2	3.517E-3	1.03	1.004
161	T9B-FREQ-4160-1J	5.999E-3	3.464E-3	1.57	1.003
162	1EGEDG-CC-ALL	6.090E-5	3.334E-3	55.74	1.003
163	1EEBUS-LU-1H-480	1.215E-5	3.334E-3	275.48	1.003
164	1EEBUS-LU-1H1	1.215E-5	3.334E-3	275.48	1.003

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
165	1EEBUS-LU-1H	1.215E-5	3.330E-3	275.14	1.003
166	1CHPAT-FS-1CHP1B	5.078E-3	3.306E-3	1.65	1.003
167	C-D105	9.470E-1	3.255E-3	1.00	1.003
168	PROB-Q08	1.000E+0	3.154E-3	1.00	1.003
169	1RCMOV-LK-1536	2.500E-2	3.094E-3	1.12	1.003
170	REC-MMP-C-MR-2	2.510E-1	3.072E-3	1.01	1.003
171	1RCMOV-LK-1535	2.500E-2	3.060E-3	1.12	1.003
172	C-TT01	8.000E-1	3.033E-3	1.00	1.003
173	PROB-PR01	2.776E-1	3.033E-3	1.01	1.003
174	1EEBUS-LU-1H1-4	1.215E-5	2.993E-3	247.47	1.003
175	1SWPIP-UM-HDRA	2.281E-2	2.987E-3	1.13	1.003
176	2EGEDG-UM-2J	1.069E-1	2.985E-3	1.02	1.003
177	1RCPCV-FC-1455A	1.812E-2	2.968E-3	1.16	1.003
178	HEP-1AP15-6	2.815E-2	2.952E-3	1.10	1.003
179	1SIMOV-CC-1890CD	3.903E-4	2.902E-3	8.43	1.003
180	1SW-HOTWEA-9MO	7.500E-1	2.874E-3	1.00	1.003
181	2HVSTR-PG-2HVS1B	9.528E-3	2.873E-3	1.30	1.003
182	1SICKV-FO-1SI47	3.442E-3	2.817E-3	1.82	1.003
183	1EEBKR-SO-14J4	3.356E-5	2.807E-3	84.64	1.003
184	2HVCHU-FS-2HVE4B	4.545E-2	2.800E-3	1.06	1.003
185	2HVPCV-FC-2235B1	1.812E-2	2.666E-3	1.14	1.003
186	1SICKV-CC-FC926	6.339E-5	2.574E-3	41.60	1.003
187	1SICKV-CC-FC116	6.339E-5	2.571E-3	41.55	1.003
188	1RCRV--FC-1455C	9.988E-3	2.569E-3	1.25	1.003
189	1EEBUS-UM-1H	1.000E-5	2.556E-3	256.64	1.003
190	1EEBUS-UM-1H-480	1.000E-5	2.498E-3	250.86	1.003
191	1SIMOV-FC-1867C	1.090E-2	2.411E-3	1.22	1.002
192	1SIMOV-FC-1867A	1.090E-2	2.411E-3	1.22	1.002
193	2EEBUS-UM-2H1-1	2.000E-4	2.323E-3	12.62	1.002
194	2EEBUS-UM-2H-480	2.000E-4	2.323E-3	12.62	1.002
195	2EEBUS-UM-2H	2.000E-4	2.323E-3	12.62	1.002
196	NON-REC-B10	2.000E-2	2.285E-3	1.11	1.002
197	1EEBUS-UM-1H1-4	1.000E-5	2.280E-3	229.03	1.002
198	1SIMOV-PG-1860B	1.357E-3	2.221E-3	2.63	1.002
199	1FWHEP-1FW548	7.499E-4	2.219E-3	3.96	1.002
200	1FWHEP-1FW546	7.499E-4	2.168E-3	3.89	1.002
201	1SICKV-CC-79185	6.339E-5	2.121E-3	34.46	1.002
202	1SIMOV-PG-1860A	1.357E-3	2.117E-3	2.56	1.002
203	2HVTCV-FC-TCV266	1.812E-2	2.108E-3	1.11	1.002
204	1FWPSB-FR-24HP3A	7.927E-4	2.081E-3	3.62	1.002
205	1EE-BAT-IV-2HR	1.000E+0	2.039E-3	1.00	1.002

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
206	1SWMOV-FC-1SW117	1.090E-2	2.030E-3	1.18	1.002
207	1RHFEL-PG-1605	4.105E-4	2.010E-3	5.90	1.002
208	1FWPSB-FR-24HP3B	7.927E-4	2.001E-3	3.52	1.002
209	1EETFM-LP-1J	1.899E-5	1.974E-3	104.94	1.002
210	1RHPSB-CC-1RHP1	3.933E-4	1.926E-3	5.90	1.002
211	2HVPAT-FR-HVP22A	7.930E-4	1.901E-3	3.39	1.002
212	2HVPAT-FR-HVP20A	7.930E-4	1.901E-3	3.39	1.002
213	1FWCKV-LEAKAGE	1.000E-5	1.802E-3	181.25	1.002
214	2HVCHU-FR-2HVE4A	1.506E-3	1.778E-3	2.18	1.002
215	HEP-1OP14:1-5:13	4.259E-3	1.728E-3	1.40	1.002
216	1SICKV-FC-1SI9	6.339E-4	1.703E-3	3.69	1.002
217	1SIMOV-PG-1864A	8.207E-4	1.697E-3	3.07	1.002
218	1SIMOV-PG-1864B	8.207E-4	1.688E-3	3.06	1.002
219	1HVCHU-CC-HVE4	4.547E-3	1.684E-3	1.37	1.002
220	1SICKV-FC-1SI18	6.339E-4	1.681E-3	3.65	1.002
221	1SICKV-FC-1SI26	6.339E-4	1.681E-3	3.65	1.002
222	T9B-FREQ-RSST-A	7.143E-2	1.678E-3	1.02	1.002
223	1CESTR-CC-SUMPPG	5.000E-5	1.670E-3	34.39	1.002
224	1QSSTR-PG-1FL1B	2.822E-2	1.657E-3	1.06	1.002
225	1FWCKV-FC-1FW165	6.339E-4	1.648E-3	3.60	1.002
226	HEP-1EO-7	1.350E-3	1.645E-3	2.22	1.002
227	IE-T5A	5.999E-3	1.613E-3	1.27	1.002
228	IE-T5B	5.999E-3	1.589E-3	1.26	1.002
229	1FWCKV-FC-1FW183	6.339E-4	1.580E-3	3.49	1.002
230	1FWHEP-1FW543	7.499E-4	1.567E-3	3.09	1.002
231	REC-CONTAINMENT	2.000E-2	1.552E-3	1.08	1.002
232	NON-REC-B111	6.799E-1	1.530E-3	1.00	1.002
233	2HVCHU-CC-HVE4	4.547E-3	1.515E-3	1.33	1.002
234	1SIMV--PG-1SI46	4.499E-5	1.497E-3	34.26	1.001
235	2HVMOV-FC-211B	1.090E-2	1.484E-3	1.13	1.001
236	2HVMOV-FC-213B	1.090E-2	1.484E-3	1.13	1.001
237	C-QS03	9.460E-1	1.446E-3	1.00	1.001
238	2EEBUS-UM-2H1-4	2.000E-4	1.445E-3	8.22	1.001
239	C-QS04	9.460E-1	1.426E-3	1.00	1.001
240	C-H103	9.610E-1	1.401E-3	1.00	1.001
241	1HVCHU-FR-1HVE4A	1.506E-3	1.390E-3	1.92	1.001
242	2HVCHU-UM-2HVE4C	9.440E-2	1.388E-3	1.01	1.001
243	C-H104	9.620E-1	1.381E-3	1.00	1.001
244	1MSPIC-LF-1447	8.022E-2	1.330E-3	1.02	1.001
245	1MSPIC-LF-1446	8.022E-2	1.330E-3	1.02	1.001
246	1FWCKV-FC-1FW148	6.339E-4	1.299E-3	3.05	1.001

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
247	1EEBUS-LU-1J-480	1.215E-5	1.258E-3	104.55	1.001
248	1EEBUS-LU-1J1	1.215E-5	1.258E-3	104.55	1.001
249	1EEBUS-LU-1J	1.215E-5	1.248E-3	103.72	1.001
250	1SIPSB-FR-24HP1B	7.927E-4	1.243E-3	2.57	1.001
251	1MSAOV-FO-TV101C	1.812E-2	1.240E-3	1.07	1.001
252	HEP-1ECA3:2-5	7.249E-4	1.219E-3	2.68	1.001
253	2HVMOD-FO-MOD238	1.090E-2	1.219E-3	1.11	1.001
254	2HVMOD-FC-MOD237	1.090E-2	1.219E-3	1.11	1.001
255	1SIPSB-FR-24HP1A	7.927E-4	1.203E-3	2.52	1.001
256	C-Y03	8.980E-1	1.147E-3	1.00	1.001
257	1SICKV-FC-1SI12	6.339E-4	1.134E-3	2.79	1.001
258	1SICKV-FC-1SI29	6.339E-4	1.129E-3	2.78	1.001
259	1SICKV-CC-FC1229	6.339E-5	1.081E-3	18.06	1.001
260	1SIMOV-PG-1865B	8.207E-4	1.080E-3	2.31	1.001
261	1HVFAN-FS-1FM07	3.933E-3	1.040E-3	1.26	1.001
262	2EGEDG-UM-2H	1.069E-1	1.036E-3	1.01	1.001
263	1QSSTR-PG-1FL1A	2.822E-2	1.009E-3	1.03	1.001
264	1MSSV--FO-101C	1.250E-2	1.006E-3	1.08	1.001
265	1MSSRV-DMDT7	3.999E-2	1.006E-3	1.02	1.001
266	1RSHEP-FLANGE	3.750E-4	9.962E-4	3.66	1.001
267	1EEBUS-LU-1J1-1	1.215E-5	9.851E-4	82.11	1.001
268	1SICKV-FC-1SI1	6.339E-4	9.476E-4	2.49	1.001
269	1SW-COLDWEA-3MO	2.500E-1	9.437E-4	1.00	1.001
270	1SWPAT-FS-1SWP1B	3.842E-3	9.411E-4	1.24	1.001
271	1SICKV-FC-1SI16	6.339E-4	9.261E-4	2.46	1.001
272	1SWPAT-UM-1SWP1B	3.750E-3	9.185E-4	1.24	1.001
273	1SWMOV-CC-103A-D	3.903E-4	9.136E-4	3.34	1.001
274	1SWMOV-CC-105A-D	3.903E-4	9.136E-4	3.34	1.001
275	1SWMOV-CC-101A-D	3.903E-4	9.136E-4	3.34	1.001
276	1SWMOV-CC-104A-D	3.903E-4	9.136E-4	3.34	1.001
277	1CHPAT-UM-1CHP1C	3.267E-1	9.008E-4	1.00	1.001
278	1CCAOV-FC-TV103B	1.812E-2	9.002E-4	1.05	1.001
279	2HVCHU-FS-2HVE4C	4.545E-2	8.969E-4	1.02	1.001
280	1CCAOV-FC-TV103A	1.812E-2	8.953E-4	1.05	1.001
281	1SWTCV-CC-102BC	1.812E-3	8.842E-4	1.49	1.001
282	1EGEDG-TM-1H	5.708E-4	8.783E-4	2.54	1.001
283	1RCPIC-LF-PC402	4.123E-2	8.598E-4	1.02	1.001
284	1RCPIC-LF-PC403	4.123E-2	8.598E-4	1.02	1.001
285	1RHPSB-FS-1RHP1B	3.933E-3	8.524E-4	1.22	1.001
286	1RHPSB-FS-1RHP1A	3.933E-3	8.487E-4	1.21	1.001
287	1SICKV-FC-1SI144	6.339E-4	8.387E-4	2.32	1.001

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
288	1SICKV-FC-1SI142	6.339E-4	8.334E-4	2.31	1.001
289	1SWPIP-UM-HDRB	2.281E-2	8.311E-4	1.04	1.001
290	1EGEDG-CC-1H-2J	2.663E-4	8.302E-4	4.12	1.001
291	1SWPAT-CC-SWP1B	3.842E-4	8.204E-4	3.13	1.001
292	1CHPAT-FS-1CHP1A	1.983E-3	8.171E-4	1.41	1.001
293	1EGEDG-TM-1J	5.708E-4	8.046E-4	2.41	1.001
294	1EEBUS-UM-1J-480	1.000E-5	8.015E-4	81.16	1.001
295	1EEBUS-UM-1J	1.000E-5	7.929E-4	80.30	1.001
296	1EEBKR-FO-15H2	2.735E-4	7.754E-4	3.83	1.001
297	1EGEDG-CC-1H-2H	2.663E-4	7.427E-4	3.79	1.001
298	C-B111	3.200E-1	7.197E-4	1.00	1.001
299	1EEBKR-FO-15J2	2.735E-4	7.151E-4	3.61	1.001
300	1HVCHU-UM-1HVE4C	9.440E-2	7.027E-4	1.01	1.001
301	2SWPAT-UM-2SWP1B	3.725E-2	6.937E-4	1.02	1.001
302	1EGEDG-CC-1J-2J	2.663E-4	6.922E-4	3.60	1.001
303	1EGEDG-CC-1J-2H	2.663E-4	6.911E-4	3.59	1.001
304	1HVCHU-FS-1HVE4C	4.545E-2	6.827E-4	1.01	1.001
305	1HVPAT-FR-HVP20A	7.930E-4	6.749E-4	1.85	1.001
306	1HVPAT-FR-HVP22A	7.930E-4	6.749E-4	1.85	1.001
307	1RHPSB-UM-1RHP1B	3.750E-3	6.745E-4	1.18	1.001
308	1RHPSB-UM-1RHP1A	3.750E-3	6.710E-4	1.18	1.001
309	2EEBKR-SO-25H8	3.356E-5	6.664E-4	20.86	1.001
310	2EEBKR-SO-24H4	3.356E-5	6.664E-4	20.86	1.001
311	2EEBKR-SO-24H1	3.356E-5	6.664E-4	20.86	1.001
312	1MSRV--FC-101B	9.988E-3	6.552E-4	1.06	1.001
313	1MSAOV-FC-TV111A	1.812E-2	6.497E-4	1.04	1.001
314	1MSAOV-FC-TV111B	1.812E-2	6.497E-4	1.04	1.001
315	1HVSTR-PG-1HVS1B	9.528E-3	6.418E-4	1.07	1.001
316	HEP-1E1-25	1.175E-2	6.087E-4	1.05	1.001
317	2HVSTR-PL-2HVS1A	6.390E-4	6.079E-4	1.95	1.001
318	2HVPCV-FC-2235C1	1.812E-2	6.053E-4	1.03	1.001
319	1SIMOV-FO-1115B	1.090E-2	6.050E-4	1.05	1.001
320	1SIMOV-FO-1115D	1.090E-2	6.050E-4	1.05	1.001
321	2HVFAN-FR-2FM07	1.357E-4	6.000E-4	5.42	1.001
322	1SWPSB-FS-1SWP-4	3.152E-3	5.783E-4	1.18	1.001
323	1EEBUS-UM-1J1-1	1.000E-5	5.544E-4	56.44	1.001
324	1SICKV-CC-ACCCKV	6.339E-5	5.510E-4	9.69	1.001
325	1SIMOV-FC-1836	1.090E-2	5.418E-4	1.05	1.001
326	2HVPCV-CC-2235	1.812E-3	5.396E-4	1.30	1.001
327	1SICKV-FC-1SI79	6.339E-4	5.352E-4	1.84	1.001
328	2EEBKR-SO-24H2	3.356E-5	5.242E-4	16.62	1.001

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
329	1FWFCV-CC-788898	1.812E-3	5.205E-4	1.29	1.001
330	2HVCHU-UM-HVE4BC	2.259E-3	5.044E-4	1.22	1.001
331	1HVCHU-UM-HVE4BC	2.259E-3	4.818E-4	1.21	1.000
332	1HVPCV-CC-1235	1.812E-3	4.769E-4	1.26	1.000
333	1SICKV-CC-959903	6.339E-5	4.697E-4	8.41	1.000
334	1SICKV-CC-206207	6.339E-5	4.697E-4	8.41	1.000
335	HEP-1FRS:1-5	2.970E-2	4.696E-4	1.02	1.000
336	1RPBKR-CC-RTARTB	1.300E-5	4.696E-4	37.13	1.000
337	1EEBUS-UM-1H1-2N	2.000E-4	4.505E-4	3.25	1.000
338	1HVSTR-PL-1HVS1A	6.390E-4	4.459E-4	1.70	1.000
339	2HVSV--SO-2200	9.333E-5	4.113E-4	5.41	1.000
340	REC-1ES1:4-1	1.039E-1	3.923E-4	1.00	1.000
341	1HVPAT-FS-HVP22B	1.983E-3	3.884E-4	1.20	1.000
342	1HVPAT-FS-HVP20B	1.983E-3	3.884E-4	1.20	1.000
343	1MSMOV-FO-NRV101	1.090E-2	3.856E-4	1.03	1.000
344	HEP-1FRH:1-5	3.125E-3	3.829E-4	1.12	1.000
345	1QSMOV-FC-101B	1.090E-2	3.808E-4	1.03	1.000
346	2HVFAN-FS-2FM06	3.933E-3	3.787E-4	1.10	1.000
347	1MSRV--FC-101A	9.988E-3	3.634E-4	1.04	1.000
348	2EETFM-LP-2H	1.899E-5	3.484E-4	19.35	1.000
349	1SIMOV-PG-1862A	1.350E-4	3.338E-4	3.47	1.000
350	1SIMV--PG-1SI305	1.350E-4	3.338E-4	3.47	1.000
351	1SIMV--PG-1SI306	1.350E-4	3.308E-4	3.45	1.000
352	1SIMOV-PG-1862B	1.350E-4	3.308E-4	3.45	1.000
353	1EEBUS-LU-DC-I	1.215E-5	3.301E-4	28.17	1.000
354	1EEBUS-LU-DC-III	1.215E-5	3.285E-4	28.05	1.000
355	1CCMOV-FC-CC100B	1.090E-2	3.273E-4	1.03	1.000
356	1CCMOV-FC-CC100A	1.090E-2	3.248E-4	1.03	1.000
357	HEP-0AP55-30HR	6.565E-3	3.173E-4	1.05	1.000
358	1FWPCV-CC-159AB	1.369E-5	3.099E-4	23.64	1.000
359	1SICKV-CC-144161	6.339E-5	3.097E-4	5.89	1.000
360	1RHCKV-CC-1RH715	6.339E-5	3.097E-4	5.89	1.000
361	2HVMOV-FC-211C	1.090E-2	3.085E-4	1.03	1.000
362	2HVMOV-FC-213C	1.090E-2	3.085E-4	1.03	1.000
363	1SIMOV-CC-1867CD	3.903E-4	3.079E-4	1.79	1.000
364	1SIMOV-CC-1867AB	3.903E-4	3.079E-4	1.79	1.000
365	1SWSCN-PG-1SWP1B	9.528E-3	3.053E-4	1.03	1.000
366	1MSTCV-CC-1408AB	1.812E-3	2.958E-4	1.16	1.000
367	1RCPCV-CC-1455AB	1.812E-3	2.950E-4	1.16	1.000
368	1QSMOV-FC-101A	1.090E-2	2.942E-4	1.03	1.000
369	1EPBUS-UM-2	2.000E-4	2.886E-4	2.44	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
370	1EPBUS-UM-4	2.000E-4	2.886E-4	2.44	1.000
371	1EEBKR-SO-14J5	3.356E-5	2.723E-4	9.11	1.000
372	1CHPAT-FR-24HP1A	7.930E-4	2.683E-4	1.34	1.000
373	1HVCHU-FR-1HVE4B	1.506E-3	2.655E-4	1.18	1.000
374	1CHPAT-FR-24HP1B	7.930E-4	2.577E-4	1.32	1.000
375	1MSMV--FO-1MS95	1.250E-4	2.479E-4	2.98	1.000
376	1TMSOV-FC-20-ET	1.812E-2	2.474E-4	1.01	1.000
377	1TMSOV-FC-ASO	1.812E-2	2.474E-4	1.01	1.000
378	1EGEDG-CC-1H2H2J	9.576E-5	2.458E-4	3.57	1.000
379	1HVPCV-FC-1235C1	1.812E-2	2.454E-4	1.01	1.000
380	1SIMOV-PG-1885D	1.350E-4	2.291E-4	2.70	1.000
381	1SIMOV-PG-1885C	1.350E-4	2.291E-4	2.70	1.000
382	1SIMOV-PG-1885A	1.350E-4	2.291E-4	2.70	1.000
383	1SIMOV-PG-1885B	1.350E-4	2.291E-4	2.70	1.000
384	1EGEDG-CC-1J2H2J	9.576E-5	2.250E-4	3.35	1.000
385	1SILIC-CC-RWST	4.644E-4	2.235E-4	1.48	1.000
386	2EEBUS-LU-2H-480	1.215E-5	2.225E-4	19.32	1.000
387	2EEBUS-LU-2H1-1	1.215E-5	2.225E-4	19.32	1.000
388	2EEBUS-LU-2H	1.215E-5	2.225E-4	19.32	1.000
389	2EEBUS-LU-2H1	1.215E-5	2.225E-4	19.32	1.000
390	HEP-1ECA3:3-35	4.924E-3	2.157E-4	1.04	1.000
391	1FWFCV-CC-798999	1.812E-3	2.120E-4	1.12	1.000
392	1HVACU-UM-1HVAC7	1.654E-3	2.074E-4	1.13	1.000
393	1EPBUS-UM-1E	2.000E-4	2.043E-4	2.02	1.000
394	1EEBKR-SO-14H1-7	3.356E-5	2.017E-4	7.01	1.000
395	1EEBKR-SO-14H1-1	3.356E-5	2.017E-4	7.01	1.000
396	1CCMOV-CC-100AB	3.903E-4	1.989E-4	1.51	1.000
397	1RHMOV-CC-1720	3.903E-4	1.989E-4	1.51	1.000
398	HEP-1E0-14	1.000E+0	1.952E-4	1.00	1.000
399	2HVPAT-FS-HVP22B	1.983E-3	1.951E-4	1.10	1.000
400	2HVPAT-FS-HVP20B	1.983E-3	1.951E-4	1.10	1.000
401	1CHPAT-PT-14:2	6.999E-4	1.947E-4	1.28	1.000
402	1SIMOV-FC-1890B	1.090E-2	1.899E-4	1.02	1.000
403	1SIMOV-FO-1864B	1.090E-2	1.899E-4	1.02	1.000
404	1SIMOV-FO-1864A	1.090E-2	1.882E-4	1.02	1.000
405	1SIMOV-FC-1890A	1.090E-2	1.882E-4	1.02	1.000
406	1CHPAT-UM-1CHPBC	7.529E-4	1.848E-4	1.25	1.000
407	2EEBUS-LU-2H1-4	1.215E-5	1.757E-4	15.46	1.000
408	HEP-1OP21:6	1.050E-3	1.703E-4	1.16	1.000
409	1QSHEP-FLANGE	3.750E-4	1.700E-4	1.45	1.000
410	2EGEDG-FS-2J	1.434E-2	1.638E-4	1.01	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
411	IE-T4	6.001E-7	1.573E-4	263.09	1.000
412	1QSPSB-CC-P1A-1B	3.933E-4	1.568E-4	1.40	1.000
413	1SILMS-LF-1860A	1.250E-4	1.566E-4	2.25	1.000
414	1QSMOV-CC-101A-B	3.903E-4	1.556E-4	1.40	1.000
415	HEP-1AP33:1	3.866E-1	1.552E-4	1.00	1.000
416	1HVFAN-FR-1FM06	1.357E-4	1.550E-4	2.14	1.000
417	1RHPSB-FR-1RHP1B	7.927E-4	1.546E-4	1.19	1.000
418	1RHPSB-FR-1RHP1A	7.927E-4	1.546E-4	1.19	1.000
419	1SILMS-LF-1860B	1.250E-4	1.538E-4	2.23	1.000
420	1EEBKR-SO-14H4	3.356E-5	1.537E-4	5.58	1.000
421	2EGEDG-FR-2J	1.330E-2	1.517E-4	1.01	1.000
422	2HVCHU-FR-2HVE4B	1.506E-3	1.480E-4	1.10	1.000
423	1CHCKV-FC-1CH267	6.339E-4	1.472E-4	1.23	1.000
424	2HVACU-LF-2HVAC7	3.425E-5	1.450E-4	5.24	1.000
425	1SIMOV-FO-1885C	1.090E-2	1.450E-4	1.01	1.000
426	1SIMOV-FO-1885A	1.090E-2	1.450E-4	1.01	1.000
427	1SIMOV-FO-1885B	1.090E-2	1.441E-4	1.01	1.000
428	1SIMOV-FO-1885D	1.090E-2	1.441E-4	1.01	1.000
429	2HVSV--SO-2205A	9.333E-5	1.403E-4	2.50	1.000
430	2HVSV--SO-2202A	9.333E-5	1.403E-4	2.50	1.000
431	1CCMV--PG-1CC199	4.105E-4	1.349E-4	1.33	1.000
432	1CCMV--PG-1CC194	4.105E-4	1.349E-4	1.33	1.000
433	HEP-1E0-22	1.880E-2	1.340E-4	1.01	1.000
434	1HVMOV-FC-113C	1.090E-2	1.322E-4	1.01	1.000
435	1HVMOV-FC-111C	1.090E-2	1.322E-4	1.01	1.000
436	1SWPAT-FR-1SWP1B	7.930E-4	1.291E-4	1.16	1.000
437	1RCPAT-FR-1RCP1A	7.930E-4	1.290E-4	1.16	1.000
438	1FWCKV-FC-1FW100	6.339E-4	1.240E-4	1.20	1.000
439	1RHCKV-FC-1RH15	6.339E-4	1.223E-4	1.19	1.000
440	1RHCKV-FC-1RH7	6.339E-4	1.223E-4	1.19	1.000
441	1FWCKV-FC-1FW132	6.339E-4	1.185E-4	1.19	1.000
442	C-Y04	9.850E-1	1.104E-4	1.00	1.000
443	1EETFM-LP-1H1	1.899E-5	1.091E-4	6.74	1.000
444	1EEBUS-UM-VB-III	2.000E-4	1.089E-4	1.54	1.000
445	2EGEDG-FS-2H	1.434E-2	1.057E-4	1.01	1.000
446	1HVSV--SO-1200	9.333E-5	1.035E-4	2.11	1.000
447	1SWCKV-FC-1SW10	6.339E-4	1.032E-4	1.16	1.000
448	2EGEDG-FR-2H	1.330E-2	9.813E-5	1.01	1.000
449	1RCMOV-FC-1535	1.090E-2	9.288E-5	1.01	1.000
450	1EEBUS-LU-1J1-2	1.215E-5	9.022E-5	8.43	1.000
451	HEP-1AP15-1E	7.799E-4	8.620E-5	1.11	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
534	1HVMOV-CC-HV111	3.903E-4	2.713E-5	1.07	1.000
535	1HVMOV-CC-HV113	3.903E-4	2.713E-5	1.07	1.000
536	1SWCKV-FC-SW-116	6.339E-4	2.362E-5	1.04	1.000
537	1SWCKV-FC-SW-114	6.339E-4	2.362E-5	1.04	1.000
538	1SICKV-FC-1SI185	6.339E-4	2.234E-5	1.04	1.000
539	HEP-0AP12-20HR	2.600E-4	2.177E-5	1.08	1.000
540	1QSLEV-TM-RWSTA	1.400E-3	2.171E-5	1.02	1.000
541	1QSLEV-TM-RWSTB	1.400E-3	2.171E-5	1.02	1.000
542	PROB-D104A	5.999E-2	2.085E-5	1.00	1.000
543	1HVPAT-FR-HVP22B	7.930E-4	2.074E-5	1.03	1.000
544	1HVPAT-FR-HVP20B	7.930E-4	2.074E-5	1.03	1.000
545	1SISV--MC-1845A	3.750E-5	2.066E-5	1.55	1.000
546	1SISV--MC-1845C	3.750E-5	2.031E-5	1.54	1.000
547	C-RC301	8.750E-1	1.905E-5	1.00	1.000
548	1CCPSB-FS-1CCP1B	3.933E-3	1.869E-5	1.00	1.000
549	1EEBUS-LU-1H1-2N	1.215E-5	1.866E-5	2.54	1.000
550	1RHMV--FC-1RH25	1.250E-4	1.804E-5	1.14	1.000
551	1CCPSB-UM-1CCP1B	3.750E-3	1.782E-5	1.00	1.000
552	1EEINV-LU-II	6.136E-4	1.772E-5	1.03	1.000
553	1CCSV--SO-RV131A	9.333E-5	1.653E-5	1.18	1.000
554	1CCSV--SO-RV131B	9.333E-5	1.653E-5	1.18	1.000
555	1RHSV--SO-1721B	9.333E-5	1.653E-5	1.18	1.000
556	1RHSV--SO-1721A	9.333E-5	1.653E-5	1.18	1.000
557	1EEBUS-UM-1H1-1	1.000E-5	1.652E-5	2.65	1.000
558	1RCMOV-FO-1536	1.090E-2	1.609E-5	1.00	1.000
559	1RCMOV-FO-1535	1.090E-2	1.609E-5	1.00	1.000
560	1MSMV--LK-1MS59	3.999E-2	1.608E-5	1.00	1.000
561	1EEBKR-SO-15J2	8.390E-6	1.576E-5	2.88	1.000
562	1EEBKR-SO-15H2	8.390E-6	1.576E-5	2.88	1.000
563	NON-REC-B235	8.999E-4	1.551E-5	1.02	1.000
564	1EPBKR-SO-L202	3.356E-5	1.512E-5	1.45	1.000
565	1SICKV-FC-1SI207	6.339E-4	1.447E-5	1.02	1.000
566	1FWCKV-FC-1FW68	6.339E-4	1.416E-5	1.02	1.000
567	1SICKV-FC-1SI206	6.339E-4	1.354E-5	1.02	1.000
568	1CCSV--SO-RV128B	9.333E-5	1.347E-5	1.14	1.000
569	1CCSV--SO-RV128A	9.333E-5	1.347E-5	1.14	1.000
570	1HVPAT-FS-HVP22C	1.983E-3	1.345E-5	1.01	1.000
571	1HVPAT-FS-HVP20C	1.983E-3	1.345E-5	1.01	1.000
572	1QSCKV-CC-V19-11	6.339E-5	1.331E-5	1.21	1.000
573	1CCCKV-FO-1CC24	3.442E-3	1.310E-5	1.00	1.000
574	1MSMV--LK-1MS21	3.999E-2	1.301E-5	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
575	1CHHEX-LU-1CHE5B	2.090E-4	1.297E-5	1.06	1.000
576	1CCTNK-LF-1CCTK1	2.664E-6	1.279E-5	5.80	1.000
577	1HVPAT-CC-HVP22	1.983E-4	1.182E-5	1.06	1.000
578	1HVPAT-CC-HVP20	1.983E-4	1.182E-5	1.06	1.000
579	1SIMOV-PG-1267B	8.207E-4	1.134E-5	1.01	1.000
580	NON-REC-B220	8.999E-4	1.117E-5	1.01	1.000
581	1HVCHU-FR-1HVE4C	1.506E-3	9.717E-6	1.01	1.000
582	C-B02	6.600E-1	9.476E-6	1.00	1.000
583	1CCHEX-LU-1CCE1A	2.090E-4	9.363E-6	1.04	1.000
584	1CCHEX-LF-1CCE1B	9.477E-3	9.363E-6	1.00	1.000
585	1EEBKR-SO-VB1-35	3.356E-5	9.108E-6	1.27	1.000
586	1EEBKR-SO-VB3-35	3.356E-5	9.108E-6	1.27	1.000
587	1HVTCV-SC-TCV166	1.208E-5	8.854E-6	1.73	1.000
588	1HVMOD-SC-MOD137	1.208E-5	8.854E-6	1.73	1.000
589	1EEBUS-UM-VB-II	2.000E-4	8.503E-6	1.04	1.000
590	1FWCKV-CC-9395	6.339E-5	8.267E-6	1.13	1.000
591	1FWCKV-CC-125127	6.339E-5	8.267E-6	1.13	1.000
592	1FWMV--FO-1FW128	1.250E-4	7.779E-6	1.06	1.000
593	1EEHS--LF-I	2.664E-5	7.229E-6	1.27	1.000
594	1EEHS--LF-III	2.664E-5	7.229E-6	1.27	1.000
595	1EPBUS-UM-1	2.000E-4	6.983E-6	1.03	1.000
596	1EPBUS-UM-1F	2.000E-4	6.983E-6	1.03	1.000
597	1EPBUS-UM-3	2.000E-4	6.983E-6	1.03	1.000
598	1EEBUS-UM-DC-II	2.000E-4	5.775E-6	1.03	1.000
599	1CHPAT-FS-1CHP1C	5.078E-3	5.701E-6	1.00	1.000
600	1EPBUS-UM-1B3	2.000E-4	5.428E-6	1.03	1.000
601	1EPBKR-SO-15E3	3.356E-5	5.165E-6	1.15	1.000
602	1EPBKR-SO-15E1	3.356E-5	5.165E-6	1.15	1.000
603	1EPBKR-SO-242	3.356E-5	5.165E-6	1.15	1.000
604	2EEBKR-SO-25H11	3.356E-5	5.165E-6	1.15	1.000
605	1MSMV--FO-1MS97	1.250E-4	4.680E-6	1.04	1.000
606	1MSPORV-DMDT7	1.000E+0	4.680E-6	1.00	1.000
607	1MSRV--FO-101C	2.500E-2	4.680E-6	1.00	1.000
608	1EEBKR-SO-15H12	3.356E-5	4.655E-6	1.14	1.000
609	1EPBKR-SO-15J12	3.356E-5	4.655E-6	1.14	1.000
610	1QSHEP-1QS21	7.499E-4	4.557E-6	1.01	1.000
611	1QSHEP-1QS5	7.499E-4	4.522E-6	1.01	1.000
612	1EPTFM-LP-2	1.899E-5	4.521E-6	1.24	1.000
613	1EPBKR-FC-15F1	1.834E-3	3.789E-6	1.00	1.000
614	2HVPAT-FR-HVP22C	7.930E-4	3.571E-6	1.00	1.000
615	2HVPAT-FR-HVP20C	7.930E-4	3.571E-6	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
452	1MSTCV-FC-1408B	1.812E-2	8.251E-5	1.00	1.000
453	1MSTCV-FC-1408A	1.812E-2	8.251E-5	1.00	1.000
454	1SIMOV-FC-1867D	1.090E-2	8.154E-5	1.01	1.000
455	1SIMOV-FC-1867B	1.090E-2	8.154E-5	1.01	1.000
456	2HVMOV-CC-HV213	3.903E-4	7.886E-5	1.20	1.000
457	2HVMOV-CC-HV211	3.903E-4	7.886E-5	1.20	1.000
458	REC-1ES1:2	2.660E-3	7.839E-5	1.03	1.000
459	1RHMV--PG-1RH9	4.105E-4	7.680E-5	1.19	1.000
460	1RHMV--PG-1RH16	4.105E-4	7.680E-5	1.19	1.000
461	1RHMV--PG-1RH1	4.105E-4	7.680E-5	1.19	1.000
462	1RHMV--PG-1RH8	4.105E-4	7.680E-5	1.19	1.000
463	1EEBUS-UM-1J1-2	1.000E-5	7.666E-5	8.67	1.000
464	1QSPSB-FS-1QSP1B	3.933E-3	7.146E-5	1.02	1.000
465	1QSPSB-FS-1QSP1A	3.933E-3	6.974E-5	1.02	1.000
466	1EEBUS-LU-1H1-2S	1.215E-5	6.940E-5	6.71	1.000
467	1EEBKR-SO-14H3	3.356E-5	6.837E-5	3.04	1.000
468	1EEBUS-UM-VB-I	2.000E-4	6.721E-5	1.34	1.000
469	IE-T6	6.270E-6	6.611E-5	11.54	1.000
470	1RHCKV-FO-1RH7	3.442E-3	6.580E-5	1.02	1.000
471	1RHCKV-FO-1RH15	3.442E-3	6.580E-5	1.02	1.000
472	2HVPAT-FR-HVP22B	7.930E-4	6.482E-5	1.08	1.000
473	2HVPAT-FR-HVP20B	7.930E-4	6.482E-5	1.08	1.000
474	1CCAOV-UM-TV103A	2.000E-4	6.400E-5	1.32	1.000
475	1RHMOV-FC-1720B	1.090E-2	6.367E-5	1.01	1.000
476	1RHMOV-FC-1720A	1.090E-2	6.367E-5	1.01	1.000
477	HEP-0AP10	5.274E-3	6.366E-5	1.01	1.000
478	1RHMV--PG-1RH19	4 105E-4	6.174E-5	1.15	1.000
479	1CCMV--PG-1CC762	4.105E-4	6.174E-5	1.15	1.000
480	1CCMV--PG-1CC785	4.105E-4	6.174E-5	1.15	1.000
481	1RHMV--PG-1RH30	4.105E-4	6.174E-5	1.15	1.000
482	1RHMV--PG-1RH24	4.105E-4	6.174E-5	1.15	1.000
483	1QSPSB-TM-1QSP1A	3.750E-3	6.088E-5	1.02	1.000
484	1QSPSB-UM-1QSP1A	3.750E-3	6.088E-5	1.02	1.000
485	1RHFCV-SO-1605	1.208E-5	5.871E-5	5.86	1.000
486	1EEBUS-UM-1H1	1.000E-5	5.841E-5	6.84	1.000
487	1EEBUS-UM-1H1-2S	1.000E-5	5.841E-5	6.84	1.000
488	1QSPSB-UM-1QSP1B	3.750E-3	5.638E-5	1.01	1.000
489	1QSPSB-TM-1QSP1B	3.750E-3	5.638E-5	1.01	1.000
490	1CHHEX-LU-1CHE5A	2.090E-4	5.608E-5	1.27	1.000
491	1EEBAT-CC-I-III	1.050E-6	5.426E-5	52.68	1.000
492	1MSAOV-FC-TV101A	1.812E-2	5.327E-5	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
493	1MSAOV-FC-TV101B	1.812E-2	5.327E-5	1.00	1.000
494	REC-OOP21:6	1.687E-3	5.122E-5	1.03	1.000
495	1EEBUS-LU-1H1-1	1.215E-5	5.016E-5	5.13	1.000
496	2SWCKV-FC-2SW337	6.339E-4	4.896E-5	1.08	1.000
497	2SWCKV-FC-2SW353	6.339E-4	4.896E-5	1.08	1.000
498	2CDCKV-FC-2CD211	6.339E-4	4.896E-5	1.08	1.000
499	1CCPAT-FR-1CCP1A	7.930E-4	4.770E-5	1.06	1.000
500	2HVMOD-SC-MOD238	1.208E-5	4.657E-5	4.86	1.000
501	2HVTCV-SC-TCV267	1.208E-5	4.657E-5	4.86	1.000
502	1EPBUS-UM-1B1	2.000E-4	4.648E-5	1.23	1.000
503	1MSMV--LK-1MS179	1.000E-2	4.500E-5	1.00	1.000
504	1MSMV--LK-1MS168	1.000E-2	4.500E-5	1.00	1.000
505	HEP-0AP12-10HR	4.949E-3	4.434E-5	1.01	1.000
506	1HVSV--SO-1202A	9.333E-5	4.359E-5	1.47	1.000
507	1HVSV--SO-1205A	9.333E-5	4.359E-5	1.47	1.000
508	1FWMOV-CC-150ABC	3.903E-4	4.259E-5	1.11	1.000
509	2HVPAT-FS-HVP22C	1.983E-3	4.190E-5	1.02	1.000
510	2HVPAT-FS-HVP20C	1.983E-3	4.190E-5	1.02	1.000
511	1SIPSB-FR-1HRP1A	3.304E-5	4.142E-5	2.25	1.000
512	1SIPSB-FR-1HRP1B	3.304E-5	4.127E-5	2.25	1.000
513	2HVPAT-CC-HVP20	1.983E-4	3.983E-5	1.20	1.000
514	2HVPAT-CC-HVP22	1.983E-4	3.983E-5	1.20	1.000
515	1BDAOV-FO-TV100E	1.812E-2	3.799E-5	1.00	1.000
516	1BDSOV-FO-100J	1.812E-2	3.799E-5	1.00	1.000
517	1BDSOV-FO-100F	1.812E-2	3.799E-5	1.00	1.000
518	1BDAOV-FO-TV100J	1.812E-2	3.799E-5	1.00	1.000
519	1BDSOV-FO-100E	1.812E-2	3.799E-5	1.00	1.000
520	1BDAOV-FO-TV100F	1.812E-2	3.799E-5	1.00	1.000
521	2HVACU-UM-2HVAC6	1.654E-3	3.656E-5	1.02	1.000
522	NON-REC-B221	8.999E-4	3.506E-5	1.04	1.000
523	1RCMOV-FC-1536	1.090E-2	3.432E-5	1.00	1.000
524	1HVACU-LF-1HVAC6	3.425E-5	3.340E-5	1.98	1.000
525	2HVCHU-FR-2HVE4C	1.506E-3	3.167E-5	1.02	1.000
526	1EEBAT-LP-III	1.500E-5	3.035E-5	3.02	1.000
527	1EEBAT-LP-I	1.500E-5	3.012E-5	3.01	1.000
528	1EPBUS-UM-1A1	2.000E-4	2.962E-5	1.15	1.000
529	1QSLIC-LF-100A	4.633E-3	2.902E-5	1.01	1.000
530	1QSLIC-LF-100D	4.633E-3	2.902E-5	1.01	1.000
531	1QSLIC-LF-100B	4.633E-3	2.902E-5	1.01	1.000
532	1QSLIC-LF-100C	4.633E-3	2.902E-5	1.01	1.000
533	1SWTCV-FC-SW102C	1.812E-2	2.847E-5	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
616	1QSCKV-FC-1QS-11	6.339E-4	3.441E-6	1.01	1.000
617	1CHCKV-CC-267279	6.339E-5	3.387E-6	1.05	1.000
618	1QSCKV-FC-1QS-19	6.339E-4	3.268E-6	1.01	1.000
619	1EEBUS-LU-VB-I	1.215E-5	3.223E-6	1.27	1.000
620	1EEBUS-LU-VB-III	1.215E-5	3.223E-6	1.27	1.000
621	1MSMV--PG-1MS268	1.368E-4	3.127E-6	1.02	1.000
622	1MSMV--PG-1MS270	1.368E-4	3.127E-6	1.02	1.000
623	1MSMV--PG-1MS269	1.368E-4	3.127E-6	1.02	1.000
624	1MSMV--PG-1MS271	1.368E-4	3.127E-6	1.02	1.000
625	HEP-1E0-15	1.075E-3	2.979E-6	1.00	1.000
626	1CCPSB-FR-1CCP1B	7.927E-4	2.971E-6	1.00	1.000
627	1EPBKR-FC-15A2	1.834E-3	2.760E-6	1.00	1.000
628	HEP-0AP12-40HR	1.250E-1	2.721E-6	1.00	1.000
629	1FWHCV-FO-100C	1.812E-2	2.657E-6	1.00	1.000
630	1SWMOV-FC-SW101B	1.090E-2	2.412E-6	1.00	1.000
631	1SWMOV-FC-SW101D	1.090E-2	2.412E-6	1.00	1.000
632	1SWMOV-FC-SW101A	1.090E-2	2.412E-6	1.00	1.000
633	1SWMOV-FC-SW101C	1.090E-2	2.412E-6	1.00	1.000
634	1CCCKV-FC-1CC47	6.339E-4	2.376E-6	1.00	1.000
635	1EPBUS-LU-1A	1.215E-5	1.944E-6	1.16	1.000
636	1HVPAT-FR-HVP20C	7.930E-4	1.904E-6	1.00	1.000
637	1HVPAT-FR-HVP22C	7.930E-4	1.904E-6	1.00	1.000
638	1EPBUS-LU-1B1	1.215E-5	1.612E-6	1.13	1.000
639	1EEBUS-LU-1JSTUB	1.215E-5	1.612E-6	1.13	1.000
640	1EEBUS-LU-1HSTUB	1.215E-5	1.612E-6	1.13	1.000
641	1EPBUS-LU-1A1	1.215E-5	1.612E-6	1.13	1.000
642	1EPBKR-FC-15B2	1.834E-3	1.587E-6	1.00	1.000
643	1EPBUS-LU-4	1.215E-5	1.490E-6	1.12	1.000
644	1EPBUS-LU-2	1.215E-5	1.490E-6	1.12	1.000
645	1RCMOV-CC-535536	3.903E-4	1.443E-6	1.00	1.000
646	2EGEDG-TM-2J	5.708E-4	1.179E-6	1.00	1.000
647	1EPBKR-SO-332	3.356E-5	1.172E-6	1.03	1.000
648	1EEBKR-SO-15H11	3.356E-5	1.172E-6	1.03	1.000
649	1EPBKR-SO-15F3	3.356E-5	1.172E-6	1.03	1.000
650	1EPBKR-SO-15F1	3.356E-5	1.172E-6	1.03	1.000
651	1EPBKR-SO-L102	3.356E-5	1.172E-6	1.03	1.000
652	1EEBUS-UM-1JSTUB	1.000E-5	1.042E-6	1.10	1.000
653	1EEBUS-UM-1HSTUB	1.000E-5	1.042E-6	1.10	1.000
654	1SWCKV-CC-647648	6.339E-5	1.034E-6	1.02	1.000
655	1RSSTR-PG-TEMPB	2.822E-2	1.012E-6	1.00	1.000
656	1FWHCV-FC-100B	1.812E-2	9.925E-7	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
657	1SITNK-LF-1SITK2	2.664E-6	8.886E-7	1.33	1.000
658	1EEBCH-LP-I	8.399E-5	7.986E-7	1.01	1.000
659	1EEBCH-LP-III	8.399E-5	7.986E-7	1.01	1.000
660	1FWCKV-CC-477911	6.339E-5	7.413E-7	1.01	1.000
661	1RSSTR-PG-TEMPA	2.822E-2	6.727E-7	1.00	1.000
662	1EPTFM-LP-RSST-C	1.899E-5	6.631E-7	1.03	1.000
663	1EPTFM-LP-1	1.899E-5	6.631E-7	1.03	1.000
664	1SWMOV-SC-SW208A	1.208E-5	6.561E-7	1.05	1.000
665	1SWMOV-SC-SW108A	1.208E-5	6.561E-7	1.05	1.000
666	1SWMOV-SC-SW208B	1.208E-5	6.561E-7	1.05	1.000
667	1SWMOV-SC-SW108B	1.208E-5	6.561E-7	1.05	1.000
668	1FWMOV-FC-100C	1.090E-2	5.972E-7	1.00	1.000
669	1CHPAT-FR-24HP1C	7.930E-4	5.877E-7	1.00	1.000
670	2EEBKR-FO-25J11	2.735E-4	5.649E-7	1.00	1.000
671	1EEBKR-FO-15H11	2.735E-4	5.649E-7	1.00	1.000
672	1EPBKR-FO-15F4	2.735E-4	5.649E-7	1.00	1.000
673	1EPBKR-FO-15F3	2.735E-4	5.649E-7	1.00	1.000
674	2EEBKR-FO-25J2	2.735E-4	5.649E-7	1.00	1.000
675	2EGEDG-CC-2H-2J	2.663E-4	5.500E-7	1.00	1.000
676	1FWHEP-MOV-100B	7.499E-4	5.379E-7	1.00	1.000
677	1CHPAT-PT-14:3	6.999E-4	5.187E-7	1.00	1.000
678	1SWMOV-FC-SW103B	1.090E-2	5.062E-7	1.00	1.000
679	1SWMOV-FC-SW104B	1.090E-2	5.062E-7	1.00	1.000
680	1EEBKR-SO-II-14	3.356E-5	4.922E-7	1.01	1.000
681	1EEBKR-SO-VB2-35	3.356E-5	4.922E-7	1.01	1.000
682	1EPBKR-FC-G12	1.834E-3	4.896E-7	1.00	1.000
683	1FWCKV-FC-1FW93	6.339E-4	4.547E-7	1.00	1.000
684	NON-REC-B229	8.999E-4	4.489E-7	1.00	1.000
685	1FWHEP-MOV-100D	7.499E-4	3.866E-7	1.00	1.000
686	1CHMOV-FO-1286A	1.090E-2	3.654E-7	1.00	1.000
687	1SWMOV-FC-SW103A	1.090E-2	3.364E-7	1.00	1.000
688	1SWMOV-FC-SW104A	1.090E-2	3.364E-7	1.00	1.000
689	1CHCKV-FC-1CH279	6.339E-4	3.356E-7	1.00	1.000
690	1FWCKV-FC-1FW279	6.339E-4	3.268E-7	1.00	1.000
691	1FWHEP-HCV-100C	7.499E-4	3.236E-7	1.00	1.000
692	1FWCKV-FC-1FW127	6.339E-4	2.736E-7	1.00	1.000
693	1EEBKR-SO-III-11	3.356E-5	2.575E-7	1.01	1.000
694	1EEBKR-SO-J1-B1L	3.356E-5	2.575E-7	1.01	1.000
695	1EEBKR-SO-I-11	3.356E-5	2.575E-7	1.01	1.000
696	1EEBKR-SO-H4-D2L	3.356E-5	2.575E-7	1.01	1.000
697	1MSMV--PG-1MS179	9.123E-5	2.406E-7	1.00	1.000

TABLE 3.4.1-6 (Continued)
BASIC EVENTS RANKED BY THE
FUSSELL-VESELY IMPORTANCE MEASURES

Rank	Event Name	Point Estimate	Fussell-Vesely Importance	Risk Achievement Worth	Risk Reduction Worth
698	1MSMV--PG-1MS168	9.123E-5	2.406E-7	1.00	1.000
699	1EPBKR-FO-15A1	2.735E-4	2.099E-7	1.00	1.000
700	HEP-0AP12-30HR	6.565E-3	1.723E-7	1.00	1.000
701	1EPBKR-SO-15B10	3.356E-5	1.693E-7	1.01	1.000
702	1EPBKR-SO-14B3-1	3.356E-5	1.693E-7	1.01	1.000
703	1EPBUS-LU-1	1.215E-5	1.662E-7	1.01	1.000
704	1EPBUS-LU-1F	1.215E-5	1.662E-7	1.01	1.000
705	1EPBUS-LU-3	1.215E-5	1.662E-7	1.01	1.000
706	2EEBUS-UM-2J	2.000E-4	1.619E-7	1.00	1.000
707	1FWBKR-FC-15C5	1.834E-3	1.546E-7	1.00	1.000
708	1FWBKR-FC-15A5	1.834E-3	1.546E-7	1.00	1.000
709	1FWBKR-FC-15A6	1.834E-3	1.546E-7	1.00	1.000
710	1FWBKR-FC-15B5	1.834E-3	1.546E-7	1.00	1.000

BASIC EVENTS & DESCRIPTIONS

TABLE C.8-1
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1AMRLY-LF-OUT-3A	2.66E-004	AMSAC OUTPUT RELAY 3A LOSS OF FUNCTION
1AMRLY-LF-OUT-3B	2.66E-004	AMSAC OUTPUT RELAY 3B LOSS OF FUNCTION
1AMTMR-LF-27SEC	7.99E-004	AMSAC 27 SEC. TIMER FAILS FOLLOWING A FAILURE OF RPS ACT.
1BDAOV-FO-TV100E	1.81E-002	AIR OPRTED VALVE FAILS OPEN 1-BD-TV-100E
1BDAOV-FO-TV100F	1.81E-002	AIR OPRTED VALVE FAILS OPEN 1-BD-TV-100F
1BDAOV-FO-TV100J	1.81E-002	AIR OPRTED VALVE FAILS OPEN 1-BD-TV-100J
1BDSOV-FO-100E	1.81E-002	SOLENOID VALVE FAILS OPEN 1-BD-SOV-100E
1BDSOV-FO-100F	1.81E-002	SOLENOID VALVE FAILS OPEN 1-BD-SOV-100F
1BDSOV-FO-100J	1.81E-002	SOLENOID VALVE FAILS OPEN 1-BD-SOV-100J
1CCAOV-FC-TV103A	1.81E-002	AIR-OPERATED VALVE TV103A FAILS CLOSED (FAILS TO OPEN)
1CCAOV-FC-TV103B	1.81E-002	AIR-OPERATED VALVE TV103B FAILS CLOSED (FAILS TO OPEN)
1CCAOV-SC-104A1	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-104A2	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-104B1	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-104B2	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-104C1	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-104C2	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-TV101A	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-TV101B	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-TV116A	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-TV116B	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-SC-TV116C	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE(OPN) DURING MISSION
1CCAOV-UM-TV103A	2.00E-004	AIR OPRTD VALVE 1-CC-TV-103A UNSCHD MAINT.
1CCCKV-FC-1CC47	6.34E-004	CHECK VALVE 1-CC-47 FAILS CLOSED (FAILS TO OPEN)
1CCCKV-FO-1CC24	3.44E-003	CHECK VALVE 1-CC-24 FAILS OPEN (FAILS TO CLOSE)
1CCCKV-PG-1CC24	3.00E-006	CHECK VALVE 1CC-24 PLUGGED DURING MISSION
1CCHEX-LF-1CCE1B	9.48E-003	HEAT EXCHANGER 1-CC-E-1B LOSS OF FUNCTION
1CCHEX-LU-1CCE1A	2.09E-004	HEAT EXCHANGER 1-CC-E-1A LOSS OF FUNCTION
1CCHEX-UM-1CCE1B	2.00E-004	HEAT EXCHANGER 1-CC-E-1B UNSCHED MAINTENANCE
1CCMOV-CC-100AB	3.90E-004	CCF MOTOR OPERATED VALVES CC-100A & B FAIL CLOSED
1CCMOV-FC-CC100A	1.09E-002	MOTOR OPERTD VALVE CC-100A FAILS CLSD (FAILS TO OPEN)
1CCMOV-FC-CC100B	1.09E-002	MOTOR OPERTD VALVE CC-100B FAILS CLSD (FAILS TO OPEN)
1CCMV--FC-1CC41	1.25E-004	N. C. MANUAL VALVE 1-CC-41 FAILS CLOSED
1CCMV--FC-1CC56	1.25E-004	MANUAL VALVE 1CC-56 FAILS CLOSED (FAILS TO OPEN)
1CCMV--FC-1SW232	1.25E-004	MANUAL VALVE SW-232 FAILS CLOSED (FAILS TO OPN)
1CCMV--PG-1CC194	4.10E-004	N.O. MANUAL VALVE 1-CC-194 PLUGGED DURING STANDBY
1CCMV--PG-1CC199	4.10E-004	N.O. MANUAL VALVE 1-CC-199 PLUGGED DURING STANDBY
1CCMV--PG-1CC39	4.50E-005	N.O. MANUAL VALVE 1-CC-39 PLUGGED DURING STANDBY
1CCMV--PG-1CC48	4.50E-005	N.O. MANUAL VALVE 1-CC-48 PLUGGED DURING STANDBY
1CCMV--PG-1CC50	1.37E-004	N.O. MANUAL VALVE 1-CC-50 PLUGGED DURING STANDBY
1CCMV--PG-1CC762	4.10E-004	N.O. MANUAL VALVE 1-CC-762 PLUGGED DURING STANDBY
1CCMV--PG-1CC785	4.10E-004	N.O. MANUAL VALVE 1-CC-785 PLUGGED DURING STANDBY
1CCMV--PG-1SW233	1.37E-004	N.O. MANUAL VALVE 1-SW-233 PLUGGED DURING STANDBY
1CCMV--PG-1SW241	1.37E-004	N.O. MANUAL VALVE 1-SW-241 PLUGGED DURING STANDBY
1CCPAT-FR-1CCP1A	7.93E-004	MOTOR DRIVEN PUMP 1-CC-P-1A FAILS TO RUN
1CCPSB-FR-1CCP1B	7.93E-004	STANDBY PUMP 1-CC-P-1B FAILS TO RUN
1CCPSB-FS-1CCP1B	3.93E-003	STANDBY PUMP 1-CC-P-1B FAILS TO START
1CCPSB-UM-1CCP1B	3.75E-003	MD STNDBY PUMP 1-CC-P-1B UNSCHDL MAINT.
1CCSV--SO-RV125A	9.33E-005	SAFETY VALVE RV125A SPURIOUSLY OPEN DURING MISSION
1CCSV--SO-RV125B	9.33E-005	SAFETY VALVE RV125B SPURIOUSLY OPEN DURING MISSION
1CCSV--SO-RV125C	9.33E-005	SAFETY VALVE RV125C SPURIOUSLY OPEN DURING MISSION
1CCSV--SO-RV128A	9.33E-005	FLOW DIVERSION RELIEF VLV SPURIOUS OPEN. 1-CC-RV-128A
1CCSV--SO-RV128B	9.33E-005	SAFETY VALVE SPURIOUSLY OPEN DURING MISSION
1CCSV--SO-RV131A	9.33E-005	SAFETY VALVE SPURIOUSLY OPEN DURING MISSION
1CCSV--SO-RV131B	9.33E-005	SAFETY VALVE SPURIOUSLY OPEN DURING MISSION
1CCTNK-LF-1CCTK1	2.66E-006	INSUFF CC PUMP NPSH SURGE TANK 1-CC-TK1 LOSS OF FUNCTION
1CDCKV-FC-1CD182	6.34E-004	CHECK VALVE 1-CD-182 FAILS CLOSED
1CDCKV-FC-1CD209	6.34E-004	CHECK VALVE 1-CD-209 FAILS CLOSED
1CDCKV-FC-2CD187	6.34E-004	CHECK VALVE 2-CD-187 FAILS CLOSED
1CDMV--FC-1CD174	1.25E-004	MANUAL GATE VALVE 1-CD-174 FAILS CLOSED
1CDMV--FC-1CD175	1.25E-004	MANUAL GATE VALVE 1-CD-175 FAILS CLOSED
1CDMV--FC-1CD205	1.25E-004	MANUAL GATE VALVE 1-CD-205 FAILS CLOSED

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1CDMV--FC-1CD216	1.25E-004	MANUAL GATE VALVE 1-CD-216 FAILS CLOSED
1CESTR-CC-SUMPPG	5.00E-005	COMMON CAUSE BLOCKAGE OF CONTAINMENT SUMP
1CHAOV-SC-1115A	1.21E-005	LCV-1115A SPURIOUS CLOSURE OR PLUGGING DURING MISSION
1CHCKV-CC-267279	6.34E-005	CCF OF CHECK VAVLES CH-267 AND CH-279
1CHCKV-FC-1CH238	6.34E-004	CHECK VALVE CH-238 FAILS CLOSED (FAILS TO OPEN)
1CHCKV-FC-1CH252	6.34E-004	CHECK VALVE CH-252 FAILS CLOSED (FAILS TO OPEN)
1CHCKV-FC-1CH264	6.34E-004	CHECK VALVE CH-264 FAILS CLOSED (FAILS TO OPEN)
1CHCKV-FC-1CH267	6.34E-004	CHECK VALVE CH-267 FAILS CLOSED (FAILS TO OPEN)
1CHCKV-FC-1CH279	6.34E-004	CHECK VALVE CH-279 FAILS CLOSED (FAILS TO OPEN)
1CHCKV-FO-1CH254	1.15E-003	CHECK VALVE CH-254 FAILS OPEN (FAILS TO CLOSE)
1CHCKV-FO-1CH267	3.44E-003	CHECK VALVE CH-267 FAILS OPEN (FAILS TO CLOSE)
1CHCKV-FO-CH267	3.44E-003	CHECK VALVE CH-267 FAILS OPEN (FAILS TO CLOSE)
1CHHCV-FC-1311	1.81E-002	AOV OP HAND CNT VLV FAILS CLOSED 1-CH-HCV-1311
1CHHCV-FO-1310	1.81E-002	AOV OP HAND CNT VLV FAILS OPEN 1-CH-HCV-1310
1CHHEP-MOV-1275A	7.50E-004	MOV-1275A INADVERT MISPOSITION
1CHHEP-MOV-1275B	7.50E-004	MOV-1275B INADVERT MISPOSITION
1CHHEP-MOV-1373	7.50E-004	MOV-1373 INADVERT MISPOSITION
1CHHEX-LU-1CHE5A	2.09E-004	HEAT EXCHANGER E5A LOSS OF FUNCTION DURING MISSION
1CHHEX-LU-1CHE5B	2.09E-004	HEAT EXGR CH-E-5B LOSS OF FUNCTION DURING MISSION
1CHHEX-LU-1CHE5C	2.09E-004	HEAT EXCHANGER LOSS OF FUNCTION DURING MISSION
1CHMOV-FC-CH1350	1.09E-002	MOTOR OPERTD VALVE CH-1350 FAILS CLSD (FAILS TO OPEN)
1CHMOV-FO-1286A	1.09E-002	MOTOR OPERTD VALVE FAILS OPEN 1-CH-MOV-1286A
1CHMOV-PG-1275A	4.50E-005	MOTOR OPERTD VALVE 1275A PLUGGED DURING OPERATION
1CHMOV-PG-1275B	4.50E-005	MOTOR OPERTD VALVE 1275B PLUGGED DURING STANDBY
1CHMOV-PG-1373	4.50E-005	MOTOR OPERTD VALVE 1373 PLUGGED DURING OPERATION
1CHPAT-CC-FS1ABC	4.97E-004	CCF 3/3 FS OF CHP 1A, 1B & 1C TO START
1CHPAT-CC-FS1B1C	4.97E-004	CCF 2/2 FS OF CHP 1B AND 1C TO START
1CHPAT-FR-1HRP1A	3.31E-005	CHARGING PUMP 1A FAILS TO RUN FOR ONE HOUR
1CHPAT-FR-1HRP1B	3.31E-005	CHARGING PUMP 1B FAILS TO RUN FOR ONE HOUR
1CHPAT-FR-24HP1A	7.93E-004	CHARGING PUMP 1A FAILS TO RUN FOR 24 HOURS
1CHPAT-FR-24HP1B	7.93E-004	CHARGING PUMP 1B FAILS TO RUN FOR 24 HOURS
1CHPAT-FR-24HP1C	7.93E-004	CHARGING PUMP 1C FAILS TO RUN
1CHPAT-FS-1CHP1A	1.98E-003	CAHRGING PUMP 1A FAILS TO START
1CHPAT-FS-1CHP1B	5.08E-003	CHARGING PUMP 1B FAILS TO START
1CHPAT-FS-1CHP1C	5.08E-003	CHARGING PUMP 1C FAILS TO START
1CHPAT-FS-1CHP2A	1.98E-003	BAT PUMP CH-P-2A FAILS TO SWITCH TO FAST SPEED
1CHPAT-PT-14:2	7.00E-004	CHARGING PUMP B IN PT 14.2
1CHPAT-PT-14:3	7.00E-004	CHARGING PUMP 1C IN PT 14.3
1CHPAT-UM-1CHP1C	3.27E-001	CHARGING PUMP 1C UNSCHLD MAINT.
1CHPAT-UM-1CHPBC	7.53E-004	CHARGING PUMPS 1B AND 1C IN MAINTENANCE
1CHRV--SO-1257	9.33E-005	VCT RELIEF VALVE 1257 SPURIOUS OPENING
1CHTNK-LU-1CHTK2	2.66E-006	VCT LEAK LEADING TO LOSS OF FUNCTION DURING MISSION
1CICDA-TM-HIHI-A	1.40E-003	CDA HIGH HIGH TRAIN A PROTECTION IN TEST
1CICDA-TM-HIHI-B	1.40E-003	CDA HIGH HIGH TRAIN B PROTECTION IN TEST
1CIHS--LF-PB-1-A	2.66E-005	HAND SWITCH CDA PUSHBUTTON 1 TR A LOSS OF FUNCTION
1CIHS--LF-PB-1-B	2.66E-005	HAND SWITCH CDA PUSHBUTTON 1 TR B LOSS OF FUNCTION
1CIHS--LF-PB-2-A	2.66E-005	HAND SWITCH CDA PUSHBUTTON 2 TR A LOSS OF FUNCTION
1CIHS--LF-PB-2-B	2.66E-005	HAND SWITCH CDA PUSHBUTTON 2 TR. B LOSS OF FUNCTION
1CIPIC-LF-100A	4.63E-003	PRESSURE CHANNEL PT-LM100A LOSS OF FNCN DURING STANDBY
1CIPIC-LF-100B	4.63E-003	PRESSURE CHANNEL PT-LM100B LOSS OF FNCN DURING STANDBY
1CIPIC-LF-100B-1	4.63E-003	PRESS INST CHANN LM 100B-1 LOSS OF FNCN DURING STNDBY
1CIPIC-LF-100C	4.63E-003	PRESSURE CHANNEL PT-LM100C LOSS OF FNCN DURING STANDBY
1CIPIC-LF-100C-1	4.63E-003	PRESS INST CHANN LM 100C-1 LOSS OF FNCN DURING STNDBY
1CIPIC-LF-100D	4.63E-003	PRESSURE CHANNEL PT-LM100D LOSS OF FNCN DURING STANDBY
1CIPIC-LF-100D-1	4.63E-003	PRESS INST CHANN LM 100D-1 LOSS OF FNCN DURING STNDBY
1CIRLY-LF-644XA1	2.66E-004	RELAY K644-XA1 LOSS OF FUNCTION
1CIRLY-LF-644XB1	2.66E-004	RELAY K644-XB1 LOSS OF FUNCTION
1CIRLY-LF-K137-A	2.66E-004	RELAY K137 TRAIN A FAILS TO ENERGIZE
1CIRLY-LF-K137-B	2.66E-004	RELAY K137 TRAIN B FAILS TO ENERGIZE
1CIRLY-LF-K216-A	2.66E-004	RELAY K216 TRAIN A FAILS TO ENERGIZE
1CIRLY-LF-K216-B	2.66E-004	RELAY K216 TRAIN B FAILS TO ENERGIZE
1CIRLY-LF-K217A	2.66E-004	RELAY K217 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K217B	2.66E-004	RELAY K217 TRAIN B LOSS OF FUNCTION

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1CIRLY-LF-K329-A	2.66E-004	RELAY K329 TRAIN A FAILS TO ENERGIZE
1CIRLY-LF-K329-B	2.66E-004	RELAY K329 TRAIN B FAILS TO ENERGIZE
1CIRLY-LF-K330A	2.66E-004	RELAY K330 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K330B	2.66E-004	RELAY K330 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K429-A	2.66E-004	RELAY K429-A FAILS TO ENERGIZE
1CIRLY-LF-K429-B	2.66E-004	RELAY K429 TRAIN B FAILS TO ENERGIZE
1CIRLY-LF-K430A	2.66E-004	RELAY K430 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K430B	2.66E-004	RELAY K430 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K505-A	2.66E-004	MASTER RELAY K505 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K505-B	2.66E-004	MASTER RELAY K505 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K506-A	2.66E-004	MASTER RELAY K506 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K506-B	2.66E-004	MASTER RELAY K506 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K519-A	2.66E-004	MASTER RELAY K519 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K519-B	2.66E-004	MASTER RELAY K519 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K618-A	2.66E-004	SLAVE RELAY K618 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K618-B	2.66E-004	SLAVE RELAY K618 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K619-A	2.66E-004	SLAVE RELAY K619 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K619-B	2.66E-004	SLAVE RELAY K619 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K625-A	2.66E-004	SLAVE RELAY K625 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K625-B	2.66E-004	SLAVE RELAY K625 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K626-A	2.66E-004	SLAVER RELAY K626 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K626-B	2.66E-004	SLAVE RELAY K626 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K643-A	2.66E-004	SLAVER RELAY K643 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K643-B	2.66E-004	SLAVE RELAY K643 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K644-A	2.66E-004	SLAVE RELAY K644 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K644-B	2.66E-004	SLAVE RELAY K644 TRAIN B LOSS OF FUNCTION
1CIRLY-LF-K645-A	2.66E-004	SLAVE RELAY K645 TRAIN A LOSS OF FUNCTION
1CIRLY-LF-K645-B	2.66E-004	SLAVE RELAY K645 TRAIN B LOSS OF FUNCTION
1CNCKV-FO-1CN21	3.44E-003	CHECK VALVE FAILS OPEN 1-CN-21
1CNCKV-FO-1CN9	3.44E-003	CHECK VALVE FAILS OPEN (FAILS TO CLOSE)
1CNLCV-CC-10912	1.81E-003	CCF 2/2 FAILS CLOSED 1-CN-LCV-109-1/-2
1CNLCV-FC-109-1	1.81E-002	LEVEL CONTROL VALVE FAILS CLOSED 1-CN-LCV-109-1
1CNLCV-FC-109-2	1.81E-002	LEVEL CONTROL VALVE FAILS CLOSED 1-CN-LCV-109-2
1CNPAT-FR-1CNP1A	7.93E-004	MD ALT PUMP FAILS TO RUN 1-CN-P-1A
1CNPAT-FR-1CNP1B	7.93E-004	MD ALT PUMP FAILS TO RUN 1-CN-P-1B
1CNPAT-FR-1CNP1C	7.93E-004	MD ALT PUMP FAILS TO RUN 1-CN-P-1C
1CNPAT-FS-1CNP1C	1.98E-003	MD ALT PUMP 1-CN-P-1C FAILS TO START
1CNPAT-TM-1CNP1C	3.75E-003	MD ALT PUMP 1-CN-P-1C SCHLD TST & MAINT.
1CNPAT-UM-1CNP1A	3.75E-003	UNSCHEDULED MAINTENANCE 1-CN-P-1A
1CNPAT-UM-1CNP1B	3.75E-003	UNSCHEDULED MAINTENANCE 1-CN-P-1B
1CNPAT-UM-1CNP1C	3.75E-003	MD ALT PUMP 1-CN-P-1C UNSCHLD MAINT.
1CNTNK-LF-1CNTK1	2.66E-006	TANK - INSUF WATER 1-CN-TK-1
1CNTNK-LF-1CNTK2	2.66E-006	TANK - INSUF WATER 1-CN-TK-2
1CNTNK-LU-1CNTK2	2.66E-006	INSUFFICIENT WATER IN 300000 GAL CST 1-CN-TK-2
1CWSCN-PL-1SWP-4	6.39E-004	1-SW-P-4 FAILS DUE TO SCREENWELL PLUGGING
1EE-BAT-I-2HR	1.00E+000	FAILURE OF BATTERY 1-I AT TWO HOURS
1EE-BAT-II-2HR	1.00E+000	FAILURE OF BATTERY 1-II AT TWO HOURS
1EE-BAT-III-2HR	1.00E+000	FAILURE OF BATTERY 1-III AT TWO HOURS
1EE-BAT-IV-2HR	1.00E+000	FAILURE OF BATTERY 1-IV AT TWO HOURS
1EEBAT-CC-ALL	1.05E-006	COMMON CAUSE FAULT BATTERIES FAIL TO SUPPLY POWER
1EEBAT-CC-I-III	1.05E-006	COMMON CAUSE FAULTS BATTERIES 1-BY-B-1 AND 1-BY-B-3
1EEBAT-LP-I	1.50E-005	BATTERY 1-I FAILS TO SUPPLY POWER 1-BY-B-1
1EEBAT-LP-II	1.50E-005	BATTERY 1-II FAILS TO SUPPLY POWER 1-BY-B-2
1EEBAT-LP-III	1.50E-005	BATTERY 1-III FAILS TO SUPPLY POWER 1-BY-B-3
1EEBAT-LP-IV	1.50E-005	BATTERY 1-IV FAILS TO SUPPLY POWER 1-BY-B-4
1EEBCH-LP-1C-I	8.40E-005	BATTERY CHARGER 1C-I FAILS 225 A 1-BY-C-3
1EEBCH-LP-1C-II	8.40E-005	BATTERY CHARGER 1C-II FAILS 225A 1-BY-C-6
1EEBCH-LP-I	8.40E-005	BATTERY CHARGER 1-I FAILS 225 A 1-BY-C-2
1EEBCH-LP-II	8.40E-005	BATTERY CHARGER 1-II FAILS 1-BY-C-4
1EEBCH-LP-III	8.40E-005	BATTERY CHARGER 1-III FAILS 225A 1-BY-C-5
1EEBCH-LP-IV	8.40E-005	BATTERY CHARGER 1-IV FAILS 1-BY-C-7
1EEBKR-FO-15H11	2.74E-004	BREAKER 15H11 FAILS OPEN, WILL NOT CLOSE 4160 V
1EEBKR-FO-15H2	2.74E-004	BREAKER 15H2 EDG OUTPUT BREAKER FAILS TO CLOSE

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1EEBKR-FO-15J1	2.74E-004	BREAKER 15J1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EEBKR-FO-15J11	2.74E-004	BREAKER 15J11 FAILS OPEN WILL NOT RECLOSE
1EEBKR-FO-15J2	2.74E-004	BREAKER 15J2 EDG OUTPUT BREAKER FAILS TO CLOSE
1EEBKR-FO-25H11	2.74E-004	BREAKER 25H11 FAILS OPEN, WILL NOT CLOSE 4160 V
1EEBKR-FO-I-12	2.74E-004	BREAKER 12 ON DC PANEL 1-I FAILS TO CLOSE 125 V DC
1EEBKR-FO-II-11	2.74E-004	BREAKER 11 ON DC PANEL 1-II FAILS TO CLOSE 125 V DC
1EEBKR-FO-III-10	2.74E-004	BREAKER 10 ON DC PANEL 1-III FAILS TO CLOSE
1EEBKR-FO-IV-8	2.74E-004	BREAKER 8 ON DC PANEL 1-IV FAILS TO CLOSE
1EEBKR-SO-14H1	3.36E-005	BREAKER 14H1 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H1-1	3.36E-005	BREAKER 14H1-1 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H1-7	3.36E-005	BREAKER 14H1-7 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H2	3.36E-005	BREAKER 14H2 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H3	3.36E-005	BREAKER 14H3 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H4	3.36E-005	BREAKER 14H4 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14H5	3.36E-005	BREAKER 14H5 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14J1	3.36E-005	BREAKER 14J1 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14J1-1	3.36E-005	BREAKER 14J1-1 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14J4	3.36E-005	BREAKER 14J4 SPURIOUSLY OPENS 480 V
1EEBKR-SO-14J5	3.36E-005	BREAKER 14J5 SPURIOUSLY OPENS
1EEBKR-SO-14J6	3.36E-005	BREAKER 14J6 SPURIOUSLY OPENS 480 V
1EEBKR-SO-15H11	3.36E-005	BREAKER 15H11 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-15H12	3.36E-005	BREAKER 15H12 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-15H2	8.39E-006	BREAKER 15H2 EDG OUTPUT BREAKER SPURIOUSLY OPENS
1EEBKR-SO-15H8	3.36E-005	BREAKER 15H8 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-15J11	3.36E-005	BREAKER 15J11 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-15J2	8.39E-006	BREAKER 15J2 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-15J8	3.36E-005	BREAKER 15J8 SPURIOUSLY OPENS 4160 V
1EEBKR-SO-16A-17	3.36E-005	BREAKER 17 ON SEMI VITAL DIST 1A SPURIOUSLY OPENS
1EEBKR-SO-16B-17	3.36E-005	BREAKER 17 ON SEMI VITAL DIST 1B SPURIOUSLY OPENS
1EEBKR-SO-1A-26	3.36E-005	BREAKER 26 ON SEMI VITAL BUS 1A SPURIOSLY OPENS
1EEBKR-SO-1B-25	3.36E-005	BREAKER 25 ON SEMI VITAL BUS 1B SPURIOUSLY OPENS
1EEBKR-SO-1C-26	3.36E-005	BREAKER 26 ON SEMI VITAL BUS 1C SPURIOUSLY OPENS
1EEBKR-SO-H1-H1R	3.36E-005	BREAKER H1R ON MCC 1H1-1 SPURIOUSLY OPENS
1EEBKR-SO-H3-A3	3.36E-005	BREAKER A3 ON MCC 1H1-3 SPURIOUSLY OPENS
1EEBKR-SO-H4-C1L	3.36E-005	BREAKER C1L ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-H4-C1R	3.36E-005	BREAKER C1R ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-H4-D1L	3.36E-005	BREAKER D1L ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-H4-D1R	3.36E-005	BREAKER D1R ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-H4-D2L	3.36E-005	BREAKER D2L ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-H4-D2R	3.36E-005	BREAKER D2R ON MCC 1H1-4 SPURIOUSLY OPENS
1EEBKR-SO-I-11	3.36E-005	BREAKER 11 ON DC PANEL 1-I SPURIOUSLY OPENS
1EEBKR-SO-I-13	3.36E-005	BREAKER 13 ON DC BUS 1-I SPURIOUSLY OPENS
1EEBKR-SO-II-12	3.36E-005	BREAKER 12 ON DC PANEL 1-II SPURIOUSLY OPENS
1EEBKR-SO-II-14	3.36E-005	BREAKER 14 ON DC BUS 1-II SPURIOUSLY OPENS
1EEBKR-SO-III-11	3.36E-005	BREAKER 11 ON DC PANEL 1-III SPURIOUSLY OPENS
1EEBKR-SO-IV-11	3.36E-005	BREAKER 11 ON DC BUS 1-IV SPURIOUSLY OPENS
1EEBKR-SO-IV-9	3.36E-005	BREAKER 9 ON DC PANEL 1-IV SPURIOUSLY OPENS
1EEBKR-SO-J1-B1L	3.36E-005	BREAKER B1L ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-B1R	3.36E-005	BREAKER B1R ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-C1L	3.36E-005	BREAKER C1L ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-E1L	3.36E-005	BREAKER E1L ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-E1R	3.36E-005	BREAKER E1R ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-F3L	3.36E-005	BREAKER F3L ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J1-F3R	3.36E-005	BREAKER F3R ON MCC 1J1-1 SPURIOUSLY OPENS
1EEBKR-SO-J3-B4	3.36E-005	BREAKER B4 ON MCC 1J1-3 SPURIOUSLY OPENS
1EEBKR-SO-VB1-35	3.36E-005	BREAKER 35 ON VITAL BUS 1-I SPURIOUSLY OPENS
1EEBKR-SO-VB2-35	3.36E-005	BREAKER 35 ON VITAL BUS 1-II SPURIOUSLY OPENS
1EEBKR-SO-VB3-12	3.36E-005	BREAKER 12 ON DC BUS 1-III SPURIOUSLY OPENS
1EEBKR-SO-VB3-35	3.36E-005	BREAKER 35 ON VITAL BUS 1-III SPURIOUSLY OPENS
1EEBKR-SO-VB4-35	3.36E-005	BREAKER 35 ON VITAL BUS 1-IV SPURIOUSLY OPENS
1EEBUS-LU-1H	1.21E-005	4160 V BUS 1H LOSS OF FUNCTION 1-EE-SW-1
1EEBUS-LU-1H-480	1.21E-005	480 V BUS 1H LOSS OF FUNCTION 1-EE-SS-1
1EEBUS-LU-1H1	1.21E-005	480 V BUS 1H1 LOSS OF FUNCTION 1-EE-SS-3

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1EEBUS-LU-1H1-1	1.21E-005	480 V MCC 1H1-1 LOSS OF FUNCTION 1-EP-MC-10
1EEBUS-LU-1H1-2N	1.21E-005	480 V MCC 1H1-2N LOSS OF FUNCTION 1-EP-MC-19
1EEBUS-LU-1H1-2S	1.21E-005	480 V MCC 1H1-2S LOSS OF FUNCTION 1-EP-MC-20
1EEBUS-LU-1H1-3	1.21E-005	480 V MCC 1H1-3 LOSS OF FUNCTION 1-EP-MC-32
1EEBUS-LU-1H1-3A	1.21E-005	480 V MCC 1H1-3A LOSS OF FUNCTION 1-EP-MC-50
1EEBUS-LU-1H1-4	1.21E-005	480 V MCC 1H1-4 LOSS OF FUNCTION 1-EP-CB-41
1EEBUS-LU-1HSTUB	1.21E-005	4160 V STUB BUS 1H LOSS OF FUNCTION 1-EE-SW-1
1EEBUS-LU-1J	1.21E-005	4160 V BUS 1J LOSS OF FUNCTION 1-EE-SW-2
1EEBUS-LU-1J-480	1.21E-005	480 V BUS 1J LOSS OF FUNCTION 1-EE-SS-2
1EEBUS-LU-1J1	1.21E-005	480 V BUS 1J1 LOSS OF FUNCTION 1-EE-SS-4
1EEBUS-LU-1J1-1	1.21E-005	480 V MCC 1J1-1 LOSS OF FUNCTION 1-EP-MC-11
1EEBUS-LU-1J1-2	1.21E-005	480V MCC 1J1-2N &2S LOSS OF FUNCTION 1-EP-CB-21 & 22
1EEBUS-LU-1J1-3	1.21E-005	480 V MCC 1J1-3 LOSS OF FUNCTION 1-EP-MC-33
1EEBUS-LU-1J1-3A	1.21E-005	480 V MCC 1J1-3A LOSS OF FUNCTION 1-EP-MC-51
1EEBUS-LU-1JSTUB	1.21E-005	4160 V STUB BUS 1J LOSS OF FUNCTION 1-EE-SW-2
1EEBUS-LU-DB-1A	1.21E-005	SEMI VITAL DIST 1A LOSS OF FUNCTION 1-EP-DB-16A 120 V
1EEBUS-LU-DB-1B	1.21E-005	SEMI VITAL DIST 1B LOSS OF FUNCTION 1-EP-DB-16B 120 V
1EEBUS-LU-DC-I	1.21E-005	125 V DC BUS 1-I LOSS OF FUNCTION 1-EP-CB-12A
1EEBUS-LU-DC-II	1.21E-005	125 V DC BUS 1-II LOSS OF FUNCTION 1-EP-CB-12B
1EEBUS-LU-DC-III	1.21E-005	125 V DC BUS 1-III LOSS OF FUNCTION 1-EP-CB-12C
1EEBUS-LU-DC-IV	1.21E-005	125 V DC BUS 1-IV LOSS OF FUNCTION 1-EP-CB-12D
1EEBUS-LU-SVB-1A	1.21E-005	SEMI VITAL BUS 1A LOSS OF FUNCTION 1-EP-CB-16A 120 V
1EEBUS-LU-SVB-1B	1.21E-005	SEMI VITAL BUS 1B LOSS OF FUNCTION 1-EP-CB-16B 120 V
1EEBUS-LU-SVB-1C	1.21E-005	SEMI VITAL BUS 1C LOSS OF FUNCTION 1-EP-CB-16C 120 V
1EEBUS-LU-VB-I	1.21E-005	120 V VITAL BUS 1-I LOSS OF FUNCTION 1-EP-CB-4A
1EEBUS-LU-VB-II	1.21E-005	120V VITAL BUS 1-II LOSS OF FUNCTION 1-EP-CB-4B
1EEBUS-LU-VB-III	1.21E-005	120 V VITAL BUS III LOSS OF FUNCTION 1-EP-CB-4C
1EEBUS-LU-VB-IV	1.21E-005	120V VITAL BUS 1-IV LOSS OF FUNCTION 1-EP-CB-4D
1EEBUS-UM-1H	1.00E-005	4160 V BUS 1H UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H-480	1.00E-005	480 V BUS 1H UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1	1.00E-005	480 V BUS 1H1 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-1	1.00E-005	480 V MCC 1H1-1 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-2N	2.00E-004	480 V MCC 1H1-2N UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-2S	1.00E-005	480 V MCC 1H1-2S UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-3	2.00E-004	480 V MCC 1H1-3 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-3A	2.00E-004	480 V MCC 1H1-3A UNSCHEDULED MAINTENANCE
1EEBUS-UM-1H1-4	1.00E-005	480 V MCC 1H1-4 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1HSTUB	1.00E-005	4160 V STUB BUS 1H UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J	1.00E-005	4160 V BUS 1J UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J-480	1.00E-005	480 V BUS 1J UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J1	1.00E-005	480 V BUS 1J1 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J1-1	1.00E-005	480 V MCC 1J1-1 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J1-2	1.00E-005	480V MCC 1J1-2N &2S UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J1-3	2.00E-004	480 V MCC 1J1-3 UNSCHEDULED MAINTENANCE
1EEBUS-UM-1J1-3A	2.00E-004	480 V MCC 1J1-3A UNSCHEDULED MAINTENANCE
1EEBUS-UM-1JSTUB	1.00E-005	4160 V STUB BUS 1J UNSCHEDULED MAINTENANCE
1EEBUS-UM-DB-1A	2.00E-004	SEMI VITAL DIST 1A UNSCHEDULED MAINTENANCE
1EEBUS-UM-DB-1B	2.00E-004	SEMI VITAL DIST 1B UNSCHEDULED MAINTENANCE
1EEBUS-UM-DC-I	2.00E-004	125 V DC BUS 1-I UNSCHEDULED MAINTENANCE
1EEBUS-UM-DC-II	2.00E-004	125 V DC BUS 1-II UNSCHEDULED MAINTENANCE
1EEBUS-UM-DC-III	2.00E-004	125 V DC BUS 1-III UNSCHEDULED MAINTENANCE
1EEBUS-UM-DC-IV	2.00E-004	125 V DC BUS 1-IV UNSCHEDULED MAINTENANCE
1EEBUS-UM-SVB-1A	2.00E-004	SEMI VITAL BUS 1A UNSCHEDULED MAINTENANCE
1EEBUS-UM-SVB-1B	2.00E-004	SEMI VITAL BUS 1B UNSCHEDULED MAINTENANCE
1EEBUS-UM-SVB-1C	2.00E-004	SEMI VITAL BUS 1C UNSCHEDULED MAINTENANCE
1EEBUS-UM-VB-I	2.00E-004	120 V VITAL BUS 1-I UNSCHEDULED MAINTENANCE
1EEBUS-UM-VB-II	2.00E-004	120V VITAL BUS 1-II UNSCHEDULED MAINTENANCE
1EEBUS-UM-VB-III	2.00E-004	120 V VITAL BUS III UNSCHEDULED MAINTENANCE
1EEBUS-UM-VB-IV	2.00E-004	120V VITAL BUS 1-IV UNSCHEDULED MAINTENANCE
1EEHS--LF-1C	2.66E-005	HAND SWITCH FOR SEMI VITAL BUS 1C LOSS OF FUNCTION
1EEHS--LF-I	2.66E-005	HAND SWITCH FOR VITAL BUS 1-I FAILS 1-VB-BP-SW-1
1EEHS--LF-II	2.66E-005	HAND SWITCH FOR VITAL BUS 1-II FAILS 1-VB-BP-SW-2
1EEHS--LF-III	2.66E-005	HAND SWITCH FOR VITAL BUS 1-III FAILS 1-VB-BP-SW-3

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1EEHS--LF-IV	2.66E-005	HAND SWITCH FOR VITAL BUS 1-IV FAILS 1-VB-BP-SW-4
1EEINV-LU-I	6.14E-004	INVERTER 1-I LOSS OF FUNCTION 1-VB-1-1
1EEINV-LU-II	6.14E-004	INVERTER 1-II LOSS OF FUNCTION 1-VB-1-2
1EEINV-LU-III	6.14E-004	INVERTER 1-III LOSS OF FUNCTION 1-VB-1-3
1EEINV-LU-IV	6.14E-004	INVERTER 1-IV LOSS OF FUNCTION 1-VB-1-4
1EETFM-LP-118	1.90E-005	TRANSFORMER 118 SEMI VITAL DIST 1A 480-120/240V 15KVA
1EETFM-LP-119	1.90E-005	TRANSFORMER 119 SEMI VITAL DIST 1B 480-120/240V 15KVA
1EETFM-LP-1H	1.90E-005	TRANSFORMER 1H 4160/480 V FAILS 1-EE-ST-1H
1EETFM-LP-1H1	1.90E-005	TRANSFORMER 1H1 4160/480 V FAILS 1-EE-ST-1H1
1EETFM-LP-1J	1.90E-005	TRANSFORMER 1J 4160/480 V FAILS 1-EE-ST-1J
1EETFM-LP-1J1	1.90E-005	TRANSFORMER 1J1 4160/480 V FAILS 1-EE-ST-1J1
1EETFM-LP-70	1.90E-005	TRANSFORMER 70 SEMI VITAL BUS 1A 480-120/240V 15KVA
1EETFM-LP-71	1.90E-005	TRANSFORMER 71 SEMI VITAL BUS 1B 480-120/240V 15KVA
1EETFM-LP-79A	1.90E-005	TRANSFORMER 79A 480/120V 1PH FAILS 10KVA VOLT REG
1EETFM-LP-79B	1.90E-005	TRANSFORMER 79B 480/120V 1PH FAILS 10KVA VOLT REG
1EETFM-LP-80	1.90E-005	TRANSFORMER 80 480/120V 1PH FAILS 15KVA VOLT REGULATE
1EETFM-LP-93	1.90E-005	TRANSFORMER 93 SEMI VITAL BUS 1C 480/120-240V 10KVA
1EGEDG-CC-1H-1J	2.66E-004	COMMON CAUSE FAULTS EDGS 1H AND 1J
1EGEDG-CC-1H-2H	2.66E-004	COMMON CAUSE FAULTS EDGS 1H AND 2H
1EGEDG-CC-1H-2J	2.66E-004	COMMON CAUSE FAULTS EDGS 1H AND 2J
1EGEDG-CC-1H1J2H	9.58E-005	COMMON CAUSE FAULTS EDGS 1H, 1J AND 2H
1EGEDG-CC-1H1J2J	9.58E-005	COMMON CAUSE FAULTS EDGS 1H, 1J AND 2J
1EGEDG-CC-1H2H2J	9.58E-005	COMMON CAUSE FAULTS EDGS 1H, 2H AND 2J
1EGEDG-CC-1J-2H	2.66E-004	COMMON CAUSE FAULTS EDGS 1J AND 2H
1EGEDG-CC-1J-2J	2.66E-004	COMMON CAUSE FAULTS EDGS 1J AND 2J
1EGEDG-CC-1J2H2J	9.58E-005	COMMON CAUSE FAULTS EDGS 1J, 2H AND 2J
1EGEDG-CC-ALL	6.09E-005	COMMON CAUSE FAULTS ALL EDGS
1EGEDG-FR-1H	1.33E-002	EMERGENCY DIESEL GENERATOR 1H FAILS TO RUN FOR 6 HOURS
1EGEDG-FR-1J	1.33E-002	EMERGENCY DIESEL GENERATOR 1J FAILS TO RUN FOR 6 HOURS
1EGEDG-FR-AAC	1.33E-002	ALTERNATE AC DIESEL GENERATOR FAILS TO RUN
1EGEDG-FS-1H	1.43E-002	EMERGENCY DIESEL GENERATOR 1H FAILS TO START
1EGEDG-FS-1J	1.43E-002	EMERGENCY DIESEL GENERATOR 1J FAILS TO START
1EGEDG-FS-AAC	2.41E-002	ALTERNATE AC DIESEL GENERATOR FAILS TO START
1EGEDG-TM-1H	5.71E-004	EDG 1H UNAVAILABLE DUE TO SCHEDULED TEST OR MAINTENANCE
1EGEDG-TM-1J	5.71E-004	EDG 1J UNAVAILABLE DUE TO SCHEDULED TEST OR MAINTENANCE
1EGEDG-TM-AAC	1.00E-002	ALTERNATE AC DIESEL UNAVAIL DUE TO SCHD TEST OR MAINTENANCE
1EGEDG-UM-1H	1.78E-002	EDG 1H UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE
1EGEDG-UM-1J	1.78E-002	EDG 1J UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE
1EGEDG-UM-AAC	1.00E-002	ALTERNATE AC DIESEL UNAVAIL DUE TO UNSCHED MAINTENANCE
1EP-LOOP-24	3.12E-004	LOSS OF OFFSITE POWER WITHIN 24 HRS OF REACTOR TRIP
1EPBAT-LP-AAC-DG	1.50E-005	BATTERY FOR ALTERNATE AC DIESEL GENERATOR FAILS
1EPBKR-FC-15A2	1.83E-003	BREAKER 15A2 FAILS CLOSED, WILL NOT OPEN 4160 V
1EPBKR-FC-15B2	1.83E-003	BREAKER 15B2 FAILS CLOSED, WILL NOT OPEN 4160 V
1EPBKR-FC-15C2	1.83E-003	BREAKER 15C2 FAILS CLOSED, WILL NOT OPEN 4160 V
1EPBKR-FC-15F1	1.83E-003	BREAKER 15F1 FAILS CLOSED, WILL NOT OPEN 4160 V
1EPBKR-FC-G12	1.83E-003	BREAKER G12 FAILS CLOSED, WILL NOT REOPEN 22 KV
1EPBKR-FO-14A1-8	2.74E-004	BREAKER 14A1-8 FAILS OPEN, WILL NOT CLOSE 480 V
1EPBKR-FO-14B1-8	2.74E-004	BREAKER 14B1-8 FAILS OPEN, WILL NOT CLOSE 480 V
1EPBKR-FO-14C1-8	2.74E-004	BREAKER 14C1-8 FAILS OPEN, WILL NOT CLOSE 480 V
1EPBKR-FO-15A1	2.74E-004	BREAKER 15A1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15A2	2.74E-004	BREAKER 15A2 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15B1	2.74E-004	BREAKER 15B1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15B11	2.74E-004	BREAKER 15B11 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15B2	2.74E-004	BREAKER 15B2 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15C1	2.74E-004	BREAKER 15C1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15C2	2.74E-004	BREAKER 15C2 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15D3	2.74E-004	BREAKER 15D3 FAILS OPEN WILL NOT RECLOSE
1EPBKR-FO-15E3	2.74E-004	BREAKER 15E3 FAILS OPEN WILL NOT RECLOSE
1EPBKR-FO-15F3	2.74E-004	BREAKER 15F3 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15F4	2.74E-004	BREAKER 15F4 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-15H1	2.74E-004	BREAKER 15H1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC11A	2.74E-004	BREAKER 1A ON AAC 1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC11B	2.74E-004	BREAKER 1B ON AAC 1 FAILS OPEN, WILL NOT CLOSE 4160 V

Event	Unavailability	Description
1EPBKR-FO-AAC12B	2.74E-004	BREAKER 2B ON AAC 1 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC21A	2.74E-004	BREAKER 1A ON AAC 2 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC3-1	2.74E-004	BREAKER 1 ON AAC #3 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC3-4	2.74E-004	BREAKER 4 ON AAC #3 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-FO-AAC3-5	2.74E-004	BREAKER 5 ON AAC #3 FAILS OPEN, WILL NOT CLOSE 4160 V
1EPBKR-SO-142	3.36E-005	BREAKER 142 SPURIOUSLY OPENS 34.5 KV
1EPBKR-SO-14A1-1	3.36E-005	BREAKER 14A1-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14A215	3.36E-005	BREAKER 14A2-15 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14A3-1	3.36E-005	BREAKER 14A3-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14B1-1	3.36E-005	BREAKER 14B1-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14B215	3.36E-005	BREAKER 14B2-15 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14B3-1	3.36E-005	BREAKER 14B3-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14C1-1	3.36E-005	BREAKER 14C1-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14C215	3.36E-005	BREAKER 14C2-15 SPURIOUSLY OPENS 480 V
1EPBKR-SO-14G2-4	3.36E-005	BREAKER 14G2-4 SPURIOUSLY OPENS 480 V
1EPBKR-SO-15A1	3.36E-005	BREAKER 15A1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15A7	3.36E-005	BREAKER 15A7 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15A8	3.36E-005	BREAKER 15A8 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15B1	3.36E-005	BREAKER 15B1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15B10	3.36E-005	BREAKER 15B10 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15B7	3.36E-005	BREAKER 15B7 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15C1	3.36E-005	BREAKER 15C1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15C7	3.36E-005	BREAKER 15C7 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15D1	3.36E-005	BREAKER 15D1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15D3	3.36E-005	BREAKER 15D3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15E1	3.36E-005	BREAKER 15E1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15E3	3.36E-005	BREAKER 15E3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15F1	3.36E-005	BREAKER 15F1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15F3	3.36E-005	BREAKER 15F3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15F4	3.36E-005	BREAKER 15F4 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15G1	3.36E-005	BREAKER 15G1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15G4	3.36E-005	BREAKER 15G4 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15G5	3.36E-005	BREAKER 15G5 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-15J12	3.36E-005	BREAKER 15J12 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-1G11A3	3.36E-005	BREAKER A3 ON 1G1-1 SPURIOUSLY OPENS 480 V
1EPBKR-SO-1G3-3B	3.36E-005	BREAKER 3B ON 1G3 SPURIOUSLY OPENS 480 V
1EPBKR-SO-242	3.36E-005	BREAKER 242 SPURIOUSLY OPENS 34.5 KV
1EPBKR-SO-332	3.36E-005	BREAKER 332 SPURIOUSLY OPENS 34.5 KV
1EPBKR-SO-AAC11A	3.36E-005	BREAKER 1A ON ACC 1 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-AAC21A	3.36E-005	BREAKER 1A ON AAC 2 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-AAC3-1	8.39E-006	BREAKER 1 ON AAC #3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-AAC3-4	3.36E-005	BREAKER 4 ON AAC #3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-AAC3-5	3.36E-005	BREAKER 5 ON AAC #3 SPURIOUSLY OPENS 4160 V
1EPBKR-SO-G102	3.36E-005	BREAKER G102 SPURIOUSLY OPENS 500 KV
1EPBKR-SO-G1TH5	3.36E-005	BREAKER G1TH5 SPURIOUSLY OPENS 500 KV
1EPBKR-SO-H502	3.36E-005	BREAKER H502 SPURIOUSLY OPENS 500 KV
1EPBKR-SO-L102	3.36E-005	BREAKER L102 SPURIOUSLY OPENS 34.5 KV
1EPBKR-SO-L202	3.36E-005	BREAKER L202 SPURIOUSLY OPENS 34.5 KV
1EPBUS-LU-1	1.21E-005	500 KV BUS #1 LOSS OF FUNCTION
1EPBUS-LU-1A	1.21E-005	4160 V BUS 1A LOSS OF FUNCTION 1-EP-SW-1
1EPBUS-LU-1A1	1.21E-005	480 V BUS 1A1 LOSS OF FUNCTION 1-EP-SS-3
1EPBUS-LU-1A2	1.21E-005	480 V BUS 1A2 LOSS OF FUNCTION 1-EP-SS-6
1EPBUS-LU-1A3	1.21E-005	480 V BUS 1A3 LOSS OF FUNCTION 1-EP-SS-10
1EPBUS-LU-1B	1.21E-005	4160 V BUS 1B LOSS OF FUNCTION 1-EP-SW-2
1EPBUS-LU-1B1	1.21E-005	480 V BUS 1B1 LOSS OF FUNCTION 1-EP-SS-5
1EPBUS-LU-1B2	1.21E-005	480 V BUS 1B2 LOSS OF FUNCTION 1-EP-SS-8
1EPBUS-LU-1B3	1.21E-005	480 V BUS 1B3 LOSS OF FUNCTION 1-EP-SS-9
1EPBUS-LU-1C	1.21E-005	4160 V BUS 1C LOSS OF FUNCTION 1-EP-SW-3
1EPBUS-LU-1C1	1.21E-005	480 V BUS 1C1 LOSS OF FUNCTION 1-EP-SS-7
1EPBUS-LU-1C2	1.21E-005	480 V BUS 1C2 LOSS OF FUNCTION 1-EP-SS-4
1EPBUS-LU-1D	1.21E-005	4160 V TRANSFER BUS 1D, 1-EP-SW-7 LOSS OF FUNCTION
1EPBUS-LU-1E	1.21E-005	4160 V TRANSFER BUS 1E, 1-EP-SW-8 LOSS OF FUNCTION
1EPBUS-LU-1F	1.21E-005	4160 V TRANSFER BUS 1F, 1-EP-SW-9 LOSS OF FUNCTION

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1EPBUS-LU-1G	1.21E-005	4160V INTAKE BUS 1G LOSS OF FUNCTION 1-EP-SW-4
1EPBUS-LU-1G1-1	1.21E-005	480 V MCC 1G1-1 LOSS OF FUNCTION 1-EP-MC-34 & 35
1EPBUS-LU-1G2	1.21E-005	480 V BUS 1G2 LOSS OF FUNCTION 1-EP-SS-11
1EPBUS-LU-1G3	1.21E-005	480 V BUS 1G3 LOSS OF FUNCTION 1-EP-SS-12
1EPBUS-LU-2	1.21E-005	500 KV BUS #2 LOSS OF FUNCTION
1EPBUS-LU-3	1.21E-005	34.5 KV BUS #3 LOSS OF FUNCTION
1EPBUS-LU-4	1.21E-005	34.5 KV BUS #4 LOSS OF FUNCTION
1EPBUS-LU-AAC-1	1.21E-005	4160 V AAC BUS #1 LOSS OF FUNCTION
1EPBUS-LU-AAC-2	1.21E-005	4160 V AAC BUS #2 LOSS OF FUNCTION
1EPBUS-LU-AAC-3	1.21E-005	4160 V AAC BUS #3 LOSS OF FUNCTION
1EPBUS-UM-1	2.00E-004	500 KV BUS #1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1A1	2.00E-004	480 V BUS 1A1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1A2	2.00E-004	480 V BUS 1A2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1A3	2.00E-004	480 V BUS 1A3 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1B1	2.00E-004	480 V BUS 1B1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1B2	2.00E-004	480 V BUS 1B2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1B3	2.00E-004	480 V BUS 1B3 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1C1	2.00E-004	480 V BUS 1C1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1C2	2.00E-004	480 V BUS 1C2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1D	2.00E-004	4160 V TRANSFER BUS 1D UNSCHEDULED MAINTENANCE
1EPBUS-UM-1E	2.00E-004	4160 V TRANSFER BUS 1E UNSCHEDULED MAINTENANCE
1EPBUS-UM-1F	2.00E-004	4160 V TRANSFER BUS 1F UNSCHEDULED MAINTENANCE
1EPBUS-UM-1G1-1	2.00E-004	480 V MCC 1G1-1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1G2	2.00E-004	480 V BUS 1G2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-1G3	2.00E-004	480 V BUS 1G3 UNSCHEDULED MAINTENANCE
1EPBUS-UM-2	2.00E-004	500 KV BUS #2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-3	2.00E-004	34.5 KV BUS #3 UNSCHEDULED MAINTENANCE
1EPBUS-UM-4	2.00E-004	34.5 KV BUS #4 UNSCHEDULED MAINTENANCE
1EPBUS-UM-AAC-1	2.00E-004	4160 V AAC BUS #1 UNSCHEDULED MAINTENANCE
1EPBUS-UM-AAC-2	2.00E-004	4160 V AAC BUS #2 UNSCHEDULED MAINTENANCE
1EPBUS-UM-AAC-3	2.00E-004	4160 V AAC BUS #3 UNSCHEDULED MAINTENANCE
1EPTFM-LP-1	1.90E-005	TRANSFORMER #1 FAILS TO SUPPLY PWR 500/34.5 KV
1EPTFM-LP-1A1	1.90E-005	TRANSFORMER 1A1 4160/480 V FAILS
1EPTFM-LP-1A2	1.90E-005	TRANSFORMER 1A2 4160/480 V FAILS
1EPTFM-LP-1A3	1.90E-005	TRANSFORMER 1A3 4160/480 V FAILS
1EPTFM-LP-1B1	1.90E-005	TRANSFORMER 1B1 4160/480 V FAILS
1EPTFM-LP-1B2	1.90E-005	TRANSFORMER 1B2 4160/480 V FAILS
1EPTFM-LP-1B3	1.90E-005	TRANSFORMER 1B3 4160/480 V FAILS
1EPTFM-LP-1C1	1.90E-005	TRANSFORMER 1C1 4160/480 V FAILS
1EPTFM-LP-1C2	1.90E-005	TRANSFORMER 1C2 4160/480 V FAILS
1EPTFM-LP-1G1-1	1.90E-005	TRANSFORMER 1G1-1 4160/480 V FAILS 1-EP-ST-1G1
1EPTFM-LP-1G2	1.90E-005	TRANSFORMER 1G2 4160/480 V FAILS 1-EP-ST-1G2
1EPTFM-LP-1G3	1.90E-005	TRANSFORMER 1G3 4160/480 V FAILS 1-EP-ST-1G3
1EPTFM-LP-2	1.90E-005	TRANSFORMER #2 FAILS TO SUPPLY PWR 500/34.5 KV
1EPTFM-LP-MAIN	1.90E-005	MAIN TRANSFORMER 500/22 KV FAILS
1EPTFM-LP-RSST-A	1.90E-005	RESERVE STATION SER TRANSFORMER A 34.5/4.16 KV FAILS
1EPTFM-LP-RSST-B	1.90E-005	RESERVE STATION SER TRANSFORMER B 34.5KV/4160V FAILS
1EPTFM-LP-RSST-C	1.90E-005	RESERVE STATION SER TRANSFORMER C 34.5KV/4160V FAILS
1EPTFM-LP-SST-1A	1.90E-005	STATION SERVICE TRANSFORMER 1A FAILS 22/4.16 KV
1EPTFM-LP-SST-1B	1.90E-005	STATION SERVICE TRANSFORMER 1B FAILS 22/4.16 KV
1EPTFM-LP-SST-1C	1.90E-005	STATION SERVICE TRANSFORMER 1C FAILS 22/4.16 KV
1FPDDP-FR-P2	1.90E-002	DIESEL DRIVEN PUMP FAILS TO RUN 1-FP-P-2
1FPDDP-FS-P2	2.05E-002	DIESEL DRIVEN PUMP FAILS TO START 1-FP-P-2
1FPMV--PG-1FP93	1.16E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FP-93
1FPPSB-FR-P1	7.93E-004	MD STNDBY PUMP FAILS TO RUN 1-FP-P-1
1FPPSB-FS-P1	3.93E-003	MD STNDBY PUMP FAILS TO START 1-FP-P-1
1FW-ACT-MFWP-A	2.66E-004	NO TRIP SIGNAL TO MFW PUMPS SI - TRAIN A
1FW-ACT-MFWP-B	2.66E-004	NO TRIP SIGNAL TO MFW PUMPS SI - TRAIN B
1FW-CONDHOTWELL	2.66E-006	INSUFFICIENT INVENTORY IN THE CONDENSER HOTWELLS
1FW-FIREMAIN	1.00E+000	INSUFFICIENT WATER MAKEUP FROM THE FIRE MAIN
1FW-SW-MAKEUP	1.00E+000	INSUFFICIENT WATER MAKEUP FROM SERVICE WATER SYSTEM
1FWBKR-FC-15A5	1.83E-003	BREAKER 15A5 FAILS CLOSED, WILL NOT OPEN
1FWBKR-FC-15A6	1.83E-003	BREAKER 15A6 FAILS CLOSED, WILL NOT OPEN

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1FWBKR-FC-15B5	1.83E-003	BREAKER 15BE FAILS CLOSED, WILL NOT OPEN
1FWBKR-FC-15C5	1.83E-003	BREAKER 15C5 FAILS CLOSED, WILL NOT OPEN
1FWCKV-CC-125127	6.34E-005	CCF 2/2 FC CHECK VALVES 1-FW-125,-127
1FWCKV-CC-477911	6.34E-005	CCF 3/3 FC CHECK VALVES 1-FW-47,79,111
1FWCKV-CC-616379	6.34E-005	CCF 3/3 FC CHECK VALVES 1-FW-61,63,279
1FWCKV-CC-9395	6.34E-005	CCF 2/2 CHECK VALVES 1-FW-93,-95
1FWCKV-CC-ALLAFW	6.34E-005	COMMON CAUSE FAULT AFW PUMP & DISCH HEADER CKVS - FC
1FWCKV-FC-1FW1	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-1
1FWCKV-FC-1FW10	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-10
1FWCKV-FC-1FW100	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-100
1FWCKV-FC-1FW111	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-111
1FWCKV-FC-1FW125	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-125
1FWCKV-FC-1FW127	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-127
1FWCKV-FC-1FW132	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-132
1FWCKV-FC-1FW148	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-148
1FWCKV-FC-1FW165	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-165
1FWCKV-FC-1FW183	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-183
1FWCKV-FC-1FW19	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-19
1FWCKV-FC-1FW210	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-210
1FWCKV-FC-1FW279	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-279
1FWCKV-FC-1FW47	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-47
1FWCKV-FC-1FW61	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-61
1FWCKV-FC-1FW63	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-63
1FWCKV-FC-1FW68	6.34E-004	CHECK VALVE FAILS TO OPEN 1-FW-68
1FWCKV-FC-1FW79	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-79
1FWCKV-FC-1FW93	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-93
1FWCKV-FC-1FW95	6.34E-004	CHECK VALVE FAILS CLOSED 1-FW-95
1FWCKV-LEAKAGE	1.00E-005	UNDETECTED LKG THRU CKVS 68, 100 & 132 -STEAM BINDING
1FWFCV-CC-788898	1.81E-003	CCF 3/3 FC CCF - FW REG VALVES FCV-1478/1488/1498
1FWFCV-CC-798999	1.81E-003	CCF 3/3 FAILS CLOSED 1-FW-FCV-1479/89/99
1FWFCV-FC-1478	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1478
1FWFCV-FC-1479	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1479
1FWFCV-FC-1488	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1488
1FWFCV-FC-1489	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1489
1FWFCV-FC-1498	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1498
1FWFCV-FC-1499	1.81E-002	FLOW CONTROL VALVE FAILS CLOSED 1-FW-FCV-1499
1FWHCV-FC-100A	1.81E-002	AOV OP HAND CNT VLV FAILS CLOSED 1-FW-HCV-100A
1FWHCV-FC-100B	1.81E-002	AOV OP HAND CNT VLV FAILS CLOSED 1-FW-HCV-100B
1FWHCV-FO-100C	1.81E-002	AOV OP HAND CNT VLV FAILS OPEN 1-FW-HCV-100C
1FWHCV-PG-100C	1.37E-004	HAND CONTROLLED VLV TRSFR CLSD -PLUGGED 1-FW-HCV-100C
1FWHEP-1FW543	7.50E-004	CRO LEAVES 1-FW-P-2 RECIRC VALVE OPEN TO ECST, 1-FW-543
1FWHEP-1FW546	7.50E-004	CRO LEAVES FW-P-3B RECIRC VALVE OPEN TO ECST, 1-FW-546
1FWHEP-1FW548	7.50E-004	CRO LEAVES FW-P-3A RECIRC VALVE OPEN TO ECST, 1-FW-458
1FWHEP-HCV-100C	7.50E-004	AFW PUMP 3A NOT ALIGNED TO S/G C HCV HEADER HCV-100C
1FWHEP-MOV-100B	7.50E-004	AFW PUMP 3B NOT ALIGNED TO S/G B MOV HEADER MOV-100B
1FWHEP-MOV-100D	7.50E-004	AFW PUMP 2 NOT ALIGNED TO S/G A MOV HEADER MOV-100D
1FWLIC-CC-SGLEV	4.64E-004	2/3 SG NARROW RANGE LEVEL INST CHAN CCF QUARTERLY TEST INTR
1FWLIC-LF-1475	4.63E-003	LEVEL INST CHANNEL 1475 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1476	4.63E-003	LEVEL INST CHANNEL 1476 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1484	4.63E-003	LEVEL INST CHANNEL 1484 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1485	4.63E-003	LEVEL INST CHANNEL 1485 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1486	4.63E-003	LEVEL INST CHANNEL 1486 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1494	4.63E-003	LEVEL INST CHANNEL 1494 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1495	4.63E-003	LEVEL INST CHANNEL 1495 TO AMSAC FAILS DURING STANDBY
1FWLIC-LF-1496	4.63E-003	LEVEL INST CHANNEL 1496 TO AMSAC FAILS DURING STANDBY
1FWMOV-CC-150ABC	3.90E-004	CCF - 3/3 FC 1-FW-MOV-150A/B/C
1FWMOV-FC-100C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-FW-MOV-100C
1FWMOV-FC-150A	1.09E-002	MOTOR OPERATED VALVE FAILS CLOSED 1-FW-MOV-150A
1FWMOV-FC-150B	1.09E-002	MOTOR OPERATED VALVE FAILS CLOSED 1-FW-MOV-150B
1FWMOV-FC-150C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-FW-MOV-150C
1FWMOV-FO-154C	1.09E-002	MOTOR OPERTD VALVE FAILS OPEN 1-FW-MOV-154C
1FWMOV-PG-100A	1.37E-004	MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-100A
1FWMOV-PG-100B	1.37E-004	MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-100B

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1FWMOV-PG-1000	1.37E-004	MOTOR OPERTD VALVE TRSFR CLSD -PLUGGED 1-FW-MOV-1000
1FWMV--CC-AFWMKU	1.25E-005	CCF - 3/3 MANUAL VALVES FAIL TO OPEN 1-FW-145,-162,-180
1FWMV--FC-1FW126	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-126
1FWMV--FC-1FW142	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-142
1FWMV--FC-1FW145	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-145
1FWMV--FC-1FW149	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-149
1FWMV--FC-1FW155	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-155
1FWMV--FC-1FW162	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-162
1FWMV--FC-1FW166	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-166
1FWMV--FC-1FW175	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-175
1FWMV--FC-1FW180	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-180
1FWMV--FC-1FW190	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-190
1FWMV--FC-1FW227	1.25E-004	MANUAL VALVE FAILS TO OPEN 1-FW-227
1FWMV--FC-1FW62	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-62
1FWMV--FC-1FW64	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-64
1FWMV--FC-1FW96	1.25E-004	MANUAL VALVE FAILS CLOSED 1-FW-96
1FWMV--FO-1FW128	1.25E-004	MANUAL VALVE FAILS OPEN 1-FW-128
1FWMV--PG-1FW112	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-112
1FWMV--PG-1FW113	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-113
1FWMV--PG-1FW128	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-128
1FWMV--PG-1FW143	4.65E-005	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-143
1FWMV--PG-1FW160	4.65E-005	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-160
1FWMV--PG-1FW172	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-172
1FWMV--PG-1FW173	4.65E-005	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-173
1FWMV--PG-1FW184	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-184
1FWMV--PG-1FW278	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-278
1FWMV--PG-1FW48	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-48
1FWMV--PG-1FW49	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-49
1FWMV--PG-1FW80	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-80
1FWMV--PG-1FW81	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-81
1FWMV--PG-1FW94	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-FW-94
1FWPAT-FR-1FWP1A	7.93E-004	MD ALT PUMP FAILS TO RUN 1-FW-P-1A
1FWPAT-FR-1FWP1B	7.93E-004	MD ALT PUMP FAILS TO RUN 1-FW-P-1B
1FWPAT-FR-1FWP1C	7.93E-004	MD ALT PUMP FAILS TO RUN 1-FW-P-1C
1FWPAT-FS-1FWP1A	1.98E-003	MD ALT PUMP FAILS TO START 1-FW-P-1A
1FWPAT-FS-1FWP1B	1.98E-003	MD ALT PUMP FAILS TO START 1-FW-P-1B
1FWPAT-FS-1FWP1C	1.98E-003	MD ALT PUMP FAILS TO START 1-FW-P-1C
1FWPAT-OIL1FWP1A	7.93E-004	MAIN FEED PUMP LUBE OIL SYS. FAILS 1-FW-P-1A
1FWPAT-OIL1FWP1B	7.93E-004	MAIN FEED PUMP LUBE OIL SYS. FAILS 1-FW-P-1B
1FWPAT-OIL1FWP1C	2.79E-003	MAIN FEED PUMP LUBE OIL SYS FAILED 1-FW-P-1C
1FWPAT-TM-1FWP1C	3.75E-003	MD ALT PUMP 1-FW-P-1C SCHLD TST & MAINT.
1FWPAT-UM-1FWP1C	3.75E-003	MD ALT PUMP 1-FW-P-1C UNSCHLD MAINT.
1FWPCV-CC-159AB	1.37E-005	CCF 2/2 FC 1-FW-PCV-159A & 1-FW-PCV-159B
1FWPCV-PG-159A	1.37E-004	PRESSURE CNTL VALVE TRSFR CLSD -PLUGGED 1-FW-PCV-159A
1FWPCV-PG-159B	1.37E-004	PRESSURE CNTL VALVE TRSFR CLSD -PLUGGED 1-FW-PCV-159B
1FWPSB-ACT2A	1.00E-007	NO SIGNAL FROM LO LO WATER LEVEL ON 2/3 SG - TRAIN A
1FWPSB-ACT2B	1.00E-007	NO SIGNAL FROM LO LO WATER LEVEL ON 2/3 SG - TRAIN B
1FWPSB-ACT3A	1.00E-007	NO SIGNAL FROM LO LO WATER LEVEL ON 1/3 SG - RPS(A)
1FWPSB-ACT3B	1.00E-007	NO SIGNAL FROM LO LO WATER LEVEL IN 1/3 SG - RPS(B)
1FWPSB-CC-MDP3AB	1.42E-004	CCF 2/2 FS MDP - COMMON CAUSE FAILURE
1FWPSB-FR-1HRP3A	3.30E-005	MD PUMP -STNDBY SYS FAILS TO RUN - 1 HR 1-FW-P-3A
1FWPSB-FR-1HRP3B	3.30E-005	MD PUMP -STNDBY SYS FAILS TO RUN - 1 HR 1-FW-P-3B
1FWPSB-FR-24HP3A	7.93E-004	MD PUMP -STNDBY SYS FAILS TO RUN -24 HR 1-FW-P-3A
1FWPSB-FR-24HP3B	7.93E-004	MD PUMP -STNDBY SYS FAILS TO RUN -24HR 1-FW-P-3B
1FWPSB-FS-1FWP3A	1.58E-003	MD PUMP -STNDBY SYS FAILS TO START 1-FW-P-3A
1FWPSB-FS-1FWP3B	1.58E-003	MD PUMP -STNDBY SYS FAILS TO START 1-FW-P-3B
1FWPSB-TM-1FWP3A	1.40E-003	MD PUMP -STDBY SYS SCHLD TEST&MAINTNCE 1-FW-P-3A
1FWPSB-TM-1FWP3B	1.40E-003	MD PUMP -STDBY SYS SCHLD TEST&MAINTNCE 1-FW-P-3B
1FWPSB-UM-1FWP3A	5.18E-003	MD STNDBY PUMP UNSCHDL MAINT. 1-FW-P-3A
1FWPSB-UM-1FWP3B	5.18E-003	MD STNDBY PUMP UNSCHDL MAINT. 1-FW-P-3B
1FWRLY-LF-1474	2.66E-004	AMSAC INPUT RELAY FROM LIC 1474 LOSS OF FUNCTION
1FWRLY-LF-1475	2.66E-004	AMSAC INPUT RELAY FROM LIC 1475 LOSS OF FUNCTION
1FWRLY-LF-1476	2.66E-004	AMSAC INPUT RELAY FROM LIC 1476 LOSS OF FUNCTION

Event	Unavailability	Description
1FWRLY-LF-1484	2.66E-004	AMSAC INPUT RELAY FROM LIC 1484 LOSS OF FUNCTION
1FWRLY-LF-1485	2.66E-004	AMSAC INPUT RELAY FROM LIC 1485 LOSS OF FUNCTION
1FWRLY-LF-1486	2.66E-004	AMSAC INPUT RELAY FROM LIC 1486 LOSS OF FUNCTION
1FWRLY-LF-1494	2.66E-004	AMSAC INPUT RELAY FROM LIC 1494 LOSS OF FUNCTION
1FWRLY-LF-1495	2.66E-004	AMSAC INPUT RELAY FROM LIC 1495 LOSS OF FUNCTION
1FWRLY-LF-1496	2.66E-004	AMSAC INPUT RELAY FROM LIC 1496 LOSS OF FUNCTION
1FWRLY-LF-3-EA01	2.66E-004	RELAY 3-1FWEA01 FAILS CAUSING LOSS OF AFW P3A ACT.
1FWRLY-LF-3-EB01	2.66E-004	RELAY 3-1FWEB01 FAILS CAUSING LOSS OF AFW P3B ACT.
1FWRLY-LF-62EA01	2.66E-004	RELAY 62-1FWEA01 FAILS FAILING AUTO ACTUATION OF P3A
1FWRLY-LF-62EB01	2.66E-004	RELAY 62-1FWEB01 FAILS FAILING AUTO ACTUATION OF P3B
1FWTRB-FR-12HP2	5.74E-002	TURBINE DRIVEN PUMP FAILS TO RUN - 12HR 1-FW-P-2
1FWTRB-FR-1HRP2	4.92E-003	TURBINE DRIVEN PUMP FAILS TO RUN - 1HR 1-FW-P-2
1FWTRB-FR-24HP2	1.12E-001	TURBINE DRIVEN PUMP FAILS TO RUN -24HR 1-FW-P-2
1FWTRB-FS-1FWP2	1.85E-002	TURBINE DRIVEN PUMP FAILS TO START 1-FW-P-2
1FWTRB-TM-1FWP2	1.40E-003	TURBINE-DRIVEN PUMP SCHLD TST & MAINT. 1-FW-P-2
1FWTRB-UM-1FWP2	1.37E-002	TURBINE-DRIVEN PUMP UNSCHLD MAINT. 1-FW-P-2
1HVACU-LF-1HVAC6	3.42E-005	OPER AHU 1-HV-AC-6 LOSS OF FUNCTION IN 24 HR MISSION
1HVACU-LF-1VHAC7	2.09E-004	STDBY AHU 1-HV-AC-7 LOSS OF FUNCTION IN 24 HR MISSION
1HVACU-UM-1HVAC7	1.65E-003	STDBY AHU 1-HV-AC-7 UNSCHEDULED MAINTENANCE
1HVCHU-CC-HVE4	4.55E-003	COMMON CAUSE FAULT 1-HV-E-4B & 4C FAIL TO START
1HVCHU-FR-1HVE4A	1.51E-003	OPERATING 1-HV-E-4A FAILS TO RUN FOR 24 HOUR MISSION
1HVCHU-FR-1HVE4B	1.51E-003	SPARE 1-HV-E-4B FAILS TO RUN FOR 24 HOUR MISSION
1HVCHU-FR-1HVE4C	1.51E-003	STANDBY 1- HV-E-4C FAILS TO RUN FOR 24 HOUR MISSION
1HVCHU-FS-1HVE4B	4.55E-002	SPARE CHILLER 1-HV-E-4B FAILS TO START
1HVCHU-FS-1HVE4C	4.55E-002	STANDBY CHILLER 1-HV-E-4C FAILS TO START
1HVCHU-UM-1HVE4B	9.44E-002	SPARE 1-HV-E-4B CHILLER TRAIN UNSCHED MAINTENANCE
1HVCHU-UM-1HVE4C	9.44E-002	STANDBY 1-HV-E-4C CHILLER TRAIN UNSCHED MAINTENANCE
1HVCHU-UM-HVE4BC	2.26E-003	1-HV-E-4B & 4C DUAL CHILLER TRAIN UNSCHED MAINTENANCE
1HVCKV-CC-182209	6.34E-005	COMMON CAUSE FAULT CKVS 1-CD-182 & 209 FAILS CLOSED
1HVFAN-FR-1FMO6	1.36E-004	OPER AHU 1-HV-AC-6 FAN MOTOR FAILS TO RUN 24 HR MISSION
1HVFAN-FR-1FMO7	1.36E-004	STDBY AHU 1-HV-AC-7 FAN MOTOR FAILS TO RUN 24 HR MISSION
1HVFAN-FS-1FMO7	3.93E-003	STDBY AHU 1-HV-AC-7 FAN MOTOR FAILS TO START
1HVMOD-FC-MOD138	1.09E-002	STDBY AHU 1-HV-AC-7 1-HV-MOD-138 FAILS CLOSED
1HVMOD-FO-MOD137	1.09E-002	AIR FLOW DIVERSION 1-HV-MOD-137 FAILS OPEN
1HVMOD-SC-MOD137	1.21E-005	OPER AHU 1-HV-AC-6 1-HV-MOD-137 SPURIOUS CLOSURE
1HVMOD-SC-MOD138	1.21E-005	STDBY AHU 1-HV-AC-7 1-HV-MOD-138 SPURIOUS CLOSURE
1HVMOV-CC-HV111	3.90E-004	COMMON CAUSE FAULT 1-HV-MOV-111B & 111C FAIL CLOSED
1HVMOV-CC-HV113	3.90E-004	COMMON CAUSE FAULT 1-HV-MOV-113B & 113C FAIL CLOSED
1HVMOV-FC-111B	1.09E-002	MOTOR OPERATD VALVE 1-HV-MOV-111B FAILS CLOSED
1HVMOV-FC-111C	1.09E-002	MOTOR OPERATD VALVE 1-HV-MOV-111C FAILS CLOSED
1HVMOV-FC-113B	1.09E-002	MOTOR OPERATD VALVE 1-HV-MOV-113B FAILS CLOSED
1HVMOV-FC-113C	1.09E-002	MOTOR OPERATD VALVE 1-HV-MOV-113C FAILS CLOSED
1HVMOV-SC-111A	1.21E-005	MOTOR OPERATD VALVE 1-HV-MOV-111A SPURIOUS CLOSURE
1HVMOV-SC-113A	1.21E-005	MOTOR OPERATD VALVE 1-HV-MOV-113A SPURIOUS CLOSURE
1HVPAT-CC-HVP20	1.98E-004	COMMON CAUSE FAULT 1-HV-P-20B & 20C FAIL TO START
1HVPAT-CC-HVP22	1.98E-004	COMMON CAUSE FAULT 1-HV-P-22B & 22C FAIL TO START
1HVPAT-FR-HVP20A	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-20A FAILS TO RUN 24 HOUR MISSION
1HVPAT-FR-HVP20B	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-20B FAILS TO RUN 24 HOUR MISSION
1HVPAT-FR-HVP20C	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-20C FAILS TO RUN 24 HOUR MISSION
1HVPAT-FR-HVP22A	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-22A FAILS TO RUN 24 HOUR MISSION
1HVPAT-FR-HVP22B	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-22B FAILS TO RUN 24 HOUR MISSION
1HVPAT-FR-HVP22C	7.93E-004	MOTOR DRIVEN PUMP 1-HV-P-22C FAILS TO RUN 24 HOUR MISSION
1HVPAT-FS-HVP20B	1.98E-003	MOTOR DRIVEN PUMP 1-HV-P-20B FAILS TO START
1HVPAT-FS-HVP20C	1.98E-003	MD ALT PUMP 1-HV-P-20C FAILS TO START
1HVPAT-FS-HVP22B	1.98E-003	MOTOR DRIVEN PUMP 1-HV-P-22B FAILS TO START
1HVPAT-FS-HVP22C	1.98E-003	MOTOR DRIVEN PUMP 1-HV-P-22C FAILS TO START
1HVPCV-CC-1235	1.81E-003	COMMON CAUSE FAULT 1-HV-PCV-1235B1 & 1235C1 FAIL CLOSED
1HVPCV-FC-1235B1	1.81E-002	PRESS CONTROL VALVE 1-HV-PCV-1235B-1 FAILS CLOSED
1HVPCV-FC-1235C1	1.81E-002	PRESS CONTROL VALVE 1-HV-PCV-1235C-1 FAILS CLOSED
1HVPCV-SC-1235A1	1.21E-005	PRESS CONTROL VALVE 1-HV-PCV-1235A-1 SPURIOUS CLOSURE
1HVPCV-SC-1235A2	1.21E-005	PRESS CONTROL VAVLE 1-HV-PCV-1235A-2 SPURIOUS CLOSURE
1HVPCV-SC-1235B1	1.21E-005	PRESS CONTROL VALVE 1-HV-PCV-1235B-1 SPURIOUS CLOSURE
1HVPCV-SC-1235B2	1.21E-005	PRESS CONTROL VALVE 1-HV-PCV-1235B-2 SPURIOUS CLOSURE

Event	Unavailability	Description
1HVPCV-SC-1235C1	1.21E-005	PRESS CONTROL VALVE 1-HV-PCV-1235C-1 SPURIOUS CLOSURE
1HVPCV-SC-1235C2	1.21E-005	PRESS CONTROL VALVE 1-HV-PCV-1235C-2 SPURIOUS CLOSURE
1HVSTR-PG-1HVS1B	9.53E-003	SW STRAINER 1-HV-S-1B PLUGGED DURING STANDBY
1HVSTR-PL-1HVS1A	6.39E-004	SW STRAINER 1-HV-S-1A PLUGGED DURING MISSION
1HVSV--SO-1200	9.33E-005	RELIEF VALVE 1-HV-RV-1200 SPURIOUS OPENING
1HVSV--SO-1201	9.33E-005	RELIEF VALVE 1-HV-RV-1201 SPURIOUS OPENING
1HVSV--SO-1202A	9.33E-005	RELIEF VALVE 1-HV-RV-1202A SPURIOUS OPENING
1HVSV--SO-1202B	9.33E-005	RELIEF VALVE 1-HV-RV-1202B SPURIOUS OPENING
1HVSV--SO-1202C	9.33E-005	RELIEF VALVE 1-HV-RV-1202C SPURIOUS OPENING
1HVSV--SO-1205A	9.33E-005	RELIEF VALVE 1-HV-RV-1205A SPURIOUS OPENING
1HVSV--SO-1205B	9.33E-005	RELIEF VALVE 1-HV-RV-1205B SPURIOUS OPENING
1HVSV--SO-1205C	9.33E-005	RELIEF VALVE 1-HV-RV-1205C SPURIOUS OPENING
1HVTCV-FC-TCV167	1.81E-002	STDBY AHU 1-HV-AC-7 1-HV-TCV-167 FAILS CLOSED
1HVTCV-SC-TCV166	1.21E-005	OPER AHU 1-HV-AC-6 1-HV-TCV-166 SPURIOUS CLOSURE
1HVTCV-SC-TCV167	1.21E-005	STDBY AHU 1-HV-AC-7 1-HV-TCV-167 SPURIOUS CLOSURE
1IAIAS-LF-CONTIA	2.52E-004	CONTAINMENT INSTRUMENT AIR SYS LOSS OF FUNCTION
1IAIAS-LF-OUTIA	2.52E-004	OUTSIDE CONTAINMENT INSTRUMENT AIR SYS LOSS OF FUNCTION
1LMPIC-CC-100	4.64E-004	CCF 3/4 CONTAINMENT PRESSURE CHANNELS 1-LM-PT-100A,B,C,D
1MS-ACT-SGBDTV	2.66E-004	NO SIGNAL FROM AFW PUMPS OR FROM CONTAINMENT ISO.
1MS-ACT-TV101A	2.66E-004	NO TRIP SIGNAL TO MAIN STEAM TRIP VALVE
1MSAOV-CC-111AB	1.81E-003	CCF 2/2 FC AOV NC-FC 1-MS-TV-111A,-111B
1MSAOV-FC-TV101A	1.81E-002	AIR-OPERATED MSTV FAILS CLOSED 1-MS-TV-101A
1MSAOV-FC-TV101B	1.81E-002	AIR-OPERATED MSTV FAILS CLOSED 1-MS-TV-101B
1MSAOV-FC-TV101C	1.81E-002	AIR-OPERATED MSTV FAILS CLOSED 1-MS-TV-101C
1MSAOV-FC-TV111A	1.81E-002	AIR-OPERATED VALVE FAILS CLOSED 1-MS-TV-111A
1MSAOV-FC-TV111B	1.81E-002	AIR-OPERATED VALVE FAILS CLOSED 1-MS-TV-111B
1MSAOV-FO-TV101C	1.81E-002	AIR OPRTED VALVE FAILS OPEN 1-MS-TV-101C
1MSAOV-SC-TV101A	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE 1-MS-TV-101A
1MSAOV-SC-TV101B	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE 1-MS-TV-101B
1MSAOV-SC-TV101C	1.21E-005	AIR OPERATED VALVE SPURIOUS CLOSE 1-MS-TV-101C
1MSCKV-FC-1MS119	6.34E-004	CHECK VALVE FAILS TO OPEN 1-MS-119
1MSCKV-FC-1MS122	6.34E-004	CHECK VALVE FAILS TO OPEN 1-MS-122
1MSCKV-FC-1MS124	6.34E-004	CHECK VALVE FAILS TO OPEN 1-MS-124
1MSCKV-FO-1MS19	3.44E-003	CHECK VALVE FAILS OPEN 1-MS-19
1MSCKV-FO-1MS58	3.44E-003	CHECK VALVE FAILS OPEN 1-MS-58
1MSFIC-CC-MSFLOW	4.64E-004	MS FLOW CCF OF 2/3 FLOW INSTR CHANNEL 30 DAY TEST INTERVL
1MSFIC-LF-1474	4.63E-003	FLOW CHANNEL MS1474 LOSS OF FUNCTION (DURING STANDBY)
1MSFIC-LF-1475	4.63E-003	FLOW CHANNEL MS1475 LOSS OF FUNCTION (DURING STANDBY)
1MSFIC-LF-1484	4.63E-003	FLOW CHANNEL MS1484 LOSS OF FUNCTION (DURING STANDBY)
1MSFIC-LF-1485	4.63E-003	FLOW CHANNEL MS1485 LOSS OF FUNCTION (DURING STANDBY)
1MSFIC-LF-1494	4.63E-003	FLOW CHANNEL MS1494 LOSS OF FUNCTION (DURING STANDBY)
1MSFIC-LF-1495	4.63E-003	FLOW CHANNEL MS1495 LOSS OF FUNCTION (DURING STANDBY)
1MSHCV-SO-104	1.21E-005	HAND CONTROL VALVE SPURIOUS OPENING 1-MS-HCV-104
1MSMOV-FO-NRV101	1.09E-002	MOTOR OPERTD VALVE FAILS OPEN 1-MS-NRV-101C
1MSMV--FO-1MS20	1.25E-004	MANUAL VALVE FAILS OPEN 1-MS-20
1MSMV--FO-1MS95	1.25E-004	MANUAL VALVE FAILS OPEN 1-MS-95
1MSMV--FO-1MS97	1.25E-004	MANUAL VALVE FAILS OPEN 1-MS-97
1MSMV--LK-1MS168	1.00E-002	VALVE 1-MS-168 CLSD TO ISOLATE LEAKING STEAM DUMP VALVES
1MSMV--LK-1MS179	1.00E-002	VALVE 1-MS-179 CLSD TO ISOLATE LEAKING STEAM DUMP VALVES
1MSMV--LK-1MS21	4.00E-002	SG A PORV BLOCKED DUE TO LEAKAGE
1MSMV--LK-1MS59	4.00E-002	SG B PORV BLOCKED DUE TO LEAKAGE
1MSMV--LK-1MS97	4.00E-002	SG C PORV BLOCKED DUE TO LEAKAGE
1MSMV--PG-1MS168	9.12E-005	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-168
1MSMV--PG-1MS179	9.12E-005	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-179
1MSMV--PG-1MS18	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-18
1MSMV--PG-1MS268	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-268
1MSMV--PG-1MS269	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-269
1MSMV--PG-1MS270	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-270
1MSMV--PG-1MS271	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-271
1MSMV--PG-1MS57	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-57
1MSMV--PG-1MS95	1.37E-004	N.O. MANUAL VALVE PLUGGED DURING STBY 1-MS-95
1MSPIC-CC-MSLP	4.64E-004	CCF OF 2/3 MS LOW PRESS INSTR CHANNEL 30 DAY TEST INTERVL
1MSPIC-CC-STMDPR	4.64E-004	CCF OF STEAM DIFF PRESS INST CHANNELS 30 DAY TEST INTERVL

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1MSPIC-LF-1446	8.02E-002	TURBINE 1ST STAGE PIC LOSS OF FNCN DURING STANDBY
1MSPIC-LF-1447	8.02E-002	TURBINE FIRST STAGE PIC LOSS OF FUNCN DURING STANDBY
1MSPIC-LF-1474A	4.63E-003	PRESS CHANN. MS- 1474A LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1474B	4.63E-003	PRESSURE CHANNEL 1474B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1475B	4.63E-003	PRESSURE CHANNEL 1475B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1476B	4.63E-003	PRESSURE CHANNEL 1476B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1484B	4.63E-003	PRESSURE CHANNEL 1484B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1485A	4.63E-003	PRESS INST CHANN MS 1485A LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1485B	4.63E-003	PRESSURE CHANNEL 1485B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1486B	4.63E-003	PRESSURE CHANNEL 1486B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1494B	4.63E-003	PRESSURE CHANNEL 1494B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1495B	4.63E-003	PRESSURE CHANNEL 1495B LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1496A	4.63E-003	PRESS INST CHANN MS 1496A LOSS OF FNCN DURING STNDBY
1MSPIC-LF-1496B	4.63E-003	PRESSURE CHANNEL 1496B LOSS OF FNCN DURING STNDBY
1MSPORV-DMDT7	1.00E+000	PROBABILITY OF SG PORV DEMAND DURING A SGTR
1MSRLY-LF-1446	2.66E-004	TURB 1ST STAGE PRES PROT CHANN. III OUTPUT RELAY FAILS
1MSRLY-LF-1447	2.66E-004	TURB 1ST STAGE PRES PROT CHAN IV OUTPUT RELAY FAILS
1MSRLY-LF-X-SA07	2.66E-004	RELAY X-1MSSA07 FAILS CAUSING LOSS OF SOV-111A ACT.
1MSRLY-LF-X-SB07	2.66E-004	RELAY X-1MSSB07 FAILS CAUSING LOSS OF SOV-111B ACT.
1MSRV--CC-101ABC	9.99E-004	CCF 3/3 FC CCF - SG PORV - FC 1-MS-PCV-101A/B/C
1MSRV--FC-101A	9.99E-003	PWR OP RELIEF VALVE FAILS CLOSED 1-MS-PCV-101A
1MSRV--FC-101B	9.99E-003	PWR OP RELIEF VALVE FAILS CLOSED 1-MS-PCV-101B
1MSRV--FC-101C	9.99E-003	PWR OP RELIEF VALVE FAILS CLOSED 1-MS-PCV-101C
1MSRV--FO-101C	2.50E-002	PWR OP RELIEF VALVE FAILS OPEN 1-MS-PCV-101C
1MSSRV-DMDT7	4.00E-002	PROBABILITY OF DEMAND ON THE SRVs DURING A SGTR
1MSSV--FO-101C	1.25E-002	SAFETY VALVE FAILS OPEN 1-MS-SV-101C
1MSTCV-CC-1408AB	1.81E-003	CCF 2/2 FTO STEAM DUMP VALVES 1-MS-TCV-1408A/B
1MSTCV-FC-1408A	1.81E-002	TEMP CONTROL VALVE FAILS CLOSED 1-MS-TCV-1408A
1MSTCV-FC-1408B	1.81E-002	TEMP CONTROL VALVE FAILS CLOSED 1-MS-TCV-1408B
1QSCKV-CC-V19-11	6.34E-005	CCF 2/2 FC OF WEIGHTED CHECK VALVES
1QSCKV-FC-1QS-11	6.34E-004	CHECK VALVE 1-QS-11 FAILS CLOSED (FAILS TO OPEN)
1QSCKV-FC-1QS-19	6.34E-004	CHECK VALVE 1-QS-19 FAILS CLOSED (FAILS TO OPEN)
1QSHEP-1QS21	7.50E-004	CRO LEAVES 1-QS-21 RECIRC VALVE OPEN AFTER 1-PT-63.1B
1QSHEP-1QS5	7.50E-004	CRO LEAVES 1-QS-5 RECIRC VALVE OPEN AFTER 1-PT-63.1A
1QSHEP-FLANGE	3.75E-004	QS SPRAY HEADER FLANGE NOT REMOVED AFTER 1-PT-63.3
1QSLEV-TM-RWSTA	1.40E-003	RWST LEVEL PROT TRAIN A IN TEST
1QSLEV-TM-RWSTB	1.40E-003	RWST LEVEL PROTECT. TRAIN B IN TEST
1QSLIC-LF-100A	4.63E-003	LEVEL CHANNEL LT-QS100A FAILS DURING STANDBY
1QSLIC-LF-100B	4.63E-003	LEVEL CHANNEL LT-QS100B FAILS DURING STANDBY
1QSLIC-LF-100C	4.63E-003	LEVEL CHANNEL LT-QS100C FAILS DURING STANDBY
1QSLIC-LF-100D	4.63E-003	LEVEL CHANNEL LT-QS100D FAILS DURING STANDBY
1QSMOV-CC-101A-B	3.90E-004	CCF 2/2 FC OF PUMP DISCHARGE MOVS
1QSMOV-FC-101A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1QSMOV-FC-101B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1QSMOV-PG-QS100A	1.35E-004	MOTOR OPERTD VALVE MOV-100A PLUGGED DURING STANDBY
1QSMOV-PG-QS100B	1.35E-004	MOTOR OPERTD VALVE MOV-100B PLUGGED DURING STANDBY
1QSMV--PG-1-QS-1	1.35E-004	N.O. MANUAL VALVE 1-QS-1 PLUGGED DURING STANDBY
1QSMV--PG-1QS-12	1.35E-004	N.O. MANUAL VALVE 1-QS-12 PLUGGED DURING STANDBY
1QSMV--PG-1QS38	6.75E-005	N.O. MANUAL VALVE QS-38 PLUGGED DURING STANDBY
1QSPSB-CC-P1A-1B	3.93E-004	CCF 2/2 FS OF QS PUMPS
1QSPSB-FR-1QSP1A	6.61E-005	MD STNDBY PUMP 1-QS-P-1A FAILS TO RUN
1QSPSB-FR-1QSP1B	6.61E-005	MD STNDBY PUMP 1-QS-P-1B FAILS TO RUN
1QSPSB-FS-1QSP1A	3.93E-003	MD STNDBY PUMP 1-QS-P-1A FAILS TO START
1QSPSB-FS-1QSP1B	3.93E-003	MD STNDBY PUMP 1-QS-P-1B FAILS TO START
1QSPSB-TM-1QSP1A	3.75E-003	MD STNDBY PUMP 1-QS-P-1A SCHLD TST & MAINT.
1QSPSB-TM-1QSP1B	3.75E-003	MD STNDBY PUMP 1-QS-P-1B SCHLD TST & MAINT.
1QSPSB-UM-1QSP1A	3.75E-003	MD STNDBY PUMP 1-QS-P-1A UNSCHDL MAINT.
1QSPSB-UM-1QSP1B	3.75E-003	MD STNDBY PUMP 1-QS-P-1B UNSCHDL MAINT.
1QSRLY-LF-512A	2.66E-004	MASTER RELAY K512 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-512B	2.66E-004	MASTER RELAY K512 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K104A	2.66E-004	RELAY K104 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-K104B	2.66E-004	RELAY K104 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K205A	2.66E-004	RELAY K205 TRAIN A LOSS OF FUNCTION

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1QSRLY-LF-K205B	2.66E-004	RELAY K205 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K301A	2.66E-004	RELAY K301 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-K301B	2.66E-004	RELAY K301 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K401A	2.66E-004	RELAY K401 TRAIN A LOSS OF FUNCTION
1QSRLY-LF-K401B	2.66E-004	RELAY K401 TRAIN B LOSS OF FUNCTION
1QSRLY-LF-K630A	2.66E-004	RECIRC MODE TRANS OUTPUT RELAY K630 TRAIN A FAILS
1QSRLY-LF-K630B	2.66E-004	RECIRC MODE TRANS OUTPUT RELAY K630 TRAIN B FAILS
1QSRLY-LF-K647A	2.66E-004	RECIRC MODE TRANSF. SI PERMISSIVE RELAY K647 FAILS TRAIN A
1QSRLY-LF-K647B	2.66E-004	RECIRC MODE TRANSF. SI PERMISSIVE RELAY K647 FAILS TRAIN B
1QSSTR-PG-1FL1A	2.82E-002	STRAINER 1-QS-FL-1A PLUGGED DRNG STNDBY
1QSSTR-PG-1FL1B	2.82E-002	STRAINER 1-QS-FL-1B PLUGGED DRNG STNDBY
1QSTNK-LF-1QSTK	2.66E-006	PLUGING OF THE RWST VENT
1RCMOV-CC-535536	3.90E-004	CCF 2/2 FC CCF - MOV FC 1-RC-MOV-1535&-1536
1RCMOV-FC-1535	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-RC-MOV-1535
1RCMOV-FC-1536	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-RC-MOV-1536
1RCMOV-FO-1535	1.09E-002	MOTOR OPERTD VALVE FAILS OPEN 1-RC-MOV-1535
1RCMOV-FO-1536	1.09E-002	MOTOR OPERTD VALVE FAILS OPEN 1-RC-MOV-1536
1RCMOV-LK-1535	2.50E-002	BLOCK VALVE SHUT DUE TO LEAKING PORV 1-RC-MOV-1535
1RCMOV-LK-1536	2.50E-002	BLOCK VALVE SHUT DUE TO LEAKING PORV 1-RC-MOV-1536
1RCMOV-LK-535536	0.00E+000	MOVs 1535 & 1536 CLOSED AT THE SAME TIME
1RCPAT-FR-1RCP1A	7.93E-004	MD ALT PUMP FAILS TO RUN 1-RC-P-1A
1RCPAT-FR-1RCP1C	7.93E-004	MD ALT PUMP FAILS TO RUN 1-RC-P-1C
1RCPCV-CC-1455AB	1.81E-003	CCF 2/2 FC CCF -PCV FC 1-RC-PCV-1455A/B
1RCPCV-FC-1455A	1.81E-002	PRES CONTROL VALVE FAILS CLOSED - 24HR 1-RC-PCV-1455A
1RCPCV-FC-1455B	1.81E-002	PRES CONTROL VALVE FAILS CLOSED - 24HR 1-RC-PCV-1455B
1RCPIC-CC-PRSZRP	4.64E-004	PRESSRZER PRESS INSTR CHANNEL CCF 30 DAY TEST INTERVL
1RCPIC-LF-1455B	4.63E-003	PRESSURE CHANNEL 1455B LOSS OF FNCN DURING STNDBY
1RCPIC-LF-1456B	4.63E-003	PRESSURE CHANNEL 1456B LOSS OF FNCN DURING STNDBY
1RCPIC-LF-1457B	4.63E-003	PRESSURE CHANNEL 1457B LOSS OF FNCN DURING STNDBY
1RCPIC-LF-PC402	4.12E-002	PRESSURE CHANNEL PT1402 LOSS OF FNCN DURING STNDBY
1RCPIC-LF-PC403	4.12E-002	PRESSURE CHANNEL PT1403 LOSS OF FNCN DURING STNDBY
1RCPORV-DMDATWS	1.00E+000	PROBABILITY OF PORV DEMAND DURING AN ATWS
1RCPORV-DMDSBO	2.00E-001	PROBABILITY OF PORV DEMAND DURING A SBO
1RCPORV-T3	6.65E-003	PROBABILITY OF PORV DEMAND DURING A TRANSIENT
1RCRV--CC-RCPORV	9.99E-004	CCF 2/2 FC CCF - RCS PORVS FC 1-RC-PCV-1455C&1456
1RCRV--FC-1455C	9.99E-003	PWR OP RELIEF VALVE FAILS CLOSED 1-RC-PCV-1455C
1RCRV--FC-1456	9.99E-003	PWR OP RELIEF VALVE FAILS CLOSED 1-RC-PCV-1456
1RCRV--FO-1455C	2.50E-002	PWR OP RELIEF VALVE FAILS OPEN 1-RC-PCV-1455C
1RCRV--FO-1456	2.50E-002	PWR OP RELIEF VALVE FAILS OPEN 1-RC-PCV-1456
1RCSRV-DMDATWS	1.00E+000	PROBABILITY OF ALL 3 SRVS DEMANDED DURING AN ATWS
1RCSV--CC-1551	1.25E-006	CCF 3/3 FC CCF - PCS SVS FTO 1-RC-SV-1551A/B/C
1RCSV--FC-1551A	1.25E-005	SAFETY VALVE FAILS CLOSED 1-RC-SV-1551A
1RCSV--FC-1551B	1.25E-005	SAFETY VALVE FAILS CLOSED 1-RC-SV-1551B
1RCSV--FC-1551C	1.25E-005	SAFETY VALVE FAILS CLOSED 1-RC-SV-1551C
1RCSV--FO-1551A	1.25E-002	SAFETY VALVE FAILS OPEN 1-RC-SV-1551A
1RCSV--FO-1551B	1.25E-002	SAFETY VALVE FAILS OPEN 1-RC-SV-1551B
1RCSV--FO-1551C	1.25E-002	SAFETY VALVE FAILS OPEN 1-RC-SV-1551C
1RCTIC-CC-TAVG	3.36E-003	TAVG TIC CCF LF TEMP INSTR CHANNEL 30 DAY TEST INTERVL
1RCTIC-LF-1412E	3.28E-002	TEMPERATURE CHANNEL 1412E LOSS OF FNCN DRNG STNDBY
1RCTIC-LF-1422E	3.28E-002	TEMPERATURE CHANNEL 1422E LOSS OF FNCN DRNG STNDBY
1RCTIC-LF-1432E	3.28E-002	TEMPERATURE CHANNEL 1432E LOSS OF FNCN DRNG STNDBY
1RHCKV-CC-1RH715	6.34E-005	CCF 2/2 FC BOTH CKVS FAIL CLOSED 1-RH-7 & 15
1RHCKV-FC-1RH15	6.34E-004	CHECK VALVE RH-15 FAILS CLOSED (FAILS TO OPEN)
1RHCKV-FC-1RH7	6.34E-004	CHECK VALVE RH-7 FAILS CLOSED (FAILS TO OPEN)
1RHCKV-FO-1RH15	3.44E-003	CHECK VALVE RH-15 FAILS OPEN (FAILS TO CLOSE)
1RHCKV-FO-1RH7	3.44E-003	CHECK VALVE RH-7 FAILS OPEN (FAILS TO CLOSE)
1RHFCV-SO-1605	1.21E-005	FLOW CONTROL VALVE 1-RH-FCV-1605 SPURIOUS OPENS
1RHFEL-PG-1605	4.10E-004	FLOW ELEMENT 1-RH-FE-1605 PLUGGED DURING STBY
1RHHCV-FC-1758	1.81E-002	1-RH-HCV-1758 FAILS CLOSED (AOV)
1RHHEX-LF-1RHE1A	2.81E-002	HEAT EXCHANGER 1-RH-E-1A LOSS OF FUNCTION
1RHHEX-LF-1RHE1B	2.81E-002	RHR HEAT EXCHANGER 1-RH-E-1B LOSS OF FUNCTION
1RHHEX-LF-1RHE2A	2.81E-002	RH PUMP SEAL COOLER 1-RH-E-2A LOSS OF FUNCTION
1RHHEX-LF-1RHE2B	2.81E-002	RH PUMP SEAL COOLER 1-RH-E-2B LOSS OF FUNCTION

Event	Unavailability	Description
1RHMOV-CC-1720	3.90E-004	CCF 2/2 FC BOTH RH DISCHARGE MOVS 1720A & 1720B
1RHMOV-FC-1700	1.09E-002	MOTOR OPERTD VALVE 1-RH-MOV-1700 FAILS CLOSED
1RHMOV-FC-1701	1.09E-002	MOTOR OPERTD VALVE 1-RH-MOV-1701 FAILS CLOSED
1RHMOV-FC-1720A	1.09E-002	MOTOR OPERTD VALVE 1-RH-MOV-1720A FAILS CLOSED
1RHMOV-FC-1720B	1.09E-002	MOTOR OPERTD VALVE 1-RH-MOV-1720B FAILS CLOSED
1RHMV--FC-1RH25	1.25E-004	MANUAL VALVE RH-25 FAILS CLOSED (FAILS TO OPN)
1RHMV--PG-1RH1	4.10E-004	N.O. MANUAL VALVE RH-1 PLUGGED DURING STANDBY
1RHMV--PG-1RH16	4.10E-004	N.O. MANUAL VALVE RH-16 PLUGGED DURING STANDBY
1RHMV--PG-1RH19	4.10E-004	GATE VALVE 1-RH-19 PLUGGED DURING STANDBY
1RHMV--PG-1RH24	4.10E-004	N.O. MANUAL VALVE RH-24 PLUGGED DURING STANDBY
1RHMV--PG-1RH30	4.10E-004	N.O. MANUAL VALVE RH-30 PLUGGED DURING STANDBY
1RHMV--PG-1RH8	4.10E-004	N.O. MANUAL VALVE RH-8 PLUGGED DURING STANDBY
1RHMV--PG-1RH9	4.10E-004	N.O. MANUAL VALVE RH-9 PLUGGED DURING STANDBY
1RHPSB-CC-1RHP1	3.93E-004	CCF 2/2 FS OF BOTH RH PUMPS 1-RH-P-1A & 1B
1RHPSB-FR-1RHP1A	7.93E-004	STANDBY PUMP 1-RH-P-1A FAILS TO RUN 24 HOURS
1RHPSB-FR-1RHP1B	7.93E-004	STANDBY PUMP 1-RH-P-1B FAILS TO RUN 24 HOURS
1RHPSB-FS-1RHP1A	3.93E-003	STANDBY PUMP 1-RH-P-1A FAILS TO START
1RHPSB-FS-1RHP1B	3.93E-003	STANDBY PUMP 1-RH-P-1B FAILS TO START
1RHPSB-UM-1RHP1A	3.75E-003	STANDBY PUMP 1-RH-P-1A UNSCHED. MAINTENANCE
1RHPSB-UM-1RHP1B	3.75E-003	STANDBY PUMP 1-RH-P-1B UNSCHED. MAINTENANCE
1RHSV--SO-1721A	9.33E-005	RELIEF VALVE 1-RH-RV-1721A SPURIOUSLY OPENS
1RHSV--SO-1721B	9.33E-005	RELIEF VALVE 1-RH-RV-1721B SPURIOUSLY OPENS
1RPBKR-CC-MGAMGB	1.83E-004	COM CAUSE FAILURES 2/2 ROD DRIVE MG SET SUPP BREAKERS
1RPBKR-CC-RTARTB	1.30E-005	COMMON CAUSE FAILURE 2/2 REACTOR TRIP BREAKERS
1RPBKR-LF-MGA	1.83E-003	ROD DRIVE MG SET SUPP. BREAKERS FAIL TO OPEN
1RPBKR-LF-MGB	1.83E-003	ROD DRIVE MG SET SUPP. BREAKER FAIL TO TRIP
1RPBKR-LF-RTA	3.38E-004	REACTOR TRIP BREAKER RTA FAILS TO OPEN
1RPBKR-LF-RTB	3.38E-004	REACTOR TRIP BREAKER RTB FAILS TO OPEN
1RPROD-LF-CRODS	1.80E-006	CONTROL RODS FAIL TO INSERT DUE TO MECHANICAL BINDING
1RPRPS-LF-INPUT	1.40E-006	NO INPUT SIGNAL FROM REACTOR TRIP PROTECTION
1RSCKV-FC-1RS18	6.34E-004	CHECK VALVE 1-RS-18 FAILS CLOSED (FAILS TO OPEN)
1RSCKV-FC-1RS27	6.34E-004	CHECK VALVE 1-RS-27 FAILS CLOSED (FAILS TO OPEN)
1RSCKV-FC-RS-123	6.34E-004	CHECK VALVE RS-123 FAILS CLOSED (FAILS TO OPEN)
1RSCKV-FC-RS-138	6.34E-004	CHECK VALVE RS-138 FAILS CLOSED (FAILS TO OPEN)
1RSFIC-LF-RS104A	1.38E-002	FLOW SWITCH FAILS - CLOSES 1-RS-MOV-101A
1RSFIC-LF-RS104B	1.38E-002	FLOW SWITCH FAILS - CLOSES 1-RS-MOV-101B
1RSHEP-1RS12	7.50E-004	CRO LEAVES RS-P-2A RECIRC VALVES OPEN 1-RS-12 & 1-RS-95
1RSHEP-1RS22	7.50E-004	CRO LEAVES RS-P-2B RECIRC VALVES OPEN 1-RS-22 & 1-RS-96
1RSHEP-ELBOW	3.75E-004	RS SPRAY HEADER ELBOW NOT INSTALLED AFTER 1-PT-64.8
1RSHEP-FLANGE	3.75E-004	RS SPRAY HEADER FLANGE NOT REMOVED AFTER 1-PT-64.3
1RSHEP-MOV-155A	7.50E-004	CRO LEAVES MOV-155A OR MOV-156A CLOSED OR DEENERGIZED
1RSHEP-MOV-155B	7.50E-004	CRO LEAVES MOV-155B OR MOV-156B CLOSED OR DEENERGIZED
1RSHEX-LU-1RSE1A	2.09E-004	HEAT EXCHANGER LOSS OF FCN-STANDBY 1-RS-E-1A
1RSHEX-LU-1RSE1B	2.09E-004	HEAT EXCHANGER LOSS OF FCN-STANDBY 1-RS-E-1B
1RSHEX-LU-1RSE1C	2.09E-004	HEAT EXCHANGER LOSS OF FUNCTION DURING MISSION
1RSHEX-LU-1RSE1D	2.09E-004	HEAT EXCHANGER LOSS OF FUNCTION 1-RS-E-1D
1RSLIC-LF-RS103A	1.38E-002	LEVEL SWITCH FAILS - CLOSES 1-RS-MOV-100A
1RSLIC-LF-RS103B	1.38E-002	LEVEL SWITCH FAILS - CLOSES 1-RS-MOV-100B
1RSMOV-FC-100B	1.09E-002	MOTOR OPERTD VALVE RS-100B FAILS CLOSE (FAILS TO OPEN)
1RSMOV-FC-RS100A	1.09E-002	MOTOR OPERTD VALVE RS-100A FAILS CLOSD (FAILS TO OPEN)
1RSMOV-PG-RS101A	1.35E-004	MOTOR OPERTD VALVE RS-101A PLUGGED DURING STANDBY
1RSMOV-PG-RS101B	1.35E-004	MOTOR OPERTD VALVE RS-101B PLUGGED DURING STANDBY
1RSMOV-PG-RS155A	1.35E-004	MOTOR OPERTD VALVE PLUGGED IN STANDBY 1-RS-MOV-155A
1RSMOV-PG-RS155B	1.35E-004	MOTOR OPERTD VALVE MOV-155B PLUGGED DURING STANDBY
1RSMOV-PG-RS156A	8.21E-004	MOTOR OPERTD VALVE PLUGGED IN STANDBY 1-RS-MOV-156A
1RSMOV-PG-RS156B	8.21E-004	MOTOR OPERTD VALVE MOV-156B PLUGGED DURING STANDBY
1RSMV--PG-RS-120	1.35E-004	N.O. MANUAL VALVE 1-RS-120 PLUGGED DURING STANDBY
1RSMV--PG-RS-135	1.35E-004	N.O. MANUAL VALVE 1-RS-135 PLUGGED DURING STANDBY
1RSMV--PG-RS-144	1.35E-004	N.O. MANUAL VALVE 1-RS-144 PLUGGED DURING STANDBY
1RSMV--PG-RS-145	1.35E-004	N.O. MANUAL VALVE 1-RS-145 PLUGGED DURING STANDBY
1RSPSB-CC-1A-1B	4.02E-004	CCF 2/2 FS OF IRS PUMPS 1-RS-P-1A/1B
1RSPSB-CC-2A-2B	4.02E-004	CCF 2/2 FS ORS PUMPS 1-RS-P-2A/2B
1RSPSB-CC-3A-3B	3.93E-004	CCF 2/2 FS OF CASING COOLING PMPS 1-RS-P-3A/3B

TABLE C.8-1 (Continued)
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Event	Unavailability	Description
1RSPSB-FR-1RSP1A	7.93E-004	MD STNDBY PUMP 1-RS-P-1A FAILS TO RUN
1RSPSB-FR-1RSP1B	7.93E-004	MD STNDBY PUMP 1-RS-1B FAILS TO RUN
1RSPSB-FR-1RSP2A	7.93E-004	MD STNDBY PUMP FAILS TO RUN 1-RS-P-2A
1RSPSB-FR-1RSP2B	7.93E-004	MD STNDBY PUMP FAILS TO RUN 1-RS-P-2B
1RSPSB-FR-1RSP3A	7.93E-004	MD STNDBY PUMP 1-RS-P-3A FAILS TO RUN
1RSPSB-FR-1RSP3B	7.93E-004	MD STNDBY PUMP 1-RS-P-3B FAILS TO RUN
1RSPSB-FS-1RSP1A	4.02E-003	MD STNDBY PUMP 1-RS-P-1A FAILS TO START
1RSPSB-FS-1RSP1B	4.02E-003	MD STNDBY PUMP 1-RS-P-1B FAILS TO START
1RSPSB-FS-1RSP2A	4.02E-003	MD STNDBY PUMP FAILS TO START 1-RS-P-2A
1RSPSB-FS-1RSP2B	4.02E-003	MD STNDBY PUMP FAILS TO START 1-RS-P-2B
1RSPSB-FS-1RSP3A	3.93E-003	MD STNDBY PUMP 1-RS-P-3A FAILS TO START
1RSPSB-FS-1RSP3B	3.93E-003	MD STNDBY PUMP 1-RS-P-3B FAILS TO START
1RSPSB-TM-1RSP2A	4.92E-003	SCHEDULED MAINTENANCE
1RSPSB-TM-1RSP2B	4.92E-003	SCHEDULED MAINTENANCE
1RSPSB-UM-1RSP1A	4.54E-003	MD STNDBY PUMP UNSCHDL MAINT. 1-RS-P-1A
1RSPSB-UM-1RSP1B	4.54E-003	MD STNDBY PUMP UNSCHDL MAINT. 1-RS-P-1B
1RSPSB-UM-1RSP2A	4.54E-003	UNSCHEDULED MAINTENANCE
1RSPSB-UM-1RSP2B	4.54E-003	UNSCHEDULED MAINTENANCE
1RSPSB-UM-1RSP3A	3.75E-003	MD STNDBY PUMP 1-RS-P-3A UNSCHDL MAINT.
1RSPSB-UM-1RSP3B	3.75E-003	MD STNDBY PUMP 1-RS-P-3B UNSCHDL MAINT.
1RSSTR-PG-TEMPA	2.82E-002	TEMPORARY SUCTION STRAINER PLUGGED 1-RS-P-3A
1RSSTR-PG-TEMPB	2.82E-002	TEMPORARY SUCTION STRAINER PLUGGED 1-RS-P-3B
1SICKV-CC-144161	6.34E-005	CCF 2/2 FC BOTH SI CKVS FAIL CLOSED SI-144 & 161
1SICKV-CC-206207	6.34E-005	COMMON CAUSE FAILUR OF CHECK VALVES SI-206 AND SI-207
1SICKV-CC-79185	6.34E-005	COMMON CAUSE FAILUR OF CHECK VALVES SI-79 AND SI-185
1SICKV-CC-838689	6.34E-005	COMMON CAUSE FAILUR CHECK VALVE SI-83 SI-86 AND SI-89
1SICKV-CC-959903	6.34E-005	CCF - 3/3 FC CHECK VALVES SI-95, SI-99 AND SI-103
1SICKV-CC-ACCCKV	6.34E-005	COMMON CAUSE FAILUR OF ALL ACCUMULATOR CHECK VALVES
1SICKV-CC-FC116	6.34E-005	COMMON CAUSE FAILUR OF CHECK VALVES SI-1 AND SI-16
1SICKV-CC-FC1229	6.34E-005	COMMON CAUSE FAILUR CHECK VALVES 12 & 29 FAIL TO OPEN
1SICKV-CC-FC926	6.34E-005	COMMON CAUSE FAULT CHECK VALVES FAIL CLOSD, SI-9 & SI-26
1SICKV-FC-1SI1	6.34E-004	CHECK VALVE SI-1 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI12	6.34E-004	CHECK VALVE SI-12 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI125	6.34E-004	CHECK VALVE SI-125 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI127	6.34E-004	CHECK VALVE SI-127 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI142	6.34E-004	CHECK VALVE SI-142 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI144	6.34E-004	CHECK VALVE SI-144 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI159	6.34E-004	CHECK VALVE SI-159 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI16	6.34E-004	CHECK VALVE SI-16 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI161	6.34E-004	CHECK VALVE SI-161 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI18	6.34E-004	CHECK VALVE SI-18 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI185	6.34E-004	CHECK VALVE SI-185 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI206	6.34E-004	CHECK VALVE SI-206 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI207	6.34E-004	CHECK VALVE SI-207 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI26	6.34E-004	CHECK VALVE SI-26 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI29	6.34E-004	CHECK VALVE SI-29 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI47	6.34E-004	CHECK VALVE SI-47 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI79	6.34E-004	CHECK VALVE SI-79 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FC-1SI9	6.34E-004	CHECK VALVE SI-9 FAILS CLOSED (FAILS TO OPEN)
1SICKV-FO-1SI47	3.44E-003	CHECK VALVE SI-47 FAILS OPEN (FAILS TO CLOSE)
1SILIC-CC-RWST	4.64E-004	RWST LEV INST CHAN COMMON CAUSE FAIL 30 DAY TEST INTERVL
1SILMS-LF-1860A	1.25E-004	LIMIT SWITCH LS-2 ON MOV-1860A LOSS OF FUNCTION
1SILMS-LF-1860B	1.25E-004	LIMIT SWITCH LS-2 ON MOV 1860B LOSS OF FUNCTION
1SILMS-LF-1863A9	1.25E-004	LIMIT SWITCH LS-9 ON 1863A LOSS OF FUNCTION
1SILMS-LF-1863B9	1.25E-004	LIMIT SWITCH LS-9 ON 1863B LOSS OF FUNCTION
1SILMS-LF-1885A	1.25E-004	LIMIT SWITCH LS-5 ON 1885A LOSS OF FUNCTION
1SILMS-LF-1885B	1.25E-004	LIMIT SWITCH LS-5 ON 1885B LOSS OF FUNCTION
1SILMS-LF-1885C	1.25E-004	LIMIT SWITCH LS-5 ON 1885C LOSS OF FUNCTION
1SILMS-LF-1885D	1.25E-004	LIMIT SWITCH LS-5 ON 1885D LOSS OF FUNCTION
1SILMS-LF-863A10	1.25E-004	LIMIT SWITCH LS-10 ON 1863A LOSS OF FUNCTION
1SILMS-LF-863B10	1.25E-004	LIMIT SWITCH LS-10 ON MOV 1863B LOSS OF FUNCTION
1SIMOV-CC-1115BD	3.90E-004	CCF 2/2 FC OF MOV 1115B AND MOV 1115D TO OPEN
1SIMOV-CC-1115CE	3.90E-004	CCF 2/2 FO OF MOV-1115C AND 1115E TO CLOSE

Event	Unavailability	Description
1SIMOV-CC-1860AB	3.90E-004	CCF 2/2 FC FAILURE OF SUMP VALVES 1860A AND B
1SIMOV-CC-1867AB	3.90E-004	CCF OF BIT INLET MOV'S 1867A AND 1867B TO OPEN
1SIMOV-CC-1867CD	3.90E-004	CCF 2/2 FC OF MOV'S 1867C AND 1867D
1SIMOV-CC-1890CD	3.90E-004	CCF - 2/2 PLUGGED 1-SI-MOV-1890 C & D 18 MO TEST INTERVAL
1SIMOV-CC-867836	3.90E-004	COMMON CAUSE FAILUR OF MOV'S 1867C, 1867D, AND 1836
1SIMOV-FC-1115B	1.09E-002	MOTOR OPERTD VALVE 1-SI-MOV-1115B FAILS TO OPEN
1SIMOV-FC-1115D	1.09E-002	MOTOR OPERTD VALVE 1-SI-MOV-1115D FAILS TO OPEN
1SIMOV-FC-1286B	1.09E-002	MOTOR OPERTD VALVE CH-1286B FAILS CLSD (FAILS TO OPEN)
1SIMOV-FC-1286C	1.09E-002	MOTOR OPERTD VALVE CH-1286C FAILS CLSD (FAILS TO OPEN)
1SIMOV-FC-1836	1.09E-002	MOTOR OPERTD VALVE 1836 FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1860A	1.09E-002	RHR TRAIN B & 1H BUSSES OR 1H EDG
1SIMOV-FC-1860B	1.09E-002	MOTOR OPERTD VALVE SI-1860B FAILS CLSD (FAILS TO OPEN)
1SIMOV-FC-1863A	1.09E-002	MOTOR OPERTD VALVE 1863A FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1863B	1.09E-002	MOTOR OPERTD VALVE 1863B FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1867A	1.09E-002	MOTOR OPERTD VALVE 1867A FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1867B	1.09E-002	MOTOR OPERTD VALVE 1867B FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1867C	1.09E-002	MOTOR OPERTD VALVE 1867C FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1867D	1.09E-002	MOTOR OPERTD VALVE 1-SI-MOV-1867D FAILS TO OPEN
1SIMOV-FC-1890A	1.09E-002	MOTOR OPERTD VALVE 1890A FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FC-1890B	1.09E-002	MOTOR OPERTD VALVE 1890B FAILS CLOSED (FAILS TO OPEN)
1SIMOV-FO-1115B	1.09E-002	MOTOR OPERTD VALVE MOV-1115B FAILS OPEN
1SIMOV-FO-1115C	1.09E-002	MOTOR OPERTD VALVE 1-SI-MOV-1115C FAILS TO CLOSE
1SIMOV-FO-1115D	1.09E-002	MOTOR OPERTD VALVE MOV-1115D FAILS OPEN
1SIMOV-FO-1115E	1.09E-002	MOTOR OPERTD VALVE MOV-115E FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1862A	1.09E-002	MOTOR OPERTD VALVE SI-1862A FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1862B	1.09E-002	MOTOR OPERTD VALVE SI-1862B FAILS OPEN
1SIMOV-FO-1864A	1.09E-002	MOTOR OPERTD VALVE 1864A FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1864B	1.09E-002	MOTOR OPERTD VALVE 1864 B FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1885A	1.09E-002	MOTOR OPERTD VALVE 1885A FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1885B	1.09E-002	MOTOR OPERTD VALVE 1885B FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1885C	1.09E-002	MOTOR OPERTD VALVE 1885C FAILS OPEN (FAILS TO CLOSE)
1SIMOV-FO-1885D	1.09E-002	MOTOR OPERTD VALVE 1885D FAILS OPEN (FAILS TO CLOSE)
1SIMOV-PG-1115C	3.00E-006	MOTOR OPERTD VALVE MOV-1115C PLUGGED DURING MISSION TIME
1SIMOV-PG-1115E	3.00E-006	MOTOR OPERTD VALVE MOV-1115E PLUGGED DURING MISSION TIME
1SIMOV-PG-1267B	8.21E-004	MOTOR OPERTD VALVE CH-1267B PLUGGED DURING STANDBY
1SIMOV-PG-1269A	4.50E-005	MOTOR OPERTD VALVE 1-CH-MOV-1269A PLUGGED IN STANDBY
1SIMOV-PG-1269B	8.21E-004	MOTOR OPERTD VALVE SI-1269B PLUGGED DURING STANDBY
1SIMOV-PG-1270A	4.50E-005	MOTOR OPERTD VALVE 1-CH-MOV-1270A PLUGGED IN STANDBY
1SIMOV-PG-1270B	8.21E-004	MOTOR OPERTD VALVE SI-1270B PLUGGED DURING STANDBY
1SIMOV-PG-1286B	4.50E-005	MOTOR OPERTD VALVE 1-SI-MOV-1286B PLUGGED IN STANDBY
1SIMOV-PG-1286C	4.50E-005	MOTOR OPERTD VALVE 1-SI-MOV-1286C PLUGGED IN STANDBY
1SIMOV-PG-1287A	8.21E-004	MOTOR OPERTD VALVE 1-CH-MOV-1287A PLUGS IN STANDBY
1SIMOV-PG-1287B	8.21E-004	MOTOR OPERTD VALVE 1-CH-MOV-1287B PLUGGED IN STANDBY
1SIMOV-PG-1287C	8.21E-004	MOTOR OPERTD VALVE 1-CH-MOV-1287C PLUGGED IN STANDBY
1SIMOV-PG-1860A	1.36E-003	MOTOR OPERTD VALVE PLUGGED DURING STANDBY
1SIMOV-PG-1860B	1.36E-003	MOTOR OPERTD VALVE PLUGGED DURING STANDBY
1SIMOV-PG-1862A	1.35E-004	N.O. MOV 1-SI-1862A PLUGGED DURING STANDBY
1SIMOV-PG-1862B	1.35E-004	N.O. MOV 1-SI-1862B PLUGGED DURING STANDBY
1SIMOV-PG-1864A	8.21E-004	N.O. MOV 1-SI-1864A PLUGGED DRNG STNDBY
1SIMOV-PG-1864B	8.21E-004	N.O. MOV 1-SI-1864B PLUGGED DRNG STNDBY
1SIMOV-PG-1865A	8.21E-004	MOTOR OPERTD VALVE 1865A PLUGGED DURING STANDBY
1SIMOV-PG-1865B	8.21E-004	N.O. OPEN MOV SI-1865B PLUGGED IN STANDBY
1SIMOV-PG-1865C	8.21E-004	N.O.OPEN MOV SI-1865C PLUGGED IN STANDBY
1SIMOV-PG-1885A	1.35E-004	N.O. MOV 1-SI-1885A PLUGGED DURING STANDBY
1SIMOV-PG-1885B	1.35E-004	N.O. MOV 1-SI-1885B PLUGGED DURING STANDBY
1SIMOV-PG-1885C	1.35E-004	N.O. MOV 1-SI-1885C PLUGGED DURING STANDBY
1SIMOV-PG-1885D	1.35E-004	MOTOR OPERTD VALVE 1-SI-1885D PLUGGED DURING STANDBY
1SIMV--PG-1SI305	1.35E-004	N.O. MANUAL VALVE 1-SI-305 PLUGGED DURING STANDBY
1SIMV--PG-1SI306	1.35E-004	N.O. MANUAL VALVE 1-SI-306 PLUGGED DURING STANDBY
1SIMV--PG-1SI46	4.50E-005	N.O. MANUAL VALVE SI-46 PLUGGED DURING STANDBY
1SIPSB-CC-FS1A1B	4.93E-004	CCF 2/2 FS OF PUMPS 1A AND 1B TO START
1SIPSB-FR-1HRP1A	3.30E-005	MD STNDBY PUMP 1-SI-P-1A FAILS TO RUN FOR 1 HOUR
1SIPSB-FR-1HRP1B	3.30E-005	MD STNDBY PUMP 1-SI-P-1B FAILS TO RUN

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1SIPSB-FR-24HP1A	7.93E-004	MD STNDBY PUMP 1-SI-P-1A FAILS TO RUN
1SIPSB-FR-24HP1B	7.93E-004	MD STNDBY PUMP 1-SI-P-1B FAILS TO RUN
1SIPSB-FS-1SIP1A	4.02E-003	MD STNDBY PUMP 1-SI-P-1A FAILS TO START
1SIPSB-FS-1SIP1B	4.02E-003	MD STNDBY PUMP 1-SI-P-1B FAILS TO START
1SIPSB-UM-1SIP1A	4.54E-003	MD STANDBY PUMP 1-SI-P-1A UNSCHDL MAINT.
1SIPSB-UM-1SIP1B	4.54E-003	MD STANDBY PUMP 1-SI-P-1B UNSCHDL MAINT.
1SIRLY-LF-3-602B	2.66E-004	AUXILIARY RELAY 3- FROM K602B LOSS OF FUNCTION
1SIRLY-LF-601B	2.66E-004	RELAY K601 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-603A	2.66E-004	RELAY K603 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K136A	2.66E-004	RELAY K136 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K136B	2.66E-004	RELAY K136 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K148A	2.66E-004	RELAY K148 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K148B	2.66E-004	RELAY K148B TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K201A	2.66E-004	RELAY K201 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K201B	2.66E-004	RELAY K201 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K203A	2.66E-004	RELAY K203 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K203B	2.66E-004	RELAY K203 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K204A	2.66E-004	RELAY K204 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K204B	2.66E-004	RELAY K204 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K218A	2.66E-004	RELAY K218 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K218B	2.66E-004	RELAY K218 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K229A	2.66E-004	RELAY K229 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K229B	2.66E-004	RELAY K229 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K231A	2.66E-004	RELAY K231 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K231B	2.66E-004	RELAY K231 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K245A	2.66E-004	RELAY K245 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K245B	2.66E-004	RELAY K245 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K247A	2.66E-004	RELAY K247 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K247B	2.66E-004	RELAY K247 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K248A	2.66E-004	RELAY K248 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K248B	2.66E-004	RELAY K248 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K306A	2.66E-004	RELAY K306 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K306B	2.66E-004	RELAY K306 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K317A	2.66E-004	RELAY K317 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K317B	2.66E-004	RELAY K317 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K318A	2.66E-004	RELAY K318 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K318B	2.66E-004	RELAY K318 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K319A	2.66E-004	RELAY K319 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K319B	2.66E-004	RELAY K319 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K320A	2.66E-004	RELAY K320 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K320B	2.66E-004	RELAY K320 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K321A	2.66E-004	RELAY K321 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K321B	2.66E-004	RELAY K321 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K327A	2.66E-004	RELAY K327 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K327B	2.66E-004	RELAY K327 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K334A	2.66E-004	RELAY K335 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K334B	2.66E-004	RELAY K334 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K337A	2.66E-004	RELAY K337 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K337B	2.66E-004	RELAY K337 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K344A	2.66E-004	RELAY K344 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K344B	2.66E-004	RELAY K344 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K347A	2.66E-004	RELAY K347 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K347B	2.66E-004	RELAY K347 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K348A	2.66E-004	RELAY K348 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K348B	2.66E-004	RELAY K348 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K408A	2.66E-004	RELAY K408 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K408B	2.66E-004	RELAY K408 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K409A	2.66E-004	RELAY K409 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K409B	2.66E-004	RELAY K409 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K410A	2.66E-004	RELAY K410 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K410B	2.66E-004	RELAY K410 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K416A	2.66E-004	RELAY K416 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K416B	2.66E-004	RELAY K416 TRAIN B LOSS OF FUNCTION

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
1SIRLY-LF-K417A	2.66E-004	RELAY K417 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K417B	2.66E-004	RELAY K417 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K418A	2.66E-004	RELAY K418 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K418B	2.66E-004	RELAY K418 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K419A	2.66E-004	RELAY K419 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K419B	2.66E-004	RELAY K419 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K431A	2.66E-004	RELAY K431 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K431B	2.66E-004	RELAY K431 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K432A	2.66E-004	RELAY K432 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K432B	2.66E-004	RELAY K432 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K433A	2.66E-004	RELAY K433 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K433B	2.66E-004	RELAY K433 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K501A	2.66E-004	MASTER RELAY K501 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K501B	2.66E-004	RELAY K501 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K521A	2.66E-004	RELAY K521 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K521B	2.66E-004	RELAY K521 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K601A	2.66E-004	RELAY K601 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K602A	2.66E-004	RELAY K602 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K602B	2.66E-004	RELAY K602 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K603B	2.66E-004	RELAY K603 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K604A	2.66E-004	RELAY K604 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K604B	2.66E-004	RELAY K604 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K608A	2.66E-004	RELAY K608 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K608B	2.66E-004	RELAY K608 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K609A	2.66E-004	RELAY K609 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K609B	2.66E-004	RELAY K609 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K610A	2.66E-004	RELAY K610 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K610B	2.66E-004	RELAY K610 TRAIN B LOSS OF FUNCTION
1SIRLY-LF-K611A	2.66E-004	RELAY K611 TRAIN A LOSS OF FUNCTION
1SIRLY-LF-K611B	2.66E-004	RELAY K611 TRAIN B LOSS OF FUNCTION
1SISV--MC-1845A	3.75E-005	SAFETY VALVE 1845A MISCALIBRATED - LIFTS EARLY
1SISV--MC-1845C	3.75E-005	SAFETY VALVE 1845C MISCALIBRATED - LIFTS EARLY
1SITNK-LF-1SITK2	2.66E-006	FLOW OBSTRUCTION IN BORON INJECTION TANK
1SW-COLDWEA-3MO	2.50E-001	FRACTION OF TIME DISCHARGE VIA BYPASS (3 MONTHS)
1SW-HOTWEA-9MO	7.50E-001	FRACTION OF TIME DISCHARGE VIA SPRAY ARRAYS (9 MONTHS)
1SWCKV-CC-386420	6.34E-005	COMMON CAUSE FAULT CKVS 1-SW-386 & 420 FAILS CLOSED
1SWCKV-CC-402436	6.34E-005	COMMON CAUSE FAULT CKVS 1-SW-402 & 436 FAILS CLOSED
1SWCKV-CC-630631	6.34E-005	CCF OF CHECK VALVES SW-630 AND SW-631
1SWCKV-CC-641644	6.34E-005	CCF PF CHECK VALVES SW-641 AND SW-644
1SWCKV-CC-647648	6.34E-005	CCF OF CHECK VALVES SW-647 AND SW-648 TO OPEN
1SWCKV-CC-658661	6.34E-005	CCF OF CHECK VALVES SW-658 AND SW-661 TO OPEN
1SWCKV-FC-1SW10	6.34E-004	CHECK VALVE FAILS CLOSED 1-SW-10
1SWCKV-FC-1SW22	6.34E-004	CHECK VALVE FAILS CLOSED 1-SW-22
1SWCKV-FC-1SW386	6.34E-004	CHECK VALVE 1-SW-386 FAILS CLOSED
1SWCKV-FC-1SW402	6.34E-004	CHECK VALVE 1-SW-402 FAILS CLOSED
1SWCKV-FC-1SW420	6.34E-004	CHECK VALVE 1-SW-420 FAILS CLOSED
1SWCKV-FC-1SW436	6.34E-004	CHECK VALVE 1-SW-436 FAILS CLOSED
1SWCKV-FC-1SW630	6.34E-004	CHECK VALVE SW-630 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW631	6.34E-004	CHECK VALVE SW-631 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW641	6.34E-004	CHECK VALVE SW-641 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW644	6.34E-004	CHECK VALVE SW-644 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW647	6.34E-004	CHECK VALVE SW-647 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW648	6.34E-004	CHECK VALVE SW-648 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW658	6.34E-004	CHECK VALVE SW-658 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-1SW661	6.34E-004	CHECK VALVE SW-661 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-114	6.34E-004	CHECK VALVE SW-114 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-116	6.34E-004	CHECK VALVE SW-116 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-120	6.34E-004	CHECK VALVE SW-120 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-130	6.34E-004	CHECK VALVE SW-130 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-140	6.34E-004	CHECK VALVE SW-140 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FC-SW-150	6.34E-004	CHECK VALVE SW-150 FAILS CLOSED (FAILS TO OPEN)
1SWCKV-FO-1SW10	3.44E-003	CHECK VALVE FAILS OPEN 1-SW-10
1SWCKV-FO-1SW23	3.44E-003	CHECK VALVE FAILS OPEN 1-SW-23

Event	Unavailability	Description
1SWCKV-FO-1SW3	3.44E-003	CHECK VALVE FAILS OPEN 1-SW-3
1SWMOV-CC-101A-D	3.90E-004	CCF 4/4 FC OF INLET SUPPLY VALVES 1-SW-CC-101A-D
1SWMOV-CC-103A-D	3.90E-004	CCF 4/4 FC OF INLET ISO VALVES 1-SW-MOV-103A-D
1SWMOV-CC-104A-D	3.90E-004	CCF 4/4 FC OF OUTLET ISO VALVES 1-SW-MOV-104A-D
1SWMOV-CC-105A-D	3.90E-004	CCF 4/4 FC OF DISCHARGE ISO VLVS 1-SW-MOV-105A-D
1SWMOV-FC-115A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-115A
1SWMOV-FC-115B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-115B
1SWMOV-FC-120A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-120A
1SWMOV-FC-120B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-120B
1SWMOV-FC-1SW117	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-117
1SWMOV-FC-1SW118	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 1-SW-MOV-118
1SWMOV-FC-SW101A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW101B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW101C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW101D	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW103A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW103B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW103C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW103D	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW104A	1.09E-002	MOTOR OPERTD VALVE SW-104A FAIL CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW104B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW104C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW104D	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW105A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW105B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW105C	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-FC-SW105D	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED (FAILS TO OPEN)
1SWMOV-PG-SW102A	4.50E-005	MOTOR OPERTD VALVE 1-SW-102A PLUGGED DURING STANDBY
1SWMOV-PG-SW102B	4.50E-005	MOTOR OPERTD VALVE 1-SW-102B PLUGGED DURING STANDBY
1SWMOV-PG-SW106A	1.35E-004	MOTOR OPERTD VALVE SW-106A PLUGGED DURING STANDBY
1SWMOV-PG-SW106B	1.35E-004	MOTOR OPERTD VALVE SW-106B PLUGGED DURING STANDBY
1SWMOV-SC-121A	1.21E-005	1-SW-MOV-121A SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-121B	1.21E-005	1-SW-MOV-121B SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-122A	1.21E-005	1-SW-MOV-122A SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-122B	1.21E-005	1-SW-MOV-122B SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-123A	1.21E-005	BYPASS VALVE 1-SW-MOV-123A SPURIOUS CLOSURE
1SWMOV-SC-123B	1.21E-005	BYPASS VALVE 1-SW-MOV-223B SPURIOUS CLOSURE
1SWMOV-SC-223A	1.21E-005	BYPASS VALVE 1-SW-MOV-223A SPURIOUS CLOSURE
1SWMOV-SC-223B	1.21E-005	BYPASS VALVE 1-SW-MOV-223B SPURIOUS CLOSURE
1SWMOV-SC-SW108A	1.21E-005	MOTOR OPERTD VALVE SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-SW108B	1.21E-005	MOTOR OPERTD VALVE SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-SW208A	1.21E-005	MOTOR OPERTD VALVE SPURIOUS CLOSED DURING MISSION
1SWMOV-SC-SW208B	1.21E-005	MOTOR OPERTD VALVE SPURIOUS CLOSED DURING MISSION
1SWMV--FC-1SW13	1.25E-004	MANUAL VALVE FAILS CLOSED 1-SW-13
1SWMV--FC-1SW222	1.25E-004	MANUAL VALVE SW-222 FAILS CLOSED (FAILS TO OPN)
1SWMV--FC-1SW362	1.25E-004	MANUAL VALVE 1-SW-362 FAILS CLOSED
1SWMV--FC-1SW385	1.25E-004	MANUAL VALVE 1-SW-385 FAILS CLOSED
1SWMV--FC-1SW4	1.25E-004	MANUAL VALVE FAILS CLOSED 1-SW-4
1SWMV--FO-1SW11	1.25E-004	MANUAL VALVE FAILS OPEN 1-SW-11
1SWMV--FO-1SW6	1.25E-004	MANUAL VALVE FAILS OPEN 1-SW-6
1SWMV--PG-1SW11	4.50E-005	N.O. MANUAL VALVE 1-SW-11 PLUGGED DURING STANDBY
1SWMV--PG-1SW634	2.74E-004	N.O. MANUAL VALVE SW-634 PLUGGED DURING STANDBY
1SWMV--PG-1SW635	2.74E-004	N.O. MANUAL VALVE SW-635 PLUGGED DURING STANDBY
1SWMV--PG-1SW636	2.74E-004	N.O. MANUAL VALVE SW-636 PLUGGED DURING STANDBY
1SWMV--PG-1SW637	2.74E-004	N.O. MANUAL VALVE SW-637 PLUGGED DURING STANDBY
1SWMV--PG-1SW642	2.74E-004	N.O. MANUAL VALVE SW-642 PLUGGED DURING STANDBY
1SWMV--PG-1SW643	2.74E-004	N.O. MANUAL VALVE SW-643 PLUGGED DURING STANDBY
1SWMV--PG-1SW645	1.05E-005	N.O. MANUAL VALVE SW-645 PLUGGED DURING STANDBY
1SWMV--PG-1SW646	1.05E-005	N.O. MANUAL VALVE SW-646 PLUGGED DURING STANDBY
1SWMV--PG-1SW651	1.05E-005	N.O. MANUAL VALVE SW-651 PLUGGED DURING STANDBY
1SWMV--PG-1SW652	1.05E-005	N.O. MANUAL VALVE SW-652 PLUGGED DURING STANDBY
1SWMV--PG-1SW653	1.05E-005	N.O. MANUAL VALVE SSW-653 PLUGGED DURING STANDBY
1SWMV--PG-1SW654	1.05E-005	N.O. MANUAL VALVE SW-654 PLUGGED DURING STANDBY

Event	Unavailability	Description
1SWMV--PG-1SW659	1.05E-005	N.O. MANUAL VALVE SW-659 PLUGGED DURING STANDBY
1SWMV--PG-1SW660	1.05E-005	N.O. MANUAL VALVE SW-660 PLUGGED DURING STANDBY
1SWMV--PG-1SW669	2.74E-004	N.O. MANUAL VALVE SW-669 PLUGGED DURING STANDBY
1SWMV--PG-1SW670	2.74E-004	N.O. MANUAL VALVE SW-670 PLUGGED DURING STANDBY
1SWPAT-CC-SWP1B	3.84E-004	COMMON CAUSE FAULT ALT PUMP IN STANDY FAILS TO START
1SWPAT-FR-1SWP1A	7.93E-004	MD ALT PUMP 1-SW-P-1A FAILS TO RUN
1SWPAT-FR-1SWP1B	7.93E-004	MD ALT PUMP 1-SW-P-1B FAILS TO RUN
1SWPAT-FS-1SWP1B	3.84E-003	MD ALT PUMP 1-SW-P-1B FAILS TO START
1SWPAT-UM-1SWP1B	3.75E-003	MD ALT PUMP 1-SW-P-1B UNSCHLD MAINT.
1SWPIP-UM-HDRA	2.28E-002	SW RTN HEADER A (3) IN MAINTENANCE
1SWPIP-UM-HDRB	2.28E-002	SW RTN HEADER B (4) IN MAINTENANCE
1SWPSB-FR-1SWP-4	7.93E-004	MD STNDBY PUMP 1-SW-P-4 FAILS TO RUN
1SWPSB-FS-1SWP-4	3.15E-003	MD STNDBY PUMP 1-SW-P-4 FAILS TO START
1SWPSB-UM-1SWP-4	8.29E-002	MD STNDBY PUMP 1-SW-P-4 UNSCHDL MAINT.
1SWRLY-LF-SWEA03	2.66E-004	RELAY 3C-SWEA03 FAILS TO OPEN AFTER 1-SW-P-1A FAILURE
1SWSCN-CC-SWRES	6.39E-005	CCF OF THE PUMPS DUE TO SCREENWELL PLUGGING
1SWSCN-PG-1SWP1B	9.53E-003	1-SW-P-1B FAILS DUE TO SCREENWELL PLUGGING
1SWSCN-PG-2SWP1B	9.53E-003	2-SW-P-1B FAILS DUE TO SCREENWELL PLUGGING
1SWSCN-PL-1SWP1A	6.39E-004	1-SW-P-1A FAILS DUE TO SCREENWELL PLUGGING
1SWTCV-CC-102BC	1.81E-003	CCF OF SW-TCV-102B AND SW-TCV-102C TO OPEN
1SWTCV-FC-SW102B	1.81E-002	TEMP CONTROL VALVE SW-102B FAILS CLSD (FAILS TO OPEN)
1SWTCV-FC-SW102C	1.81E-002	TEMP CONTROL VALVE SW-102C FAILS CLSD (FAILS TO OPEN)
1TMSOV-FC-20-ET	1.81E-002	EHC AUTO STOP OIL LOW PRESSURE SOV (FAILS TO OPEN)
1TMSOV-FC-ASO	1.81E-002	EHC / AUTO STOP OIL INTERFACE VALVE (FAILS TO OPEN)
2CDCKV-FC-2CD211	6.34E-004	CHECK VALVE 2-CD-211 FAILS CLOSED
2EE-BAT-I-2HR	1.00E+000	FAILURE OF BATTERY 2-I AT TWO HOURS
2EE-BAT-II-2HR	1.00E+000	FAILURE OF BATTERY 2-II AT TWO HOURS
2EE-BAT-III-2HR	1.00E+000	FAILURE OF BATTERY 2-III AT TWO HOURS
2EE-BAT-IV-2HR	1.00E+000	FAILURE OF BATTERY 2-IV AT TWO HOURS
2EEBAT-CC-ALL	1.05E-006	COMMON CAUSE FAULT BATTERIES FAIL TO SUPPLY POWER
2EEBAT-CC-I-III	1.05E-006	COMMON CAUSE FAULTS BATTERIES 2-BY-B-1 AND 2-BY-B-3
2EEBAT-LP-I	1.50E-005	BATTERY 2-I FAILS TO SUPPLY POWER 2-BY-B-1
2EEBAT-LP-II	1.50E-005	BATTERY 2-II FAILS TO SUPPLY POWER 2-BY-B-2
2EEBAT-LP-III	1.50E-005	BATTERY 2-III FAILS TO SUPPLY POWER
2EEBAT-LP-IV	1.50E-005	BATTERY 2-IV FAILS TO SUPPLY POWER 2-BY-B-4
2EEBCH-LP-2C-I	8.40E-005	BATTERY CHARGER 2CI FAILS 225A 2-BY-C-3
2EEBCH-LP-2C-II	8.40E-005	BATTERY CHARGER 2C-II FAILS 225A 2-BY-C-6
2EEBCH-LP-I	8.40E-005	BATTERY CHARGER 2-I FAILS 225A 2-BY-C-2
2EEBCH-LP-II	8.40E-005	BATTERY CHARGER 2-II FAILS 225A 2-BY-C-4
2EEBCH-LP-III	8.40E-005	BATTERY CHARGER 2-III FAILS 225A 2-BY-C-5
2EEBCH-LP-IV	8.40E-005	BATTERY CHARGER 2-IV FAILS 225A 2-BY-C-7
2EEBKR-FO-25H1	2.74E-004	BREAKER 25H1 FAILS OPEN, WILL NOT CLOSE 4160 V
2EEBKR-FO-25H2	2.74E-004	BREAKER 25H2 EDG OUTPUT BREAKER FAILS TO CLOSE
2EEBKR-FO-25J11	2.74E-004	BREAKER 25J11 FAILS OPEN, WILL NOT CLOSE 4160 V
2EEBKR-FO-25J2	2.74E-004	BREAKER 25J2 EDG OUTPUT BREAKER FAILS TO CLOSE
2EEBKR-FO-I-12	2.74E-004	BREAKER 12 ON DC PANEL 2-I FAILS TO CLOSE
2EEBKR-FO-II-10	2.74E-004	BREAKER 10 ON DC PANEL 2-II FAILS TO CLOSE
2EEBKR-FO-III-12	2.74E-004	BREAKER 12 ON DC PANEL 2-III FAILS TO CLOSE
2EEBKR-FO-IV-8	2.74E-004	BREAKER 8 ON DC PANEL 2-IV FAILS TO CLOSE
2EEBKR-SO-16A-17	3.36E-005	BREAKER 17 ON SEMI VITAL DIST 2A SPURIOUSLY OPENS
2EEBKR-SO-16B-17	3.36E-005	BREAKER 17 ON SEMI VITAL DIST 2B SPURIOUSLY OPENS
2EEBKR-SO-24H1	3.36E-005	BREAKER 24H1 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H1-1	3.36E-005	BREAKER 24H1-1 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H1-3	3.36E-005	BREAKER 24H1-3 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H2	3.36E-005	BREAKER 24H2 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H3	3.36E-005	BREAKER 24H3 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H4	3.36E-005	BREAKER 24H4 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24H5	3.36E-005	BREAKER 24H5 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24J1	3.36E-005	BREAKER 24J1 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24J1-1	3.36E-005	BREAKER 24J1-1 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24J4	3.36E-005	BREAKER 24J4 SPURIOUSLY OPENS 480 V
2EEBKR-SO-24J6	3.36E-005	BREAKER 24J6 SPURIOUSLY OPENS
2EEBKR-SO-25H11	3.36E-005	BREAKER 25H11 SPURIOUSLY OPENS 4160 V

Event	Unavailability	Description
2EEBKR-SO-25H12	3.36E-005	BREAKER 25H12 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25H2	8.39E-006	BREAKER 25H2 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25H8	3.36E-005	BREAKER 25H8 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25J11	3.36E-005	BREAKER 25J11 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25J12	3.36E-005	BREAKER 25J12 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25J2	8.39E-006	BREAKER 25J2 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-25J8	3.36E-005	BREAKER 25J8 SPURIOUSLY OPENS 4160 V
2EEBKR-SO-2A-25	3.36E-005	BREAKER 25 ON SEMI VITAL BUS 2A SPURIOUSLY OPENS
2EEBKR-SO-H1-E2R	3.36E-005	BREAKER E2R ON MCC 2H1-1 SPURIOUSLY OPENS
2EEBKR-SO-H1-E4L	3.36E-005	BREAKER E4L ON MCC 2H1-1 SPURIOUSLY OPENS
2EEBKR-SO-H1-E4R	3.36E-005	BREAKER E4R ON MCC 2H1-1 SPURIOUSLY OPENS
2EEBKR-SO-H1-F3L	3.36E-005	BREAKER F3L ON MCC 2H1-1 SPURIOUSLY OPENS
2EEBKR-SO-H1-F3R	3.36E-005	BREAKER F3R ON MCC 1H1-1 SPURIOUSLY OPENS
2EEBKR-SO-H3-A3	3.36E-005	BREAKER A3 ON MCC 2H1-3A SPURIOUSLY OPENS
2EEBKR-SO-H4-B4R	3.36E-005	BREAKER B4R ON MCC 2H1-4 SPURIOUSLY OPENS
2EEBKR-SO-I-12	3.36E-005	BREAKER 12 ON DC PANEL 2-I SPURIOUSLY OPENS
2EEBKR-SO-I-13	3.36E-005	BREAKER 13 ON DC BUS 2-I SPURIOUSLY OPENS
2EEBKR-SO-II-11	3.36E-005	BREAKER 11 ON DC PANEL 2-II SPURIOUSLY OPENS
2EEBKR-SO-II-14	3.36E-005	BREAKER 14 ON DC BUS 2-II SPURIOUSLY OPENS
2EEBKR-SO-III-11	3.36E-005	BREAKER 11 ON DC PANEL 2-III SPURIOUSLY OPENS
2EEBKR-SO-III-12	3.36E-005	BREAKER 12 ON DC BUS 2-III SPURIOUSLY OPENS
2EEBKR-SO-IV-11	3.36E-005	BREAKER 11 ON DC BUS 2-IV SPURIOUSLY OPENS
2EEBKR-SO-IV-25	3.36E-005	BREAKER 25 ON SEMI VITAL BUS 2B SPURIOUSLY OPENS
2EEBKR-SO-IV-9	3.36E-005	BREAKER 9 ON DC PANEL 2-IV SPURIOUSLY OPENS
2EEBKR-SO-J1-B2L	3.36E-005	BREAKER B2L ON MCC 2J1-1 SPURIOUSLY OPENS
2EEBKR-SO-J1-B2R	3.36E-005	BREAKER B2R ON MCC 2J1-1 SPURIOUSLY OPENS
2EEBKR-SO-J1-C1L	3.36E-005	BREAKER C1L ON MCC 2J1-1 SPURIOUSLY OPENS
2EEBKR-SO-J1-E1L	3.36E-005	BREAKER E1L ON MCC 2J1-1 SPURIOUSLY OPENS
2EEBKR-SO-J1-E1R	3.36E-005	BREAKER E1R ON MCC 2J1-1 SPURIOUSLY OPENS
2EEBKR-SO-J2-J2R	3.36E-005	BREAKER J2R ON MCC 2J1-2S SPURIOUSLY OPENS
2EEBKR-SO-J3-A3	3.36E-005	BREAKER A3 ON MCC 2J1-3 SPURIOUSLY OPENS
2EEBKR-SO-VB1-35	3.36E-005	BREAKER 35 ON VITAL BUS 2-1 SPURIOUSLY OPENS
2EEBKR-SO-VB2-35	3.36E-005	BREAKER 35 ON VITAL BUS 2-II SPURIOUSLY OPENS
2EEBKR-SO-VB3-35	3.36E-005	BREAKER 35 ON VITAL BUS 2-III SPURIOUSLY OPENS
2EEBKR-SO-VB4-35	3.36E-005	BREAKER 35 ON VITAL BUS 2-IV SPURIOUSLY OPENS
2EEBUS-LU-2H	1.21E-005	4160 V BUS 2H LOSS OF FUNCTION 2-EE-SW-1
2EEBUS-LU-2H-480	1.21E-005	480 V BUS 2H LOSS OF FUNCTION 2-EE-SS-1
2EEBUS-LU-2H1	1.21E-005	480 V BUS 2H1 LOSS OF FUNCTION 2-EE-SS-3
2EEBUS-LU-2H1-1	1.21E-005	480 V MCC 2H1-1 LOSS OF FUNCTION 2-EP-MC-10
2EEBUS-LU-2H1-2N	1.21E-005	480 V MCC 2H1-2N LOSS OF FUNCTION 2-EP-MC-19
2EEBUS-LU-2H1-2S	1.21E-005	480 V MCC 2H1-2S LOSS OF FUNCTION 2-EP-MC-20
2EEBUS-LU-2H1-3	1.21E-005	480 V MCC 2H1-3 LOSS OF FUNCTION 2-EP-MC-32
2EEBUS-LU-2H1-3A	1.21E-005	480 V MCC 2H1-3A LOSS OF FUNCTION 2-EP-MC-50
2EEBUS-LU-2H1-4	1.21E-005	480 V MCC 2H1-4 LOSS OF FUNCTION 2-EP-MC-41
2EEBUS-LU-2HSTUB	1.21E-005	4160 V STUB BUS 2H LOSS OF FUNCTION 2-EE-SW-1
2EEBUS-LU-2J	1.21E-005	4160 V BUS 2J LOSS OF FUNCTION 2-EE-SW-2
2EEBUS-LU-2J-480	1.21E-005	480 V BUS 2J LOSS OF FUNCTION 2-EE-SS-2
2EEBUS-LU-2J1	1.21E-005	480 V BUS 2J1 LOSS OF FUNCTION 2-EE-SS-4
2EEBUS-LU-2J1-1	1.21E-005	480 V MCC 2J1-1 LOSS OF FUNCTION 1-EP-MC-11
2EEBUS-LU-2J1-2	1.21E-005	480V MCC 2J1-2N &2S LOSS OF FUNCTION 2-EP-MC-21 & 22
2EEBUS-LU-2J1-3	1.21E-005	480V MCC 2J1-3 LOSS OF FUNCTION 2-EP-MC-33
2EEBUS-LU-2J1-3A	1.21E-005	480 V MCC 2J1-3A LOSS OF FUNCTION 2-EP-MC-51
2EEBUS-LU-2JSTUB	1.21E-005	4160V STUB BUS 2J LOSS OF FUNCTION 2-EE-SW-2
2EEBUS-LU-DB-2A	1.21E-005	SEMI VITAL DIST 2A LOSS OF FUNCTION 2-EP-DB-16A 120 V
2EEBUS-LU-DB-2B	1.21E-005	SEMI VITAL DIST 2B LOSS OF FUNCTION 2-EP-DB-2B 120 V
2EEBUS-LU-DC-I	1.21E-005	125 V DC BUS 2-I LOSS OF FUNCTION 1-EP-CB-12A
2EEBUS-LU-DC-II	1.21E-005	125 V DC BUS 2-II LOSS OF FUNCTION 2-EP-CB-12B
2EEBUS-LU-DC-III	1.21E-005	125 V DC BUS 2-III LOSS OF FUNCTION 2-EP-CB-12C
2EEBUS-LU-DC-IV	1.21E-005	125 V DC BUS 2-IV LOSS OF FUNCTION 2-EP-CB-12D
2EEBUS-LU-SVB-2A	1.21E-005	SEMI VITAL BUS 2A LOSS OF FUNCTION 2-EP-CB-16A 120 V
2EEBUS-LU-SVB-2B	1.21E-005	SEMI VITAL BUS 2B LOSS OF FUNCTION 2-EP-CB-16B 120 V
2EEBUS-LU-VB-I	1.21E-005	120 V VITAL BUS 2-I LOSS OF FUNCTION 2-EP-CB-4A
2EEBUS-LU-VB-II	1.21E-005	120V VITAL BUS 2-II LOSS OF FUNCTION 2-EP-CE-4B

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
2EEBUS-LU-VB-III	1.21E-005	120 V VITAL BUS III LOSS OF FUNCTION 2-EP-CB-4C
2EEBUS-LU-VB-IV	1.21E-005	12-V VITAL BUS 2-IV LOSS OF FUNCTION 2-EP-CB-4D
2EEBUS-UM-2H	2.00E-004	4160 V BUS 2H UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H-480	2.00E-004	480 V BUS 2H UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1	2.00E-004	480 V BUS 2H1 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-1	2.00E-004	480 V MCC 2H1-1 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-2N	2.00E-004	480 V MCC 2H1-2N UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-2S	2.00E-004	480 V MCC 2H1-2S UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-3	2.00E-004	480 V MCC 2H1-3 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-3A	2.00E-004	480 V MCC 2H1-3A UNSCHEDULED MAINTENANCE
2EEBUS-UM-2H1-4	2.00E-004	480 V MCC 2H1-4 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2HSTUB	2.00E-004	4160 V STUB BUS 2H UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J	2.00E-004	480 V BUS 2J UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J-480	2.00E-004	480 V BUS 2J UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J1	2.00E-004	480 V BUS 2J1 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J1-1	2.00E-004	480 V MCC 2J1-1 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J1-2	2.00E-004	480V MCC 2J1-2N &2S UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J1-3	2.00E-004	480V MCC 2J1-3 UNSCHEDULED MAINTENANCE
2EEBUS-UM-2J1-3A	2.00E-004	480 V MCC 2J1-3A UNSCHEDULED MAINTENANCE
2EEBUS-UM-2JSTUB	2.00E-004	4160 V STUB BUS 2J UNSCHEDULED MAINTENANCE
2EEBUS-UM-DB-2A	2.00E-004	SEMI VITAL DIST 2A UNSCHEDULED MAINTENANCE
2EEBUS-UM-DB-2B	2.00E-004	SEMI VITAL DIST 2B UNSCHEDULED MAINTENANCE
2EEBUS-UM-DC-I	2.00E-004	125 V DC BUS 2-I UNSCHEDULED MAINTENANCE
2EEBUS-UM-DC-II	2.00E-004	125 V DC BUS 2-II UNSCHEDULED MAINTENANCE
2EEBUS-UM-DC-III	2.00E-004	125 V DC BUS 2-III UNSCHEDULED MAINTENANCE
2EEBUS-UM-DC-IV	2.00E-004	125 V DC BUS 2-IV UNSCHEDULED MAINTENANCE
2EEBUS-UM-SVB-2A	2.00E-004	SEMI VITAL BUS 2A UNSCHEDULED MAINTENANCE
2EEBUS-UM-SVB-2B	2.00E-004	SEMI VITAL BUS 2B UNSCHEDULED MAINTENANCE
2EEBUS-UM-VB-I	2.00E-004	120 V VITAL BUS 2-I UNSCHEDULED MAINTENANCE
2EEBUS-UM-VB-II	2.00E-004	120V VITAL BUS 2-II UNSCHEDULED MAINTENANCE
2EEBUS-UM-VB-III	2.00E-004	120 V VITAL BUS III UNSCHEDULED MAINTENANCE
2EEBUS-UM-VB-IV	2.00E-004	120 V VITAL BUS IV UNSCHEDULED MAINTENANCE
2EEHS--LF-I	2.66E-005	HAND SWITCH FOR VITAL BUS 2-I FAILS 2-VB-BP-SW-1
2EEHS--LF-II	2.66E-005	HAND SWITCH FOR VITAL BUS 2-II FAILS 2-VB-BP-SW-2
2EEHS--LF-III	2.66E-005	HAND SWITCH FOR VITAL BUS 2-III FAILS 2-VB-BP-SW-3
2EEHS--LF-IV	2.66E-005	HAND SWITCH FOR VITAL BUS 2-IV FAILS 2-VB-BP-SW-4
2EEINV-LU-I	6.14E-004	INVERTER 2-I LOSS OF FUNCTION 2-VB-I-1
2EEINV-LU-II	6.14E-004	INVERTER 2-II LOSS OF FUNCTION 2-VB-I-2
2EEINV-LU-III	6.14E-004	INVERTER 2-III LOSS OF FUNCTION 2-VB-I-3
2EEINV-LU-IV	6.14E-004	INVERTER 2-IV LOSS OF FUNCTION 2-VB-I-4
2EETFM-LP-118	1.90E-005	TRANSFORMER 118-2 SEMI VITAL DIST 2A 480/120-240V 15KVA
2EETFM-LP-119	1.90E-005	TRANSFORMER 119-2 SEMI VITAL DIST 2B 480/120-240V 15KVA
2EETFM-LP-2H	1.90E-005	TRANSFORMER 2H 4160/480 V FAILS 2-EE-ST-2H
2EETFM-LP-2H1	1.90E-005	TRANSFORMER 2H1 4160/480 V FAILS 2-EE-ST-2H1
2EETFM-LP-2J	1.90E-005	TRANSFORMER 2J 4160/480 V FAILS 1000/1333KVA
2EETFM-LP-2J1	1.90E-005	TRANSFORMER 2J1 4160/480 V FAILS 750KVA
2EETFM-LP-70	1.90E-005	TRANSFORMER 70-2 SEMI VITAL BUS 2A 480-120/240V 15KVA
2EETFM-LP-71	1.90E-005	TRANSFORMER 71-2 SEMI VITAL BUS 2B 480V/120-240V 15KV
2EETFM-LP-79A	1.90E-005	TRANSFORMER 79A 480/120V 1PH FAILS 10KVA VOLT REG
2EETFM-LP-79B	1.90E-005	TRANSFORMER 79B 480/120V 1PH FAILS 10KVA VOLT REG
2EETFM-LP-80	1.90E-005	TRANSFORMER 80-2 480/120V 1PH FAILS 15KVA VOLT REG
2EGEDG-CC-2H-2J	2.66E-004	COMMON CAUSE FAULTS EDGS 2H AND 2J
2EGEDG-FR-2H	1.33E-002	EMERGENCY DIESEL GENERATOR 2H FAILS TO RUN FOR 6 HOURS
2EGEDG-FR-2J	1.33E-002	EMERGENCY DIESEL GENERATOR 2J FAILS TO RUN FOR 6 HOURS
2EGEDG-FS-2H	1.43E-002	EMERGENCY DIESEL GENERATOR 2H FAILS TO START
2EGEDG-FS-2J	1.43E-002	EMERGENCY DIESEL GENERATOR 2J FAILS TO START
2EGEDG-TM-2H	5.71E-004	EDG 2H UNAVAILABLE DUE TO SCHEDULED TEST OR MAINTENANCE
2EGEDG-TM-2J	5.71E-004	EDG 2J UNAVAILABLE DUE TO SCHEDULED TEST OR MAINTENANCE
2EGEDG-UM-2H	1.07E-001	EDG 2H UNAVIALABLE DUE TO UNSCHEDULED MAINTENANCE
2EGEDG-UM-2J	1.07E-001	EDG 2J UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE
2EPBKR-FC-25A2	1.83E-003	BREAKER 25A2 FAILS CLOSED, WILL NOT OPEN 4160 V
2EPBKR-FC-25B2	1.83E-003	BREAKER 25B2 FAILS CLOSED, WILL NOT OPEN 4160 V
2EPBKR-FC-25C2	1.83E-003	BREAKER 25C2 FAILS CLOSED, WILL NOT OPEN 4160 V

Event	Unavailability	Description
2EPBKR-FO-24A1-8	2.74E-004	BREAKER 24A1-8 FAILS OPEN, WILL NOT CLOSE 480 V
2EPBKR-FO-24B1-8	2.74E-004	BREAKER 24B1-8 FAILS OPEN, WILL NOT CLOSE 480 V
2EPBKR-FO-24C1-8	2.74E-004	BREAKER 24C1-8 FAILS OPEN, WILL NOT CLOSE 480 V
2EPBKR-FO-25A1	2.74E-004	BREAKER 25A1 FAILS OPEN, WILL NOT CLOSE 4160 V
2EPBKR-FO-25B1	2.74E-004	BREAKER 25B1 FAILS OPEN, WILL NOT CLOSE 4160 V
2EPBKR-FO-25B10	2.74E-004	BREAKER 25B10 FAILS OPEN, WILL NOT CLOSE 4160 V
2EPBKR-FO-25C1	2.74E-004	BREAKER 25C1 FAILS OPEN, WILL NOT CLOSE 4160 V
2EPBKR-SO-24A1-1	3.36E-005	BREAKER 24A1-1 SPURIOUSLY OPENS 480 V
2EPBKR-SO-24A215	3.36E-005	BREAKER 24A2-15 SPURIOUSLY OPENS 480 V
2EPBKR-SO-24B1-1	3.36E-005	BREAKER 24B1-1 SPURIOUSLY OPENS 480 V
2EPBKR-SO-24B215	3.36E-005	BREAKER 24B2-15 SPURIOUSLY OPENS 480 V
2EPBKR-SO-24C1-1	3.36E-005	BREAKER 24C1-1 SPURIOUSLY OPENS 480 V
2EPBKR-SO-24C215	3.36E-005	BREAKER 24C2-15 SPURIOUSLY OPENS 480 V
2EPBKR-SO-25A1	3.36E-005	BREAKER 25A1 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25A7	3.36E-005	BREAKER 25A7 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25B1	3.36E-005	BREAKER 25B1 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25B7	3.36E-005	BREAKER 25B7 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25C1	3.36E-005	BREAKER 25C1 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25C7	3.36E-005	BREAKER 25C7 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25G1	3.36E-005	BREAKER 25G1 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25G5	3.36E-005	BREAKER 25G5 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-25G9	3.36E-005	BREAKER 25G9 SPURIOUSLY OPENS 4160 V
2EPBKR-SO-2G11A3	3.36E-005	BREAKER A3 ON 2G1-1 SPURIOUSLY OPENS 480 V
2EPBKR-SO-2G2-7B	3.36E-005	BREAKER 7B ON 2G2 SPURIOUSLY OPENS 480 V
2EPBUS-LU-2A	1.21E-005	4160 V BUS 2A1 LOSS OF FUNCTION 2-EP-SW-1
2EPBUS-LU-2A1	1.21E-005	480 V BUS 2A1 LOSS OF FUNCTION 1-EP-SS-3
2EPBUS-LU-2A2	1.21E-005	480 V BUS 2A2 LOSS OF FUNCTION 2-EP-SS-6
2EPBUS-LU-2B	1.21E-005	160 V BUS 2B LOSS OF FUNCTION 2-EP-SW-2
2EPBUS-LU-2B1	1.21E-005	480 V BUS 2B1 LOSS OF FUNCTION 2-EP-SS-5
2EPBUS-LU-2B2	1.21E-005	480 V BUS 2B2 LOSS OF FUNCTION 2-EP-SS-8
2EPBUS-LU-2C	1.21E-005	4160 V BUS 2C LOSS OF FUNCTION 2-EP-SW-3
2EPBUS-LU-2C1	1.21E-005	480 V BUS 2C1 LOSS OF FUNCTION 1-EP-SS-7
2EPBUS-LU-2C2	1.21E-005	480 V BUS 2C2 LOSS OF FUNCTION 2-EP-SS-4
2EPBUS-LU-2G	1.21E-005	4160V INTAKE BUS 2G LOSS OF FUNCTION
2EPBUS-LU-2G1-1	1.21E-005	480 V MCC 2G1-1 LOSS OF FUNCTION 2-EP-MC-34 & 35
2EPBUS-LU-2G2	1.21E-005	480 V BUS 2G2 LOSS OF FUNCTION 2-EP-SS-9
2EPBUS-UM-2A1	2.00E-004	480 V BUS 2A1 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2A2	2.00E-004	480 V BUS 2A2 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2B1	2.00E-004	480 V BUS 2B1 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2B2	2.00E-004	480 V BUS 2B2 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2C1	2.00E-004	480 V BUS 2C1 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2C2	2.00E-004	480 V BUS 2C2 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2G	2.00E-004	4160V INTAKE BUS 2G UNSCHEDULED MAINTENANCE
2EPBUS-UM-2G1-1	2.00E-004	480 V MCC 2G1-1 UNSCHEDULED MAINTENANCE
2EPBUS-UM-2G2	2.00E-004	480 V BUS 2G2 UNSCHEDULED MAINTENANCE
2EPTFM-LP-2A1	1.90E-005	TRANSFORMER 2A1 4160/480 V FAILS
2EPTFM-LP-2A2	1.90E-005	TRANSFORMER 2A2 4160/480 V FAILS
2EPTFM-LP-2B1	1.90E-005	TRANSFORMER 2B1 4160/480 V FAILS
2EPTFM-LP-2B2	1.90E-005	TRANSFORMER 2B2 4160/480 V FAILS
2EPTFM-LP-2C1	1.90E-005	TRANSFORMER 2C1 4160/480 V FAILS
2EPTFM-LP-2C2	1.90E-005	TRANSFORMER 2C2 4160/480 V FAILS
2EPTFM-LP-2G1-1	1.90E-005	TRANSFORMER 2G1-1 4160/480 V FAILS 2-EP-ST-2G1
2EPTFM-LP-2G2	1.90E-005	TRANSFORMER 2G2 4160/480 V FAILS 2-EP-ST-2G2
2HVACU-LF-2HVAC6	3.42E-005	STDBY AHU 2-HV-AC-6 LOSS OF FUNCTION IN 24 HR MISSION
2HVACU-LF-2HVAC7	3.42E-005	OPER AHU 2-HV-AC-7 LOSS OF FUNCTION IN 24 HR MISSION
2HVACU-UM-2HVAC6	1.65E-003	STDBY AHU 2-HV-AC-6 UNSCHEDULED MAINTENANCE
2HVCHU-CC-HVE4	4.55E-003	COMMON CAUSE FAULT 2-HV-E-4B & 4C FAIL TO START
2HVCHU-FR-2HVE4A	1.51E-003	OPERATING 2-HV-E-4A FAILS TO RUN FOR 24 HOUR MISSION
2HVCHU-FR-2HVE4B	1.51E-003	SPARE 2-HV-E-4B FAILS TO RUN FOR 24 HOUR MISSION
2HVCHU-FR-2HVE4C	1.51E-003	STANDBY 2-HV-E-4C FAILS TO RUN FOR 24 HOUR MISSION
2HVCHU-FS-2HVE4B	4.55E-002	SPARE CHILLER 2-HV-E-4B FAILS TO START
2HVCHU-FS-2HVE4C	4.55E-002	STANDBY CHILLER 2-HV-E-4C FAILS TO START
2HVCHU-UM-2HVE4B	9.44E-002	SPARE 2-HV-E-4B CHILLER TRAIN UNSCHED MAINTENANCE

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
2HVCHU-UM-2HVE4C	9.44E-002	STANDBY 2-HV-E-4C CHILLER TRAIN UNSCHED MAINTENANCE
2HVCHU-UM-HVE4BC	2.26E-003	2-HV-E-4B & 4C DUAL CHILLER TRAIN UNSCHED MAINTENANCE
2HVCKV-CC-187211	6.34E-005	COMMON CAUSE FAULT CKVS 2-CD-187 & 211 FAILS CLOSED
2HVFAN-FR-2FM06	1.36E-004	STDBY AHU 2-HV-AC-6 FAN MOTOR FAILS TO RUN 24 HR MISSION
2HVFAN-FR-2FM07	1.36E-004	OPER AHU 2-HV-AC-7 FAN MOTOR FAILS TO RUN 24 HR MISSION
2HVFAN-FS-2FM06	3.93E-003	STDBY AHU 2-HV-AC-6 FAN MOTOR FAILS TO START
2HVMOD-FC-MOD237	1.09E-002	STDBY AHU 2-HV-AC-6 2-HV-MOD-237 FAILS CLOSED
2HVMOD-FO-MOD238	1.09E-002	AIR FLOW DIVERSION 2-HV-MOD-238 FAILS OPEN
2HVMOD-SC-MOD237	1.21E-005	STDBY AHU 2-HV-AC-6 2-HV-MOD-237 SPURIOUS CLOSURE
2HVMOD-SC-MOD238	1.21E-005	OPER AHU 2-HV-AC-7 2-HV-MOD-238 SPURIOUS CLOSURE
2HVMOV-CC-HV211	3.90E-004	COMMON CAUSE FAULT 2-HV-MOV-211B & 211C FAIL CLOSED
2HVMOV-CC-HV213	3.90E-004	COMMON CAUSE FAULT 2-HV-MOV-213B & 213C FAIL CLOSED
2HVMOV-FC-211B	1.09E-002	MOTOR OPERATD VALVE 2-HV-MOV-211B FAILS CLOSED
2HVMOV-FC-211C	1.09E-002	MOTOR OPERATD VALVE 2-HV-MOV-211C FAILS CLOSED
2HVMOV-FC-213B	1.09E-002	MOTOR OPERATD VALVE 2-HV-MOV-213B FAILS CLOSED
2HVMOV-FC-213C	1.09E-002	MOTOR OPERATD VALVE 2-HV-MOV-213C FAILS CLOSED
2HVMOV-SC-211A	1.21E-005	MOTOR OPERATD VALVE 2-HV-MOV-211A SPURIOUS CLOSURE
2HVMOV-SC-213A	1.21E-005	MOTOR OPERATD VALVE 2-HV-MOV-213A SPURIOUS CLOSURE
2HVMV--FC-2CD207	1.25E-004	MANUAL VALVE 2-CD-207 FAILS CLOSED
2HVMV--FC-2CD218	1.25E-004	MANUAL VALVE 2-CD-218 FAILS CLOSED
2HVPAT-CC-HVP20	1.98E-004	COMMON CAUSE FAULT 2-HV-P-20B & 20C FAIL TO START
2HVPAT-CC-HVP22	1.98E-004	COMMON CAUSE FAULT 2-HV-P-22B & 22C FAIL TO START
2HVPAT-FR-HVP20A	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-20A FAILS TO RUN 24 HOUR MISSION
2HVPAT-FR-HVP20B	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-20B FAILS TO RUN 24 HOUR MISSION
2HVPAT-FR-HVP20C	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-20C FAILS TO RUN 24 HOUR MISSION
2HVPAT-FR-HVP22A	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-22A FAILS TO RUN 24 HOUR MISSION
2HVPAT-FR-HVP22B	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-22B FAILS TO RUN 24 HOUR MISSION
2HVPAT-FR-HVP22C	7.93E-004	MOTOR DRIVEN PUMP 2-HV-P-22C FAILS TO RUN 24 HOUR MISSION
2HVPAT-FS-HVP20B	1.98E-003	MOTOR DRIVEN PUMP 2-HV-P-20B FAILS TO START
2HVPAT-FS-HVP20C	1.98E-003	MD ALT PUMP 2-HV-P-22C FAILS TO START
2HVPAT-FS-HVP22B	1.98E-003	MOTOR DRIVEN PUMP 2-HV-P-22B FAILS TO START
2HVPAT-FS-HVP22C	1.98E-003	MOTOR DRIVEN PUMP 2-HV-P-22C FAILS TO START
2HVPCV-CC-2235	1.81E-003	COMMON CAUSE FAULT 2-HV-PCV-2235B1 & 1235C1 FAIL CLOSED
2HVPCV-FC-2235B1	1.81E-002	PRESS CONTROL VALVE 2-HV-PCV-2235B-1 FAILS CLOSED
2HVPCV-FC-2235C1	1.81E-002	PRESS CONTROL VALVE 2-HV-PCV-2235C-1 FAILS CLOSED
2HVPCV-SC-2235A1	1.21E-005	PRESS CONTROL VALVE 2-HV-PCV-2235A-1 SPURIOUS CLOSURE
2HVPCV-SC-2235A2	1.21E-005	PRESS CONTROL VAVLE 2-HV-PCV-2235A-2 SPURIOUS CLOSURE
2HVPCV-SC-2235B1	1.21E-005	PRESS CONTROL VALVE 2-HV-PCV-2235B-1 SPURIOUS CLOSURE
2HVPCV-SC-2235B2	1.21E-005	PRESS CONTROL VALVE 2-HV-PCV-2235B-2 SPURIOUS CLOSURE
2HVPCV-SC-2235C1	1.21E-005	PRESS CONTROL VALVE 2-HV-PCV-2235C-1 SPURIOUS CLOSURE
2HVPCV-SC-2235C2	1.21E-005	PRESS CONTROL VALVE 2-HV-PCV-2235C-2 SPURIOUS CLOSURE
2HVSTR-PG-2HVS1B	9.53E-003	SW STRAINER 2-HV-S-1B PLUGGED DURING STANDBY
2HVSTR-PL-2HVS1A	6.39E-004	SW STRAINER 2-SW-S-1A PLUGGED DURING MISSION
2HVSV--SO-2200	9.33E-005	RELIEF VALVE 2-HV-SV-2200 SPURIOUS OPENING
2HVSV--SO-2201	9.33E-005	RELIEF VALVE 2-HV-SV-2201 SPURIOUS OPENING
2HVSV--SO-2202A	9.33E-005	RELIEF VALVE 2-HV-RV-2202A SPURIOUS OPENING
2HVSV--SO-2202B	9.33E-005	RELIEF VALVE 2-HV-RV-2202B SPURIOUS OPENING
2HVSV--SO-2202C	9.33E-005	RELIEF VALVE 2-HV-RV-2202C SPURIOUS OPENING
2HVSV--SO-2205A	9.33E-005	RELIEF VALVE 2-HV-RV-2205A SPURIOUS OPENING
2HVSV--SO-2205B	9.33E-005	RELIEF VALVE 2-HV-RV-2205B SPURIOUS OPENING
2HVSV--SO-2205C	9.33E-005	RELIEF VALVE 2-HV-RV-2205C SPURIOUS OPENING
2HVTCV-FC-TCV266	1.81E-002	STDBY AHU 2-HV-AC-6 2-HV-TCV-266 FAILS CLOSED
2HVTCV-SC-TCV266	1.21E-005	OPER AHU 2-HV-AC-7 2-HV-TCV-267 SPURIOUS CLOSURE
2HVTCV-SC-TCV267	1.21E-005	OPER AHU 2-HV-AC-7 2-HV-TCV-267 SPURIOUS CLOSURE
2IAIAS-LF-OUTIA	2.52E-004	OUTSIDE CONTAINMENT INSTRUMENT AIR SYS LOSS OF FUNCTION
2SWCKV-CC-306337	6.34E-005	COMMON CAUSE FAULT CKVS 2-SW-306 & 337 FAILS CLOSED
2SWCKV-CC-322353	6.34E-005	COMMON CAUSE FAULT CKVS 2-SW-322 & 353 FAILS CLOSED
2SWCKV-FC-2SW10	6.34E-004	CHECK VALVE FAILS CLOSED 2-SW-10
2SWCKV-FC-2SW306	6.34E-004	CHECK VALVE 2-SW-306 FAILS CLOSED
2SWCKV-FC-2SW322	6.34E-004	CHECK VALVE 2-SW-322 FAILS CLOSED
2SWCKV-FC-2SW337	6.34E-004	CHECK VALVE 2-SW-337 FAILS CLOSED
2SWCKV-FC-2SW353	6.34E-004	CHECK VALVE 2-SW-353 FAILS CLOSED
2SWCKV-FO-2SW10	3.44E-003	CHECK VALVE FAILS OPEN 2-SW-10

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
2SWMOV-FC-215A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 2-SW-MOV-215A
2SWMOV-FC-215B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 2-SW-MOV-215B
2SWMOV-FC-220A	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 2-SW-MOV-220A
2SWMOV-FC-220B	1.09E-002	MOTOR OPERTD VALVE FAILS CLOSED 2-SW-MOV-220B
2SWMOV-SC-221A	1.21E-005	2-SW-MOV-221A SPURIOUS CLOSED DURING MISSION
2SWMOV-SC-221B	1.21E-005	2-SW-MOV-221B SPURIOUS CLOSED DURING MISSION
2SWMOV-SC-222A	1.21E-005	2-SW-MOV-222A SPURIOUS CLOSED DURING MISSION
2SWMOV-SC-222B	1.21E-005	2-SW-MOV-222B SPURIOUS CLOSED DURING MISSION
2SWMV--FC-2SW11	1.25E-004	MANUAL VALVE FAILS CLOSED 2-SW-11
2SWMV--FC-2SW302	1.25E-004	MANUAL VALVE 2-SW-302 FAILS CLOSED
2SWMV--FC-2SW305	1.25E-004	MANUAL VALVE 2-SW-305 FAILS CLOSED
2SWMV--FO-2SW13	1.25E-004	MANUAL VALVE FAILS OPEN 2-SW-13
2SWMV--PG-2SW13	4.50E-005	N.O. MANUAL VALVE 2-SW-13 PLUGGED DURING STANDBY
2SWPAT-FR-2SWP1B	7.93E-004	MD ALT PUMP 2-SW-P-1B FAILS TO RUN
2SWPAT-FS-2SWP1B	3.84E-003	MD ALT PUMP 2-SW-P-1B FAILS TO START
2SWPAT-UM-2SWP1B	3.72E-002	MD ALT PUMP 2-SW-P-1B UNSCHLD MAINT.
C-B01	5.20E-001	COMPLEMENT FOR NON-REC-B01 USED IN T1A
C-B02	6.60E-001	COMPLEMENT FOR NON-REC-B02 USED IN T1A
C-B102	3.20E-001	COMPLEMENT FOR NON-REC-B102 USED IN T1A
C-B103	3.20E-001	COMPLEMENT FOR NON-REC-B103 USED IN T1A
C-B111	3.20E-001	COMPLEMENT FOR NON-REC-B111 USED IN T1A
C-B117	3.20E-001	COMPLEMENT FOR NON-REC-B117 USED IN T1A
C-CHFLD	1.00E-015	COMPLEMENT FOR CONT HEAT REMOVAL DUE TO FLOODING
C-D102	9.40E-001	COMPLEMENT FOR D102 USED IN T1 AND T1TR
C-D105	9.47E-001	COMPLEMENT FOR D105 USED IN T1A,T2,T2A T3,T2ATr,T2Tr,T3Tr
C-D304	8.80E-001	COMPLEMENT FOR D304 USED IN T1
C-FM01	4.80E-002	COMPLEMENT FOR FM01 USED IN S2 AND VX
C-H103	9.61E-001	COMPLEMENT FOR H103 USED IN T5A
C-H104	9.62E-001	COMPLEMENT FOR H104 USED IN T5B
C-H105	9.49E-001	COMPLEMENT FOR H105 USED IN T9A & T9ATR
C-H106	9.36E-001	COMPLEMENT FOR H106 USED IN T9B & T9BTR
C-HV05	7.49E-001	COMPLEMENT FOR HV05 USED IN T9A
C-L08	8.41E-001	COMPLEMENT FOR L08 USED IN T7
C-LT01	9.07E-001	COMPLEMENT FOR LT01 USED IN T1A, T6, T8 AND Tr TREES
C-M03	7.06E-001	COMPLEMENT FOR M03 USED IN TH
C-O01	1.00E-015	COMPLEMENT FOR O01 USED IN S1 AND VX
C-O05	6.13E-001	COMPLEMENT FOR O05 USED IN T4
C-P01	1.00E+000	COMPLEMENT FOR P01 USED IN S2, T1A, T2, T2A, T3 & T7
C-P02	9.87E-001	COMPLEMENT FOR P02 USED IN T1
C-P03	9.87E-001	COMPLEMENT FOR P03 USED IN T1
C-PR01	7.22E-001	COMPLEMENT FOR PR01 USED IN TH
C-Q08	1.00E-015	COMPLEMENT FOR Q08 USED IN TH
C-QS03	9.46E-001	COMPLEMENT FOR QS03 USED IN T5A
C-QS04	9.46E-001	COMPLEMENT FOR QS04 USED IN T5B
C-QS05	9.46E-001	COMPLEMENT FOR QS05 USED IN T9A
C-QS06	9.46E-001	COMPLEMENT FOR QS06 USED IN T9B
C-RC301	8.75E-001	COMPLEMENT FOR RC301 USED IN T6
C-RC303	8.75E-001	COMPLEMNT FOR RC303 USED IN T8 & TR FOR T1 T2 T2A T3 T9A &B
C-SGI01	9.89E-001	COMPLEMENT FOR SGI01 USED IN T7
C-SPRAY	7.50E-001	COMP FOR SPRAY SPRAY OPERABLE FRACTION
C-TT01	8.00E-001	COMPLEMENT FOR TT01 USED IN TH
C-VI01	1.00E-015	COMPLEMENT FOR VI01 USED IN VX
C-Y01	1.00E-015	COMPLEMENT FOR Y01 USED IN S1
C-Y02	9.80E-001	COMPLEMENT FOR Y02 USED IN S2
C-Y03	8.98E-001	COMPLEMENT FOR Y03 USED IN T1
C-Y04	9.85E-001	COMPLEMENT FOR Y04 USED IN T4
CHFLD	1.00E+000	FAILURE OF CHR DUE TO FLOODING
HEP-0AP10	5.27E-003	0-AP-10 LOSS OF ELECTRICAL POWER
HEP-0AP12-10HR	4.95E-003	0-AP-12 LOSS OF SERVICE WATER RECOVERY IN 10 HR
HEP-0AP12-20HR	2.60E-004	0-AP-12 LOSS OF SERVICE WATER RECOVERY IN 20 HR
HEP-0AP12-30HR	6.57E-003	0-AP-12 LOSS OF SERVICE WATER WITH RECOVERY IN 30 HR
HEP-0AP12-40HR	1.25E-001	0-AP-12 LOSS OF SERVICE WATER WITH RECOVERY IN 40 HR
HEP-0AP12-ATTCH4	1.61E-004	0-AP-12 LOSS OF SW ATTACHMENT 4: TWO PUMPS ON ONE HEADER

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
HEP-0AP55-10HR	4.95E-003	0-AP-55 LOSS OF MCR/ESGR HVAC RECOVERY IN 10 HR
HEP-0AP55-20HR	2.60E-004	0-AP-55 LOSS OF MCR/ESGR HVAC RECOVERY IN 20 HR
HEP-0AP55-30HR	6.57E-003	0-AP-55 LOSS OF MCR /ESGR HVAC RECOVERY IN 30 HOUR
HEP-0AP55-40HR	1.25E-001	0-AP-55 LOSS OF SERVICE WATER WITH RECOVERY IN 40 HR
HEP-0OP49:4A	6.26E-002	0-OP-49.4A VALVE CHECKOFF MCR A/C SERVICE WATER
HEP-1AP15-1E	7.80E-004	1-AP-15 LOSS OF CC STEP 1E RESTORE SW TO CC HEAT EXCHANGR
HEP-1AP15-6	2.81E-002	1-AP-15 LOSS OF CC STEP 6 CROSS TIE CC IF UNIT 2 AVAILABLE
HEP-1AP22:5	1.75E-004	1-AP-22.5 LOSS OF EMERGENCY CONDNSATE STORAGE TANK
HEP-1AP33:1	3.87E-001	1-AP-33.1 REACTOR COOLANT PUMP SEAL FAILURE
HEP-1AP49	1.34E-002	1-AP-49 LOSS OF NORMAL CHARGING
HEP-1E0-1	1.35E-003	1-E-0 RX TRIP OR SI STEP 1 VERIFY REACTOR TRIP
HEP-1E0-11	1.35E-003	1-E-0 RX TRIP OR SI STEP 11 VERIFY SW PUMPS RUNNING
HEP-1E0-12	1.35E-003	1-E-0 RX TRIP OR SI STEP 12 MAIN STEAM LINES ISOLATION
HEP-1E0-13	1.35E-003	1-E-0 RX TRIP OR SI STEP 13 CHECK IF CDA IS REQUIRED
HEP-1E0-14	1.00E+000	1-E-0 RX TRIP OR SI STEP 14 VERIFY SI FLOW
HEP-1E0-15	1.07E-003	1-E-0 RX TRIP OR SI STEP 15 VERIFY AUX FEEDWATER FLOW
HEP-1E0-16	8.00E-003	1-E-0 RX TRIP OR SI STEP 16 CHARGING PUMP ALIGNMENT
HEP-1E0-22	1.88E-002	1-E-0 RX TRIP OR SI STEP 22 PRZR PORVS SPRAY VALVES CLOSED
HEP-1E0-7	1.35E-003	1-E-0 RX TRIP OR SI STEP 7 VERIFY SI PUMPS RUNNING
HEP-1E0-8	1.35E-003	1-E-0 RX TRIP OR SI STEP 8 VERIFY MAIN FEEDWATER ISOLATION
HEP-1E0-ATTACH:1	7.70E-003	1-E-0 RX TRIP OR SI ATTACHMENT 1 VERIFY PHASE B ISOLATION
HEP-1E1-25	1.17E-002	1-E-1 LOSS OF RX OR 2ND COOLANT STEP 25 REDUNDANT COLD LEG
HEP-1E3-13	2.18E-002	1-E-3 SGTR STEP 13 INITIATE RCS COOLDOWN
HEP-1E3-3	3.65E-003	1-E-3 SGTR STEP 3 ISOLATE FLOW FROM RUPTURED S/G
HEP-1ECA3:1-16	3.02E-003	1-ECA-3.1 SGTR WITH SUBCOOLED RCS STEP 16 COOLDOWN
HEP-1ECA3:2-5	7.25E-004	1-ECA-3.2 SGTR WITH SATURATED RCS STEP 5 COOLDOWN
HEP-1ECA3:3-27	8.97E-002	1-ECA-3.3 SGTR & NO PRESSURE CONTROL STEP 27 COOLDOWN
HEP-1ECA3:3-35	4.92E-003	1-ECA-3.3 SGTR & NO PRESSURE CONTROL STEP 35 LATE COOLDN
HEP-1ES1:2-S1	1.00E+000	1-ES-1.2 POST LOCA COOLDOWN AND DEPRESSURIZATION S1
HEP-1ES1:2-S2	8.50E-004	1-ES-1.2 POST LOCA COOLDOWN AND DEPRESSURIZATION S2
HEP-1ES1:3	1.22E-002	1-ES-1.3 TRANSFER TO COLD LEG RECIRCULATION
HEP-1ES1:4	8.50E-004	1-ES-1.4 TRANSFER TO HOT LEG RECIRCULATION
HEP-1FRC:1-11-S1	1.00E+000	1-FR-C.1 INADEQUATE CORE COOLING STEP11 DEPRESSURE S/GS S1
HEP-1FRC:1-11-S2	1.06E-002	1-FR-C.1 INADEQUATE CORE COOLING STEP11 DEPRESSURE S/GS S2
HEP-1FRH:1-11	4.82E-002	1-FR-H.1 LOSS OF HEAT SINK STEP 11 RCS FEED PATH
HEP-1FRH:1-15	8.25E-003	1-FR-H.1 LOSS OF HEAT SINK STEP 15 RCS BLEED PATH
HEP-1FRH:1-5	3.12E-003	1-FR-H.1 LOSS OF HEAT SINK STEP 5 CHECK S/G LEVELS
HEP-1FRS:1-4	7.60E-003	1-FR-S.1 ATWS STEP 4 INITIATE EMERGENCY BORATE
HEP-1FRS:1-5	2.97E-002	1-FR-S.1 ATWS STEP 5 DO ATTACH 2 REMOTE REACTOR TRIP
HEP-1OP14:1-5:13	4.26E-003	1-OP-14.1 RHR STEP 5.13, OPEN MOV-1700 & MOV-1701
HEP-1OP21:6	1.05E-003	1-OP-21.6 MCR AND RELAY ROOM AIR CONDITIONING
HEP-1OP49:1	1.33E-001	1-OP-49.1 STARTUP AND SHUTDOWN OF THE SERVICE WATER SYSTM
HEP-NO-PROCEDURE	1.00E+000	NO PROCEDURE FOR THIS OPERATOR ACTION
IE-A	5.00E-004	IE FREQUENCY LARGE LOCA
IE-RX	2.66E-007	IE FREQUENCY REACTOR VESSEL RUPTURE
IE-S1	1.00E-003	IE FREQUENCY MEDIUM LOCA
IE-S2	2.10E-002	IE FREQUENCY SMALL LOCA
IE-T1	1.14E-001	IE FREQUENCY LOSS OF OFFSITE POWER
IE-T2	5.00E-002	IE FREQUENCY NON-RECOVERABLE LOSS OF MFW
IE-T2A	5.50E-001	IE FREQUENCY RECOVERABLE LOSS OF MFW
IE-T3	1.35E+000	IE FREQUENCY TRANSIENT WITH MFW AVAILABLE
IE-T4	6.00E-007	IE FREQUENCY LOSS OF RC PUMP SEAL COOLING
IE-T5A	6.00E-003	IE FREQUENCY LOSS OF DC BUS 1-I
IE-T5B	6.00E-003	IE FREQUENCY LOSS OF DC BUS 1-III
IE-T6	6.27E-006	IE FREQUENCY LOSS OF SERVICE WATER
IE-T7	1.00E-002	IE FREQUENCY STEAM GENERATOR TUBE RUPTURE
IE-T8	6.58E-003	IE FREQ, LOSS OF EMER SWITCHGEAR ROOM COOLING
IE-TH	1.75E+000	IE FREQ, TRANSIENT AT/ABOVE 40 PERCENT POWER FOR ATWS
IE-TL	3.50E-001	IE FREQ, TRANSIENT BELOW 40 PERCENT POWER FOR ATWS
IE-VX	1.60E-006	IE FREQUENCY INTERFACING LOCA OUTSIDE CONTAINMENT
IEFAB2	1.00E-004	IE FREQ FOR FLOOD IN AUX BUILDING FROM SW PIPING COMP
IEFAB4	6.20E-007	IE FREQ FOR FLOOD IN AUX BUILDING DUE TO RWST PIPE BREAK
IEFAC1	5.60E-004	IE FREQ FOR FLOOD IN CHILLER ROOM

Event	Unavailability	Description
IS	3.80E-008	INITIATING EVENT FREQUENCY FOR CD SEQS W/ NO BYPASS
ISOL	3.80E-008	INITIATING EVENT FREQUENCY FOR CD SEQS W/ NO BYPASS
NON-REC-B01	4.80E-001	T1A NON-RECOVERY OF AC POWER IN 0.6 HR BEFORE CORE MELT
NON-REC-B02	3.40E-001	T1A NON-RECOVERY OF AC POWER IN 1.5 HR BEFORE CORE MELT
NON-REC-B10	2.00E-002	T1A NON-RECOVERY OF AC POWER IN 10 HR BEFORE CORE MELT
NON-REC-B102	6.80E-001	T1A NON-REC OF AC IN 1.6 HR AFTER B01 BEFORE VESSEL FAIL
NON-REC-B103	6.80E-001	T1A NON-REC OF AC IN 2.5 HR AFTER B02 BEFORE VESSEL FAIL
NON-REC-B111	6.80E-001	T1A NON-REC OF AC IN 11.4 HR AFTR B10 BEFORE VESSEL FAIL
NON-REC-B117	6.80E-001	T1A NON-REC OF AC IN 12.2 HR AFTR B16 BEFORE VESSEL FAIL
NON-REC-B16	7.50E-003	T1A NON-RECOVERY OF AC POWER IN 11.2 HR BEFORE CORE MELT
NON-REC-B20	2.50E-004	T1TR NON-RECOVERY AC POWER IN 20 HR BEFORE CORE MELT
NON-REC-B220	9.00E-004	T1A NON-REC OF AC IN 20 HR AFTER B102 BEFORE CONT FAILURE
NON-REC-B221	9.00E-004	T1A NON-REC OF AC IN 21 HR AFTER B103 BEFORE CONT FAILURE
NON-REC-B229	9.00E-004	T1A NON-REC OF AC IN 29 HR AFTER B111 BEFORE CONT FAILURE
NON-REC-B235	9.00E-004	T1A NON-REC OF AC IN 30 HR AFTER B117 BEFORE CONT FAILURE
PROB-CHFLD	1.00E+000	CONT HEAT REMOVAL LOST IN FLOOD
PROB-D104A	6.00E-002	T1A, PROB SEAL LOCA IN PROGRESS WHEN AC POWER IS RECOVERED
PROB-FM01	9.52E-001	S2 VERY SMALL LOCA PROBABILITY GIVEN S2 HAS OCCURRED
PROB-M03	2.94E-001	LOSS OF MAIN FW PROBABILITY GIVEN TH ATWS HAS OCCURED
PROB-PR01	2.78E-001	PROBABILITY OF UET (UNFAV EXP TIME) HI POWER ATWS
PROB-Q08	1.00E+000	RCS INTEGRITY LOSS RCS PRESS > 3200PSI TH ATWS W/O FW/TT
PROB-VI01	1.00E+000	NON ISOLATION PROB AFTER ISLOCA
REC-0MOP26:64	5.42E-002	0-MOP-26.64 SWITCHYARD WALK DOWN & RESTORATION
REC-0OP21:6	1.69E-003	0-OP-21.6 MCR AND RELAY ROOM AIR CONDITIONING
REC-0OP26:10	1.76E-003	0-OP-26.10 480 VOLT BREAKER OPERATION
REC-1AP28	1.02E-001	1-AP-28 LOSS OF INSTRUMENT AIR
REC-1ES1:2	2.66E-003	1-ES-1.2 POST LOCA DEPRESSURIZATION AND COOLDOWN
REC-1ES1:4-1	1.04E-001	1-ES-1.4 HOT LEG RECIRC STEP 1 OPEN 1-SI-MOV-1890A & B
REC-1FRH:1-4	1.13E-002	1-FR-H.1 LOSS OF HEAT SINK STEP 4 MAIN FEEDWATER
REC-1MOP6:70	5.42E-002	1-MOP-6.70 1H EMERGENCY BUS MAINTENANCE
REC-1MOP6:71	5.42E-002	1-MOP-6.71 1J EMERGENCY BUS MAINTENANCE
REC-1OP14:1	1.04E-001	1-OP-14.1 RHR RECOVERY
REC-2AP28	1.02E-001	2-AP-28 LOSS OF INSTRUMENT AIR
REC-2MOP6:70	5.42E-002	2-MOP-6.70 2H EMERGENCY BUS MAINTENANCE
REC-B12AVE	1.06E-001	TIME AVERAGED NON- RECOVERY OF AC POWER IN 12 HOURS
REC-CONTAINMENT	2.00E-002	RECOVER SEQUENCES CONTAINMENT HAS FAILED NO CORE MELT
REC-FW-RECIRC	1.00E-001	REVISED PROCEDURES TO VERIFY FW RECIRC HAS BEEN CLOSED
REC-MMP-C-MR-2	2.51E-001	MMP-C-MR-2 TROUBLE SHOOTING & REPAIR MCR CHILLER UNITS
REC-QS-FLANGE	2.32E-002	REVISED PROCEDURES TO VERIFY QS FLANGE HAS BEEN REMOVED
REC-RS-FLANGE	2.32E-002	REVISED PROCEDURES TO VERIFY RS FLANGE HAS BEEN REMOVED
REC-SCREEN-TURNS	1.00E-001	SW RESERVOIR TRAVELING SCREEN AUTO ROTATES & WASH
SPRAY	2.50E-001	SPRAY FAILURE FRACTION
T9A-FREQ-4160-1H	6.00E-003	FREQUENCY OF LOSS OF 1H 4160 VAC BUS BUS FAULT
T9A-FREQ-500KV-1	1.79E-001	FREQUENCY OF 500KV BUS 1 FAULT CAUSING LOSS OF PWR 1H 4160
T9A-FREQ-RSST-C	7.14E-002	FREQUENCY OF RSST C FAULT RESULTING IN LOSS OF PWR 1H 4160
T9B-FREQ-4160-1J	6.00E-003	FREQUENCY OF LOSS OF 1J 4160 VAC BUS BUS FAULT
T9B-FREQ-500KV-2	1.79E-001	FREQUENCY OF 500KV BUS 2 FAULT CAUSING LOSS OF PWR 1J 4160
T9B-FREQ-RSST-A	7.14E-002	FREQUENCY OF RSST A FAULT RESULTING IN LOSS OF PWR 1J 4160
XHOS-1-OF-2-SG	0.00E+000	HOUSE EVENT TO SELECT FLOW TO 1 OF 2 SG's
XHOS-1-OF-3-SG	1.00E+000	HOUSE EVENT TO SELECT FLOW TO 1 OF 3 SG's
XHOS-1H-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL 4160 V BUS 1H NORMALLY = 0
XHOS-1J-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL 4160 V BUS 1J NORMALLY = 0
XHOS-2-OF-2-SG	0.00E+000	HOUSE EVENT TO SELECT FLOW TO 2 OF 2 SG's
XHOS-2-OF-3-SG	0.00E+000	HOUSE EVENT TO SELECT FLOW TO 2 OF 3 SG's
XHOS-2H-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL 4160 V BUS 2H NORMALLY = 0
XHOS-2J-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL 4160 V BUS 2J NORMALLY = 0
XHOS-ATWS	0.00E+000	HOUSE EVENT FOR ATWS SEQUENCES
XHOS-CASCOOLREQD	1.00E+000	CASING COOLING REQUIRED
XHOS-CORECOOLREC	1.00E+000	CORE COOLING RECOVERY IN PROGRESS
XHOS-DCBUS-1-I	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 1-I NORMALLY = 0
XHOS-DCBUS-1-II	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 1-II NORMALLY = 0
XHOS-DCBUS-1-III	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 1-III NORMALLY = 0
XHOS-DCBUS-1-IV	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 1-IV NORMALLY = 0

TABLE C.8-1 (Continued)
NAPS1.BED:TUESDAY, OCTOBER 13, 1992

Event	Unavailability	Description
XHOS-DCBUS-2-I	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 1-I NORMALLY = 0
XHOS-DCBUS-2-II	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 2-II NORMALLY = 0
XHOS-DCBUS-2-III	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 2-III NORMALLY = 0
XHOS-DCBUS-2-IV	0.00E+000	HOUSE EVENT = 1 TO FAIL DC BUS 2-IV NORMALLY = 0
XHOS-DG-1H-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL EDG 1H NORMALLY = 0
XHOS-DG-1J-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL EDG 1J NORMALLY = 0
XHOS-DG-2H-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL EDG 2H NORMALLY = 0
XHOS-DG-2J-FAILS	0.00E+000	HOUSE EVENT = 1 TO FAIL EDG 2J NORMALLY = 0
XHOS-DG-AAC-FAIL	1.00E+000	HOUSE EVENT = 1 TO FAIL ALT AC DIESEL NORMALLY = 1
XHOS-ELE-1H-2J	0.00E+000	HOUSE EVENT = 0 TO XTIE 1H AND 2J NORMALLY = 0
XHOS-ELE-1H-AAC	1.00E+000	HOUSE EVENT = 0 FOR ALTERNATE AC DIESEL TO SUPPLY POWER
XHOS-ELE-1J-AAC	1.00E+000	HOUSE EVENT = 0 FOR ALTERNATE AC DIESEL TO SUPPLY POWER
XHOS-ELE-2H-2J	1.00E+000	HOUSE EVENT = 0 TO CROSS TIE 2H AND 2J NORMALLY = 1
XHOS-ELE-2H-AAC	1.00E+000	HOUSE EVENT = 0 FOR ALTERNATE AC DIESEL TO SUPPLY POWER
XHOS-ELE-2J-AAC	1.00E+000	HOUSE EVENT = 0 FOR ALERNATE AC DIESEL TO SUPPLY POWER
XHOS-HIRCSPRESS	0.00E+000	LHSI PUMP SHUTOFF HEAD EXCEEDED
XHOS-LOOP	0.00E+000	HOUSE EVENT = 1 FOR LOSS OF OFFSITE POWER, NORMALLY = 0
XHOS-NO-ATM-DUMP	0.00E+000	HOUSE EVENT TO FAIL SG PORV FOR CCR
XHOS-NO-ATWS	1.00E+000	HOUSE EVENT FOR NON-ATWS SEQUENCES
XHOS-NO-CND-DUMP	0.00E+000	HOUSE EVENT TO FAIL CONDENSER DUMP FOR CCR
XHOS-NO-SGA	0.00E+000	HOUSE EVENT NO SG-A
XHOS-NO-SGB	0.00E+000	HOUSE EVENT - NO SG-B
XHOS-NO-SGC	0.00E+000	HOUSE EVENT - NO SG-C
XHOS-QS-REQ-NPSH	1.00E+000	SEQUENCE IN WHICH QS IS REQUIRED TO PROVIDE NPSH FOR RS
XHOS-SBO	0.00E+000	HOUSE EVENT FOR SBO SEQUENCES
XHOS-SI	0.00E+000	HOUSE EVENT NO SI SIGNAL
XHOS-SLB	0.00E+000	HOUSE EVENT STEAM LINE BREAK
XHOS-SW	1.00E+000	SERVICE WATER REQUIRED
XHOS-TDP-FAILED	0.00E+000	HOUSE EVENT - TDP FAILED NORMALLY = 0

INFORMATION ON ONE HUMAN ERROR IN THE IPE

HEP(median) = $p_2 + p_3$ = 1.000E+0 + 6.0E-3 = 1.000E+0

- Consideration of Dependency:

There is no dependency between this HEP and other Type C HEPs.

- HEP Conversion To A Mean:

HEP(mean) = HEP(median) * M
where $M=EXP\{[1/1.645)*\ln(EF)]^2/2\}$
M=1.00 for an EF = 1
= 1.000E+0 * 1.00 = 1.000E+0

D.6.32.2 Summary: HEP-1FRC:1-11-S1

Fault Trees: FFT00

Gates: GFFT421 (OR) S1 medium LOCA for Y01.

Physical Id: HEP-1FRC:1-11-S1

Description: 1-FR-C.1_INADEQUATE
CORE_COOLING_STEP11
DEPRESSURIZE_SGS___

Failure Rate: 1.000E+0

Distribution: Lognormal
Median: 1.000E+0
Error Factor: 1

Reference: 324MAF.N__________
9-1-92__________
____

Why modified: NAPS IPE Final Quantification Value

D.6.33 HEP-1FRC:1-11-S2

D.6.33.1 Analysis: HEP-1FRC:1-11-S2

- Equivalent Surry HRA: HEP-1FRC:1-12-S2
see Surry IPE report page D.3-83 to D.3-84.
calculated mean = 3.067E-1

- NAPS Procedures:

1-E-0 Reactor Trip or Safety Injection, Rev 9, 12-14-91.
1-E-1 Loss of Reactor Or Secondary Coolant, Rev 2, 12-27-89.
1-ES-1.2 Post LOCA Cooldown and Depressurization, Rev 4, 12-27-89.

1-F-0	Critical Safety Function Status Trees, Rev 0, 12-27-89.
1-FR-C.1	Response To Inadequate Core Cooling, Rev 3, 12-27-89.

• 1-E-0 verifies proper response of the Reactor Protection and Emergency Core Cooling Systems. Step 25 checks that the RCS is intact by checking the containment radiation, pressure and sump level. The RNO is to transition to 1-E-1. Step 28 initiates monitoring of the Critical Safety Function Status Trees.

• 1-E-1 Step 20 checks if RCS cooldown and depressurization is required and transitions to 1-ES-1.2.

• 1-F-0 provides a method for checking Critical Safety Factions. These status trees are monitored during all emergency procedures except during the first 25 steps of 1-E-0. Operators will immediately implement the applicable procedure whenever an orange or red path are encountered. Attachment 2 is for Core Cooling. The red paths implement 1-FR-C.1, the orange paths implement 1-FR-C.2, the yellow paths implement 1-FR-C.3 and the green path is CSF satisfactory. The red paths are core exit thermocouple greater than 1200°F; or RCS subcooling less than 30°F when no RCP are running, core exit thermocouple greater than 700°F and RVLIS full range less than 48%.

• 1-FR-C.1 provides instructions to restore Core Cooling. This procedure is entered from the red terminus of the core cooling CSF status tree. Step 11 depressurizes all intact SGs to 120 psig. Step 14 depressurizes all intact SG to atmospheric pressure by dumping steam to the Condenser at the maximum rate. Step 19 tries to locally depressurize all intact SG to atmospheric pressure. Return to 1-E-1 is instructed once the core exit thermocouple are less than 1200°F, RVLIS is less than 67% and at least two hot leg temperatures are less than 345°F.

• HEP-1FRC:1-11-S2 represents the operator action required to identify and complete a rapid depressurization of the Steam Generators during a small break LOCA. This is the Y function on the S2 event tree.

• HEP Calculation:

Input Parameters:

T_b = 0 minutes. The CRO will be able to immediately determine if 1-FR-C.1 should be implemented without any delay.

T_e = 91 minutes (5470 seconds). The system time-window is defined by MAAP analysis (325MAF.N.5) case 36A for a 2" inch break. This break sizes cause SG dryout in 91 minutes. The operator must fully depressurize the Steam Generators before dry out occurs.

T_a = 5 minutes. Task action time to depressurize the SGs from 1000 psig to 120 psig. This is an estimated time value.

T_w = 86 minutes. Time available for cognitive response ($T_w = T_e - T_b - T_a$).

$T_{1/2}$ = 20 minutes. Operator median response time. It is estimated that the CRO in the Control Room will require approximately 15 minutes to reach 1-E-0 step 25 to transition to 1-E-1. As discussed above, the core exit temperature will not reach 1200°F for 1350 seconds (18.5 minutes). This means the operator will have time to transition to 1-E-1 where he will then immediately transition to 1-FR-C.1 as soon as 1200°F is reached, or as soon as 700°F is reached and RVLIS < 40%. Once in 1-FR-C.1 the operator will require only five minutes to reach step 11 and initiate SG depressurization. The total operator response time will be approximately 20 minutes.

σ = 0.6 for emergency procedure steps after the immediate operator action steps, and there has been training.

p_3 = 6.0E-3, 3.0E-3 is the estimated human error probability from NUREG/CR-1278, Table 20-7, item 2, estimated probabilities of errors of omission per item of instruction when use of written procedures is specified, when procedures with checkoff provisions are correctly used, long list >10 items. Error Factor = 3. The error rate has been doubled due to operators normally working 12 hour shifts.

Calculations:

p_2(mean) = $1 - \Phi(\ln(T_w/T_{1/2}) / \sigma)$
= $1 - \Phi(\ln(86/20) / 0.6)$
= $1 - \Phi(2.43)$
= 7.5E-3

P_2(median) = HEP(mean) / M
where $M=EXP\{[(1/1.645) * \ln(EF)]^2/2\}$
M=1.25 for an EF = 3
= 7.5E-3 / 1.25 = 6.00E-3

- Adjustment For Recovery:
  R = 0.1, the recovery factor. From NUREG/CR-1278, Table 20-22, Estimated probabilities that a checker will fail to

detect errors made by others, item 1, checking routine tasks, checker using over the shoulder inspections, verifying positions etc. Error Factor = 5. Because of the long time window, > 1 hour, credit can be taken for recovery of this operator action due to the TSC manning. This recovery is applicable to only the p_3 term.

p_3(recovered) = p_3 * R = 6.0E-3 * 0.1 = 6.0E-4

HEP(median) = p_2 + p_3 = 6.00E-3 + 6.0E-4 = 6.60E-3

- Consideration of Dependency:

There is no dependency between this HEP and other Type C HEPs.

- HEP Conversion To A Mean:

HEP(mean) = HEP(median) * M
where $M=EXP\{[(1/1.645)* \ln (EF)]^2/2\}$
M=1.25 for an EF = 3
= 6.6E-3 * 1.25 = 8.25E-3

D.6.33.2 Summary: HEP-1FRC:1-11-S2

Fault Trees: FFT00, MS100

Gates:
GFFT422 (OR) S2 small LOCA for Y02.
GFFT423 (OR) T1 LOOP for Y03.
GFFT424 (OR) T4 Seal LOCA for Y04.
GMS1112 (OR) Failure of operator to dump steam from 2 of 3 SG's.

Physical Id: HEP-1FRC:1-11-S2

Description: 1-FR-C.1_INADEQUATE CORE_COOLING_STEP11 DEPRESSURE_SGS__S2_

Failure Rate: 8.250E-3

Distribution: Lognormal
Median: 6.600E-3
Error Factor: 3

Reference: 324MAF.N
9-1-92

Why modified: NAPS IPE Final Quantification Value

RISK-INFORMED INSPECTION NOTEBOOK FOR

NORTH ANNA POWER STATION

UNITS 1 AND 2

(Revision 1)

PWR, WESTINGHOUSE, THREE-LOOP PLANT WITH SUB-ATMOSPHERIC CONTAINMENT

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NOTICE

This notebook was developed for the NRC's inspection teams to support risk-informed inspections. The "Reactor Oversight Process Improvement," SECY-99-007A, March 1999 discusses the activities involved in these inspections. The user of this notebook is assumed to be an inspector with an extensive understanding of plant-specific design features and operation. Therefore, the notebook is not a stand-alone document, and may not be suitable for use by non-specialists. It will be periodically updated with new or replacement pages incorporating additional information on this plant. All recommendations for improvement of this document should be forwarded to the Chief, Probabilistic Safety Assessment Branch, NRR, with a copy to the Chief, Inspection Program Branch, NRR.

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ABSTRACT

This notebook contains summary information to support the Significance Determination Process (SDP) in risk-informed inspections for the North Anna Power Station, Units 1 and 2 plant.

The information includes the following: Categories of Initiating Events Table, Initiators and System Dependency Table, SDP Worksheets, and SDP Event Trees. This information is used by the NRC's inspectors to identify the significance of their findings, i.e., in screening risk-significant findings, consistent with Phase 2 screening in SECY-99-007A. The Categories of Initiating Event Table is used to determine the likelihood for the applicable initiating events. The SDP worksheets are used to assess the remaining mitigation capability rating for the applicable initiating event likelihood in identifying the significance of the inspector's findings. The Initiators and System Dependency Table and the SDP Event Trees (the simplified event trees developed in preparing the SDP worksheets) provide additional information supporting the use of SDP worksheets.

The information contained herein is based on the licensee's Individual Plant Examination (IPE) submittal, the updated Probabilistic Risk Assessment (PRA), and system information obtained from the licensee during site visits as part of the review of earlier versions of this notebook. Approaches used to maintain consistency within the SDP, specifically within similar plant types, resulted in sacrificing some plant-specific modeling approaches and details. Such generic considerations, along with changes made in response to plant-specific comments, are summarized. A benchmarking of the notebook was conducted comparing and analyzing the risk significance of the inspection findings obtained using this notebook and the plant-specific PRA. Following benchmarking, the notebook is updated considering licensee's updated PRA, and any changes in plant design and operational practices. Systems/components for which Phase 2 assessment using this Notebook are expected to result in conservative or non-conservative results, compared to the plant-specific PRA, are also noted.

CONTENTS

TABLES

FIGURES

1. INFORMATION SUPPORTING SIGNIFICANCE DETERMINATION PROCESS (SDP)

SECY-99-007A (NRC, March 1999) describes the process for making a Phase 2 evaluation. The first step is to identify the pertinent core damage scenarios that require further evaluation consistent with the specifics of the inspection findings. To aid in this process, this notebook provides the following information:

1. Estimated Likelihood for Initiating Event Categories
2. Initiators and System Dependency Table
3. Significance Determination Process (SDP) Worksheets
4. SDP Event Trees.

Table 1, Categories of Initiating Events, is used to obtain an estimated likelihood for the applicable initiating events for the plant for different exposure time under degraded conditions. Initiating events are grouped in frequency bins covering one order-of-magnitude apart. The Table includes the initiating events that should be considered for the plant and for which SDP worksheets are provided. The following initiating events are categorized by industry-average frequency: transients (Reactor Trip) (TRANS); transients without power conversion system (TPCS); large, medium, and small loss of coolant accidents (LLOCA, MLOCA, and SLOCA); stuck-open relief valve (SORV), if applicable; steam generator tube rupture (SGTR); main steam line break (MSLB), anticipated transients without scram (ATWS), and interfacing system LOCA (ISLOCA). The frequency of the remaining initiating events vary significantly from plant to plant, and accordingly, they are categorized by plant-specific frequency obtained from the licensee. They include loss of offsite power (LOOP) and special initiators caused by loss of support systems. Table 1 may also include an initiator with an acronym LEAC standing for LOOP with loss of one Emergency AC bus. This initiator is added to capture those sequences that are not included in the simplified LOOP worksheet. An initiating event is categorized into a row if the estimated frequency falls within the frequency range defined for the row. In some situations, where the frequency of the initiating event is near the upper end of the range, it may be assigned to the next row with higher frequency range based on the benchmarking conducted at the plant. In such cases, a footnote is given at the bottom of Table 1.

Table 2, The Initiators and System Dependency Table, shows the major dependencies between frontline- and support-systems, and identifies their involvement in different types of initiators. This table identifies the most risk-significant systems; it is not an exhaustive nor comprehensive compilation of the dependency matrix, as known in Probabilistic Risk Assessments (PRAs). Footnotes are provided to explain any specific design characteristics and considerations that may be needed in defining system/component failures based on the dependency defined. Systems/components for which the Phase 2 assessment using this notebook is expected to result in non-conservative or conservative estimates are also noted in the footnotes. For pressurized water reactors (PWRs), the support systems/success criteria for Reactor Coolant Pump (RCP) seals are explicitly denoted to assure that the inspection findings on them are properly accounted for. This table is also used to identify the SDP worksheets to be evaluated, corresponding to inspection findings on systems and components.

To evaluate the impact of an inspection finding on the core-damage scenarios, SDP worksheets are provided. The SDP worksheets contain two parts. The first identifies the functions, the systems, or combinations thereof that have mitigating functions, the number of trains in each system, and the number of trains required (success criteria) for the initiator. It also characterizes the mitigation capability in terms of the available hardware (e.g., 1 train, 1 multi-train system) and the operator action involved. The second part of the SDP worksheet contains the core-damage accident sequences associated with each initiator; these sequences are based on SDP event trees. In the parenthesis next to each sequence, the corresponding event-tree branch number(s) representing the sequence is given. Multiple branch numbers indicate that the different accident sequences identified by the event tree have been merged into one through Boolean reduction. In addition to the branch numbers, below each of the terms of the sequences the applicable ratings or credits for the base case defined in this notebook is noted. For the initiating event, an estimated likelihood corresponding to a degraded condition existing for more than 30 days is used. For the safety function base case, credits are given for full mitigation capability. The result for the sequence is obtained by summing the likelihood for the initiating event and the credits for the mitigation functions. The overall result is provided to help the user determine the results for specific inspection findings.

SDP worksheets are developed for each initiating event, including the "Special Initiators" that typically are caused by complete or partial loss of support systems. A special initiator typically leads to a reactor scram and degrades some mitigation capabilities (e.g., Loss of CCW in PWRs).

In considering the special initiators, we defined a set of criteria for including them to maintain some consistency across the plants. These conditions are as follows:

1. The special initiator should degrade at least one of the mitigating safety functions, changing its mitigation capability in the worksheet. For example, when a safety function with two redundant trains, classified as a multi-train system, degrades to a one-train system, to be classified as 1 Train, due to the loss of one of the trains as a result of the special initiator.

2. The special initiators which degrade the mitigation capability of the accident sequences associated with the initiator from comparable transient sequences by two and higher orders of magnitude must be considered.

SDP worksheets are not developed for special initiators that directly lead to a core damage (the inspection of these initiators are assessed differently; see SECY-99-007A). If these initiators are significant contributor for the plant, they are noted in Table 2.

From the above considerations, the special initiators applicable for this plant are defined and worksheets are developed for each. Section 1.3 lists the initiating events including the plant-specific special initiators addressed in this notebook.

SDP worksheet for ISLOCA is different from other worksheets discussed above. This worksheet identifies potential paths for high and low pressure interface, but does not identify the mitigation capabilities. The inspection finding that could degrade integrity of any of these paths should be evaluated in consultation with the Regional Senior Risk Analyst (SRA).

Following the SDP worksheets, the SDP event trees corresponding to each of the worksheets are presented. The SDP event trees are simplified event trees developed to define the accident sequences identified in the SDP worksheets. For special initiators whose event tree closely corresponds to another event tree (typically, the Transient (Reactor trip) or Transients w/o PCS event tree) with one or more functions eliminated or degraded, a separate event tree may not be drawn. When a separate event tree is not developed, reference to the applicable worksheet is provided in the footnote.

We considered the following items in establishing the SDP event trees and the core-damage sequences in the SDP worksheets; Section 2.1 gives additional guidelines and assumptions.

1. Event trees and sequences were developed such that the worksheet contains all the major accident sequences identified by the plant-specific IPEs/PRAs. The special initiators modeled for a plant is based on a review of the special initiators included in the plant IPE/PRA and the information provided by the licensee.

2. The event trees and sequences for each plant take into account the IPE/PRA models and event trees for all similar plants. For modeling the response to an initiating event, major deviations in one plant from similar plants may be noted at the end of the worksheet.

3. The event trees and the sequences were designed to capture core-damage scenarios, without including containment-failure probabilities and consequences. Therefore, branches of event trees that are developed only for the purpose of a Level II PRA analysis are not considered. The resulting sequences are merged, using Boolean logic.

4. The simplified event trees focus on classes of initiators, as defined above. In so doing, many separate event trees in the IPEs/PRAs often are represented by a single tree. For example, some IPEs/PRAs define four classes of LOCAs rather than the three classes considered here. The sizes of LOCAs for which high-pressure injection is not required are sometimes divided into two classes, the only difference between them being the need for reactor scram in the smaller break size. There may be some consolidation of transient event trees besides defining the special initiators following the criteria defined above.

5. Major actions by the operator during accident scenarios are credited using three categories of Human Error Probabilities (HEPs). They are termed operator action=1 (representing an

error probability of 5E-2 to 0.5), operator action=2 (error probability of 5E-3 to 5E-2), and operator action=3 (error probability of 5E-4 to 5E-3). An human action is assigned to a category bin, based on a generic grouping of similar actions among a class of plants. This approach resulted in designation of some actions to a higher bin, even though the IPE/PRA HEP value may have been indicative of a lower category. In such cases, it is noted at the end of the worksheet. On the other hand, if the IPE/PRA HEP value suggests a higher category than that generically assumed, the HEP is assigned to a bin consistent with the IPE/PRA value in recognition of potential plant-specific design; a note is also given in these situations. A special case for operator action with credit of 4 is defined for hot leg/cold leg switchover in medium and large LOCAs. Section 2.1 provides an explanation of this mitigation credit.

The four sections that follow include Categories for Initiating Events Table, Initiators and Dependency Table, SDP worksheets, and the SDP event trees for North Anna Power Station, Units 1 and 2.

1.1 INITIATING EVENT LIKELIHOOD

Table 1 lists the applicable initiating events for this plant and their estimated likelihood corresponding to the exposure time under degraded conditions. The initiating events are grouped into rows based on their frequency. As mentioned earlier, loss of offsite power and special initiators are assigned to rows using the plant-specific frequency obtained from individual licensees. For other initiating events, industry-average values are used, as per SECY-99-007A. The plant-specific initiating event frequency for the special initiators is noted as a footnote in the worksheet for the special initiator in Section 1.3. A special initiator event is assigned to a row in Table 1 if its frequency falls within the range of the frequency defined for that row. In some cases, when the frequency is close to the upper range it may be placed in the next row with higher frequency; then, a footnote is provided.

Table 1 Categories of Initiating Events for North Anna Power Station, Units 1 and 2

Row	Approximate Frequency	Event Type	Initiating Event Likelihood (IEL)		
I	> 1 per 1-10 yr	Transients (Reactor Trip) (TRANS), Transients Without PCS (TPCS)	1	2	3
II	1 per 10-10^2 yr	Loss of Offsite Power (LOOP) [(1)], Loss of a 4.16 kV Bus (1H) (L4KVH), Loss of 4.16 kV BUS (1J) (L4KVJ)	2	3	4
III	1 per 10^2 - 10^3 yr	Loss of Instrument Air (LIA) [(2)], Loss of a 125 VDC Bus (LDC) [(3)], Steam Generator Tube Rupture (SGTR), Stuck-open PORV (SORV), Small LOCA including RCP seal failures (SLOCA) [(5)], Main Steam Line Break Outside Containment (MSLB), Loss of Service Water (LSW) [(4)]	3	4	5
IV	1 per 10^3 - 10^4 yr	Medium LOCA (MLOCA) [(5)], LOOP with Loss of One Emergency AC Bus (LEAC)	4	5	6
V	1 per 10^4 - 10^5 yr	Large LOCA (LLOCA) [(5)]	5	6	7
VI	less than 1 per 10^5 yr	Anticipated Transients Without Scram (ATWS) [(6)], Interfacing System LOCA (ISLOCA)	6	7	8
			> 30 days	3-30 days	< 3 days
			Exposure Time for Degraded Condition		

Notes:

1. LOOP frequency is about 2.6E-2 per reactor-year in the updated licensee's PRA.
2. Loss of instrument air is assigned to Row III per generic initiating event frequency from plants with similar design. The licensee does not model this initiator.

3. The initiating event frequency for loss of each DC bus 1-I or 1-III is about 1.77E-3 per reactor-year. A combined frequency of 3.5E-3 per reactor-year is assumed for loss of either of bus.

4. Frequency of loss of SW for both reservoir to reservoir and lake to lake operation is about 6E-6 per reactor-year. The SDP models the loss of reservoir to reservoir operation as the special initiator and assigns it to Row III. The lake to lake operation using the auxiliary SW pumps is explicitly modeled in the worksheet.

5. Sizes of Small, Medium, and Large LOCAs are <2" , between 2" and 6", and >6" respectively.

6. The SDP worksheets for ATWS core damage sequences assume that the ATWS is not recoverable by manual actuation of the reactor trip function. Thus, the ATWS frequency to be used by these worksheets must represent the ATWS condition that can only be mitigated by the systems shown in the worksheet (e.g., boration). Any inspection finding that represents a loss of capability for manual reactor trip for a postulated ATWS scenario should be evaluated by a risk analyst to consider the probability of a successful manual trip.

1.2 INITIATORS AND SYSTEM DEPENDENCY

Table 2 lists the systems included in the SDP worksheets, the major components in the systems, and the support system dependencies. The systems' involvements in different initiating events are noted in the last column.

Table 2. Initiators and System Dependency for North Anna Power Station, Units 1 and 2 [6]

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
AC Power (AC) [21]	4.16 kV/480 VAC Trains H & J, 120 VAC	125 VDC for breaker control power, Emergency Switchgear Room Ventilation (ESGR)	All
Accumulators (ACC)	3 Accumulators [23]	None	SLOCA, SORV, LLOCA
AFW	2 MDPs [1, 15, 23]	4.16 kV AC (1H, 1J) [5], 125 VDC, SSPS	All except MLOCA and LLOCA
	1 TDP [1, 23]	125 VDC [2], IA [2], Main Steam, SSPS	
Alternate Emergency Power	SBO Diesel generator [23]	Self supported	LOOP
ATWS Mitigation System Activation Circuitry (AMSAC)	Programmable logic controllers	TSC (Technical Support Center) UPS	ATWS
Bearing Cooling	2 pumps, 2 Heat Exchangers, 1 Cooling Tower per unit	4.16 kV AC (Station Services), 480 VAC	LSW
Circulating Water	4 pumps/unit	4.16 kV AC (Station Services)	TRANS, TPCS, L4KVJ, L4KVH, LDC
Component Cooling Water (CCW) [16, 17] System	Two trains per unit, each with one pump and one heat exchanger. Normally cross-tied between two units. One train per unit normally running; the other in standby.	4.16 kV AC (1H, 1J), 480 VAC, Vital AC, 125 VDC, IA, SW	See Note 26 : TRANS, SGTR
Condensate	Pumps P1A, P1B, P1C; Condenser Hotwell	4.16 kV AC (1A, 1B, 1C- Station Services), 125 VDC, Bearing Cooling, IA (needed for condenser Vacuum), Circulating Water	TRANS, TPCS, L4KVJ, L4KVH, LDC

Table 2 (continued)

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
125 VDC [24]	4 panels (buses) (red, white, blue, yellow), each with a battery [24], and one "normal" battery charger. 2 swing battery chargers [9].	480 VAC, ESGR	ALL
Emergency Diesel Generator (EDG) [3]	2 EDGs per unit [23]	125 VDC, SSPS, Fuel oil system [13], Exhaust fans	LOOP, LEAC
Emergency Switchgear Room (ESGR) Cooling	3 Air Handling Units and chillers per unit	4.16 kV AC (1H, 1J), 480 VAC, 120 VAC, 125 VDC, SSPS, SW [7], IA [18]	See Note 28
Fire Protection [4]	2 pumps (motor- and diesel-driven) for both units	4.16 kV AC (Station Services)	LSW
HHSI (Charging pumps)	Pumps P1A, P1B, P1C	4.16 kV AC (1H, 1J), 125 VDC, SW [4], SSPS	All except LLOCA and LSW
Instrument Air (IA) [10]	Two Motor-Driven Compressors [11, 24]	480 V MCC, SW (IA compressors only)	LIA
Service Air (SA)	Two air-cooled compressors	Normal AC	
LHSI	Pumps P1A, P1B	4.16 kV AC (1H, 1J), 125 VDC, SSPS (for LLOCA only)	All except ATWS and LSW
	MOVs	480 VAC, SSPS (for LLOCA only)	
Main Feedwater (MFW)	Motor Driven MFW Pumps P1A, P1B, P1C	4.16 kV AC (1A, 1B,1C- Station Services), 125 VDC, IA (Valves), Bearing Cooling	TRANS, TPCS, L4KVJ, L4KVH, LDC

Table 2 (continued)

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
Main Steam	1 ADV (PORV) per SG [19]	120 VAC (Vital Bus Channels I, II & III), IA [8]	TPCS, SLOCA, SORV, LOOP, SGTR, MSLB, LIA, LDC, LSW, LEAC
	1 Main Steam Trip Valve per SG [24]	125 VDC, IA	MSLB, SGTR
	5 Safety relief valves per SG	None	TPCS, LOOP, MSLB, LIA, LDC, LSW, LEAC
	8 Condenser Steam Dump Valves	125 VDC, IA	SGTR
Primary Grade Water [4]	Tank, 2 pumps	4.16 kV AC (Station Services)	LSW
Quench Spray (QS)	Pumps P1A, P1B	480 V MCC, 125 VDC, SSPS	LLOCA
Reactor Coolant Pumps (RCPs)	Seals of pumps 1A, 1B, 1C (Both units are equipped with high temperature W seals)	RCP seal cooling is provided by 1/2 CCW and 1/3 Charging pumps for seal injection [22,23,25]	SLOCA
RCS Pressure Relief	PORVs 1455C & 1456 [23]	125 VDC, IA [27]	All except LLOCA, MLOCA, and LSW
	PORV block valves	AC Power	SORV
	3 safety relief valves (SRVs)	None	ATWS
	Pressurizer main spray and Aux Spray	125 VDC, IA [14]	SLOCA, SORV, SGTR
Recirculation Spray Inside Loop	2 pumps and 2 Heat Exchangers	4.16 kV AC, 480 VAC, SSPS, 125 VDC, SW	All except ATWS and LSW
Recirculation Spray Outside Loop	2 pumps and 2 Heat Exchangers, 2 Casing Cooling pumps, Casing Cooling Tank [20, 24]		
RHR [23]	Pumps P1A, P1B, and 2 Heat Exchangers	4.16 kV AC (1H, 1J), 125 VDC, CCW	SGTR

Table 2 (continued)

Affected Systems	Major Components	Support Systems	Initiating Event Scenarios
Service Water (shared between both units)	4 primary (one pump per unit normally in operation), 2 auxiliary pumps for both units (12)	4.16 kV AC, 480 VAC, SSPS	LSW
Solid State Protection System (SSPS)	Trains A, B	120 VAC (Vital Bus Channels I, II, III, IV)	All

Notes:

1. The AFW pumps do not require component or room cooling. Service water and fire protection can be used as backup water supplies for the AFW pumps.

2. The turbine-driven pump turbine inlet valves require instrument air and DC power for control. However, on loss of either instrument air or DC power the valves fail open allowing steam flow to the pump turbine.

3. Each diesel generator is a self-contained unit. The diesels are self-cooled (water cooled with water-air radiators), are provided with self-contained starting air systems, batteries, take suction directly from outside air, and are each provided with separate day tanks. The EDG output breaker requires vital DC to operate.

4. The Fire Protection and Primary Grade Water Systems can provide backup pump cooling.

5. The unit conventions in the support systems is for Unit 1.

6. The plant internal event CDF is 6.1E-6 (including 1.6E-6 contribution from ISLOCA) per reactor-year based on N0A (year 2000) update; Internal Flooding CDF is about 4.0E-6 per reactor-year.

7. Bearing Cooling is a backup heat sink to SW for Unit 1 only.

8. IA accumulators provide a backup source of air.

9. There are two swing battery chargers. Each of them can supply power to one of two 125 VDC panels. The battery chargers cannot carry SI loads by themselves initially and require the availability of the batteries. The licensee's PRA, however, has modeled them as if either the batteries or chargers can carry the SI loads. Loss of a panel battery is treated as loss of the associated DC in the SDP notebook for all initiators when actuation of SI is expected.

Table 2 (continued)

10. The Compressed Air system consists of three individual subsystems: Service Air subsystem, Instrument Air (IA) subsystem, and Containment Instrument Air subsystem. Service Air normally feeds all loads. Normally, the Containment Instrument Air subsystem is secured and the plant IA subsystem supplies air to all loads upon failure of Service Air. There are a total of four compressors; two service air and two IA compressors for both units. The two Service Air compressors are normally running and feeding a common header shared by both units. The IA compressors will auto start upon loss of Service Air compressors. Each IA compressor is fed from the associated H bus in each unit.

11. Each IA Compressor is associated with one unit in terms of power supply and control, and discharges to individual IA receivers.

12. In the lake-to-lake mode of operation the two auxiliary pumps can be used as a backup to the main SW.

13. There is about four hours of fuel in the day tank. There are two trains of fuel oil transfer pumps per each EDG.

14. The valves of the pressurizer main spray and Aux Spray fail closed on a loss of air or power.

15. There is an air backup for AFW flow control valves sufficient for 30 minutes. This will temporarily prevent SG overfill and allow manual isolation of the AOV operated control valve and use of the bypass MOV for flow control.

16. CCW pumps are air cooled and SW is just needed for the CCW heat exchangers.

17. The CCW containment isolation valves go shut on loss of air or DC (H bus).

18. On loss of air the SW valve to the chillers go fully open and could cause the trip of the AHUs if the temperature drops below 60 degree F. Manual action is required to recover the ESGR HVAC.

19. Two of the SG PORVs are fed from the H bus (A and B); the C SG PORV is fed from the J bus. There is a manual valve that can be used to block the SG PORV when the system is depressurized and cooled (for SGTR after late depressurization and cooldown).

20. The casing pumps are required to provide net positive suction head (NPSH) for outside recirculation only.

21. There are three sets of batteries in the switchyard that can provide 8 hours of DC power for breaker operation and restoration of offsite power.

22. The seal injection could be manually cross-tied between the two units.

23. The benchmarking report identifies these cases as overestimates by one color and discusses the reasons behind them. These cases are: one EDG, SBO DG, one accumulator, one MDAFW pump, one TDAFW pump, one SG PORV, one PORV fails to open or to reclose, one inside recirculation spray pump, failure of RHR drop line valve, operator failure to conduct emergency boration after ATWS, and operator failure to cross-tie the seal injection between the two units. The benchmarking report should be consulted for those inspection findings relating to these items.

24. The benchmarking report identifies these cases as overestimate by two or more colors: 125 VDC, one battery, one air compressor, one MSIV fail to close, and one LHSI pump. The benchmarking report should be consulted for those inspection findings relating to these items.

25. The benchmarking report identified the failure of seal injection due to failure of either injection valves to remain open as an underestimate by one color. The benchmarking report should be consulted for the inspection findings relating to these valves.

26. All inspection findings on loss of one CC pump at North Anna Units 1 and 2 are considered to be Green by the SDP notebook. Total loss of CC will not cause a reactor trip, but will result in manual reactor trip before RCP bearing temperature exceeds the procedural limit. The trip will behave similar to a transient if the operator trips RCPs in time. Failure to trip RCPs could potentially result in seal LOCA. The availability of charging and other systems not affected by the loss of CC will make the contribution of such sequences negligible.

27. There is a backup nitrogen supply to the PORVs from nitrogen reserve tanks.

28. Inspection finding on loss of one chiller or one air handling unit is examined and found to be always Green.

1.3 SDP WORKSHEETS

This section presents the SDP worksheets to be used in the Phase 2 evaluation of the inspection findings for the North Anna Power Station, Units 1 and 2. The SDP worksheets are presented for the following initiating event categories:

1. Transients (Reactor Trip) (TRANS)
2. Transients Without PCS (TPCS)
3. Small LOCA (SLOCA)
4. Stuck-open PORV (SORV)
5. Medium LOCA (MLOCA)
6. Large LOCA (LLOCA)
7. Loss of Offsite Power (LOOP)
8. Steam Generator Tube Rupture (SGTR)
9. Main Steam Line Break Outside Containment (MSLB)
10. Anticipated Transients Without Scram (ATWS)
11. Loss of Instrument Air (LIA)
12. Loss of a 4.16 kV Bus (1J) (L4KVJ)
13. Loss of a 4.16 kV Bus (1H) (L4KVH)
14. Loss of a 125 VDC Bus (LDC)
15. Loss of Service Water (LSW)
16. LOOP with Loss of One Emergency AC Bus (LEAC)
17. Interfacing System LOCA (ISLOCA)

Table 3.1 SDP Worksheet for North Anna, Units 1 and 2 — Transients (Reactor Trip) (TRANS)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (AFW)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train)
Power Conversion System (PCS)	1/3 Main Feedwater (MFW) trains and 1/3 Condensate pump trains (operator action = 2) (1)
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) (2)
High Pressure Recirculation (HPR) (3)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) (4)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 TRANS - AFW - PCS - RS (4) 1 + 4 + 2 + 3	**10**				
2 TRANS - AFW - PCS - HPR (5) 1 + 4 + 2 + 3	**10**				
3 TRANS - AFW - PCS - FB (6) 1 + 4 + 2 + 2	**9**				
4 TRANS - AFW - PCS - EIHP (7) 1 + 4 + 2 + 3	**10**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Restoring main feedwater has a Human Error Probability (HEP) value of 2.45E-3 for most transients in the licensee's PRA. A credit of 2 is generically assigned which includes both the HEP as well as the hardware failure probability.

2. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The HEP assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

3. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. ORS can be manually aligned as backup for low head recirculation for NAPS Unit 1. Change over to High Head Recirculation automatically takes place on RWST low level.

4. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.2 SDP Worksheet for North Anna, Units 1 and 2 — Transients Without PCS (TPCS)

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Secondary Heat Removal (AFW)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) (1)
High Pressure Recirculation (HPR) (2)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) (3)

Circle Affected Functions		**IEL**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Recovery Credit**	**Results**
1 TPCS - AFW - RS (3) **1 + 4 + 3**	**8**				
2 TPCS - AFW - HPR (4) **1 + 4 + 3**	**8**				
3 TPCS - AFW - FB (5) **1 + 4 + 2**	**7**				
4 TPCS - AFW - EIHP (6) **1 + 4 + 3**	**8**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

2. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. ORS can be manually aligned as backup for low head recirculation for NAPS Unit 1. Change over to High Head Recirculation automatically takes place on RWST low level.

3. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.3 SDP Worksheet for North Anna, Units 1 and 2 — Small LOCA (SLOCA)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Secondary Heat Removal, 1/3 SGs (AFW1)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) to 1/3 SGs
Secondary Heat Removal, 2/3 SGs (AFW2)	2/3 AFW trains to 2/3 SGs (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) (3)
RCS Cooldown/Depressurization (RCSDEP1)	Operator depressurizes and cools down RCS using 1/3 ADVs & (1/2 Pzr sprays or 1/2 PORVs or 1/1 Aux Spray) (operator action = 3) (1)
RCS Cooldown and Depressurization, No EIHP (RCSDEP2)	Operator depressurizes and cools down RCS using 2/3 ADVs & 1/2 Pzr sprays (operator action = 2) (2)
Low Pressure Cooling (LPC)	2/2 LHSI pump trains and 2/3 Accumulators (1 train)
High Pressure Recirculation (HPR)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system) (4)
Low Pressure Recirculation (LPR)	1/2 LHSI pump trains (1 multi-train system) (4)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) (5)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 SLOCA - RS (2, 5, 8, 12) 3 + 3	6				
2 SLOCA - LPR (3, 13) 3 + 3	6				
3 SLOCA - RCSDEP1 - HPR (6) 3 + 3 + 3	9				
4 SLOCA - AFW1 - HPR (9) 3 + 4 + 3	10				
5 SLOCA - AFW1 - FB (10) 3 + 4 + 2	9				
6 SLOCA - EIHP - LPC (14) 3 + 3 + 2	8				
7 SLOCA - EIHP - RCSDEP2 (15) 3 + 3 + 2	8				

8 SLOCA - EIHP - AFW2 (16) 3 + 3 + 3	9				
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.					

Notes:

1. The human error probability (HEP) value for depressurizing RCS during SLOCA to allow for low pressure recirculation is 8.5E-4 per demand in the licensee's PRA. A credit of 3 is assigned.

2. The HEP value for rapid depressurization of primary is 8.25E-3 per demand in the licensee's PRA. A credit of 2 is therefore assigned.

3. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

4. Change over for HPR and LPR is automatic. The change over takes place on low RWST level.

5. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.4 SDP Worksheet for North Anna, Units 1 and 2 — Stuck-open PORV (SORV)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Isolation of Small LOCA (BLK)	The closure of the block valve associated with stuck open PORV (1 train)
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Secondary Heat Removal, 1/3 SGs (AFW1)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) to 1/3 SGs
Secondary Heat Removal, 2/3 SGs (AFW2)	2/3 AFW trains to 2/3 SGs (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	Operator conducts Feed/Bleed using 1/1 remaining PORV (operator action = 2) [3]
RCS Cooldown/Depressurization (RCSDEP1)	Operator depressurizes and cools down RCS using 1/3 ADVs & 1/2 Pzr sprays or 1/1 remaining PORV or 1/1 Aux Spray (operator action = 3) [1]
RCS Cooldown and Depressurization, No EIHP (RCSDEP2)	Operator depressurizes and cools down RCS using 2/3 ADVs & 1/2 Pzr sprays (operator action = 2) [2]
Low Pressure Cooling (LPC)	2/2 LHSI pump trains and 2/3 remaining Accumulators (1 train)
High Pressure Recirculation (HPR)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system) [4]
Low Pressure Recirculation (LPR)	1/2 LHSI pump trains (1 multi-train system) [4]
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) [5]

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 SORV - BLK - RS (3, 6, 9, 13) 3 + 2 + 3	8				
2 SORV - BLK - LPR (4,14) 3 + 2 + 3	8				
3 SORV - BLK - RCSDEP1 - HPR (7) 3 + 2 + 3 + 3	11				
4 SORV - BLK - AFW1 - HPR (10) 3 + 2 + 4 + 3	12				
5 SORV - BLK - AFW1 - FB (11) 3 + 2 + 4 + 2	11				
6 SORV - BLK - EIHP - LPC (15) 3 + 2 + 3 + 2	10				
7 SORV - BLK - EIHP - RCSDEP2 (16) 3 + 2 + 3 + 2	10				

8 SORV - BLK - EIHP - AFW2 (17) **3 + 2 + 3 + 3**	**11**				
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.					

Notes:

1. The human error probability (HEP) value for depressurizing RCS during SLOCA to allow for low pressure recirculation is 8.5E-4 per demand in the licensee's PRA. A credit of 3 is assigned.

2. The HEP value for rapid depressurization of primary is 8.25E-3 per demand in the licensee's PRA . A credit of 2 is therefore assigned.

3. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

4. Change over for HPR and LPR is considered automatic in the PRA. The change over takes place on low RWST level.

5. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.5 SDP Worksheet for North Anna, Units 1 and 2 — Medium LOCA (MLOCA)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
High Pressure Recirculation (HPR)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system) (1)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps in spray mode (1 multi-train system) (2)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 MLOCA - RS (2) **4 + 3**	7				
2 MLOCA - HPR (3) **4 + 3**	7				
3 MLOCA - EIHP (4) **4 + 3**	7				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Change over for HPR is considered automatic in the PRA. The change over takes place on low RWST level.

2. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.6 SDP Worksheet for North Anna, Units 1 and 2 — Large LOCA (LLOCA)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Early Inventory, Accumulators (EIAC)	2/2 remaining accumulators (1 train)
Early Inventory, Low Pressure Injection (EILP)	1/2 LHSI pump trains (1 multi-train system)
Quench Spray (QS) (1)	1/2 QS pumps drawing from RWST (1 multi-train system)
Recirculation Spray (RS)	[1/2 Inside RS loop(2 pumps) or 1/2 Outside RS loop(2 pumps)] (1 multi-train system) (4)
Outside Recirculation Spray (ORS)	1/2 Outside RS loop (2 pumps) and 1/2 casing pumps (1 train) (3)
Low Pressure Recirculation (LPR)	1/2 LHSI pump trains (1 multi-train system) (2)
Hot Leg Recirculation (HLR)	Operator transfers from cold leg to hot leg recirculation (operator action = 3)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 LLOCA - HLR (2, 6) **5 + 3**	**8**				
2 LLOCA - LPR (3, 7) **5 + 3**	**8**				
3 LLOCA - RS (4) **5 + 3**	**8**				
4 LLOCA - QS - ORS (8) **5 +3 + 2**	**10**				
5 LLOCA - EILP (9) **5 + 3**	**8**				
6 LLOCA - EIAC (10) **5 + 2**	**7**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. A high containment pressure (28 psia) signal initiates both QS pumps. Successful operation of a QS pump is needed to fill the containment sump for required NPSH for inside RS pumps.

2. Change over for LPR is considered automatic in the PRA. The change over takes place on low RWST level.

3. For the outside recirculation, operation of the casing pump is required to satisfy the requirement for NPSH. A major contributor to system failure is from the casing cooling failure from temporary strainers. These strainers are assumed to have been installed during construction as temporary and have been left in service. A mitigation credit of 1 train is assigned.

4. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.7 SDP Worksheet for North Anna, Units 1 and 2 — Loss of Offsite Power (LOOP)

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Emergency AC Power (EAC)	1/2 Emergency Diesel Generators (1 multi-train system)
RCP Seal Integrity (SEAL) (1)	RCP Seal Intact (Credit =1)
Turbine-driven AFW Pump (TDAFW)	1/1 TDP train of AFW (1 ASD train) through 1/3 SGs and associated 1/5 safety relief valves
SBO DG or Recovery of Offsite Power in 1 Hr (SBO/REC1)	1/1 SBO DG or AC recovery in 1 hour (operator action = 1)
Secondary Heat Removal (AFW)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves
Recovery of AC Power in < 3 Hrs (REC3)	Recovery of offsite power within 3 hours (operator action = 1) (2)
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs for feed and bleed (operator action = 2)
High Pressure Recirculation (HPR)	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system) (3)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system)

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 LOOP - AFW - RS (1) **2 + 4 + 3**	**9**				
2 LOOP - AFW - HPR (1) **2 + 4 + 3**	**9**				
3 LOOP - AFW - FB (1) **2 + 4 + 2**	**8**				
4 LOOP - AFW - EIHP (1) **2 + 4 + 3**	**9**				
5 LOOP - EAC - SBO/REC1 - REC3 (4) **2 + 3 + 1 + 1**	**7**				
6 LOOP - EAC - TDAFW - RS (6, 17) **2 + 3 + 1 + 3** (AC Recovered)	**9**				

7 LOOP - EAC - TDAFW - HPR (7, 18) 2 + 3 + 1 + 3 (AC Recovered)	9				
8 LOOP - EAC - TDAFW - FB (8,19) 2 + 3 + 1 + 2 (AC Recovered)	8				
9 LOOP - EAC - TDAFW - EIHP (9, 20) 2 + 3 + 1 + 3 (AC Recovered)	9				
10 LOOP - EAC - TDAFW - SBO/REC1 (10, 21) 2 + 3 + 1 + 1	7				
11 LOOP - EAC - SEAL - RS (12) 2 + 3 + 1 + 3 (AC Recovered)	9				
12 LOOP - EAC - SEAL - HPR (13) 2 + 3 + 1 + 3 (AC Recovered)	9				
13 LOOP - EAC - SEAL - EIHP (14) 2 + 3 + 1 + 3 (AC Recovered)	9				
14 LOOP - EAC - SEAL - SBO/REC1 (15) 2 + 3 + 1 + 1	7				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. In this worksheet, the current NRC's position on the RCP seal model for qualified high temperature Westinghouse seals known as "WOG 2000" model was utilized. It is therefore assumed that seal LOCA may occur within 15 minutes with 0.2 probability during the SBO scenarios. As a consequence of this model, the alignment of the SBO DG (AAC) is treated as a recovery of AC power in 1 hour but not as a means to protect the RCP seals. The licensee estimated that AAC alignment would take at least 30 minutes to complete.

2. The failure to recover offsite power in 90 minutes is 0.34 and in 8 hours is 0.04. A credit of 1 is given for recovery of AC in 1 hour, largely due to alignment of the SBO DG. A credit of 1 is given for recovery of AC power in 3 hours corresponding to core uncovery as a result of RCP seal failure consistent with the PRA estimate. For those inspection findings on the SBO DG, the SDP is evaluated by not crediting the REC1.

3. Change over for HPR and LPR is considered automatic in the PRA. The change over takes place on low RWST level.

Table 3.8 SDP Worksheet for North Anna, Units 1 and 2 — Steam Generator Tube Rupture (SGTR)

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Secondary Heat Removal (AFW)	1/2 MDPs of AFW (1 multi-train system) or 1/1 TDP of AFW (1 ASD train)
Secondary Hear Removal, No EIHP (AFW1)	Any 2/3 AFW trains (1 multi-train system)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed and Bleed (operator action = 2) (2)
Pressure Equalization (EQ)	Operator isolates the ruptured SG and depressurizes RCS using 1/1 SG ADV (on each SG fed by AFW) or opening of 1/2 PORVs to reduce primary pressure to less than setpoint of relief valves of SG (operator action = 2) (1)
RCS Depressurization (RCSDEP)	Operator depressurizes RCS using (1/2 Pzr main Spray or 1/2 PORVs or 1/1 Aux Spray) and (1/2 ADVs or 1/2 condenser steam dump valves) (operator action = 3) (3)
High Pressure Recirculation (HPR)	1/2 Charging trains with 1/2 LHSI pump trains for recirculation (1 multi-train system) (4)
Residual Heat Removal (RHR)	Operator aligns 1/2 RHR pumps with CCW flow to 1/2 RHR-HXs through one drop line valve for shutdown cooling (1 train)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) (5)

Circle Affected Functions		**IEL**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Recovery Credit**	**Results**
1 SGTR - EQ - RHR (3) **3 + 2 + 2**	**7**				
2 SGTR - EQ - RCSDEP (4) **3 + 2 + 3**	**8**				
3 SGTR - AFW - RS (6) **3 + 4 + 3**	**10**				
4 SGTR - AFW - HPR (7) **3 + 4 + 3**	**10**				
5 SGTR - AFW - EQ (8) **3 + 4 + 2**	**9**				
6 SGTR - AFW - FB (9) **3 + 4 + 2**	**9**				

7 SGTR - EIHP - RCSDEP (11) **3 + 3 + 3**	**9**				
8 SGTR - EIHP - EQ (12) **3 + 3 + 2**	**8**				
9 SGTR - EIHP - AFW1 (13) **3 + 3 + 3**	**9**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Operator failure probability to isolate the faulted SG and depressurize below the relief valve/ADV setpoint is estimated at 3.65E-3. A generic credit of 2 is assigned which includes the failure of the relief valve to reseat following the initial pressure increase.

2. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability (HEP) assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

3. The HEP value for depressurizing RCS during SGTR to reach RHR entry criteria is 8.5E-4 per demand in the licensee's PRA. A credit of 3 is assigned.

4. Change over for HPR and LPR is considered automatic in the PRA. The change over takes place on low RWST level.

5. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.9 SDP Worksheet for North Anna, Units 1 and 2 — Main Steam Line Break Outside Containment (MSLB) [(1)]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
MSLB Isolated (MSIV3)	3/3 Main Steam Trip Valves close (1 train) [(2)]
MSLB Isolated (MSIV2)	2/2 remaining Main Steam Trip Valves close (1 train)
Early Inventory, High Pressure Injection (EIHP)	1/2 Charging trains (3 pumps) (1 multi-train system)
Secondary Heat Removal (AFW)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) through 1/2 SGs and associated 1/1 ADV or 1/5 safety relief valves
Feedwater Valves Close (FWVC)	Operators close the valves feeding the SG whose Main Steam Trip Valve did not close (1 train)
Stop Injection (STIN)	Operators stop high pressure injection (operator action = 2)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) [(3)]
High Pressure Recirculation (HPR) [(4)]	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) [(5)]

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 MSLB - MSIV3 - STIN - RS (4) 3 + 2 + 2 + 3	10				
2 MSLB - MSIV3 - STIN - HPR (5) 3 + 2 + 2 + 3	10				
3 MSLB - MSIV3 - FWVC - STIN (7) 3 + 2 + 2 + 2	9				
4 MSLB - MSIV3 - AFW - RS (9) 3 + 2 + 4 + 3	12				
5 MSLB - MSIV3 - AFW - HPR (10) 3 + 2 + 4 + 3	12				
6 MSLB - MSIV3 - AFW - FB (11) 3 + 2 + 4 + 2	11				
7 MSLB - MSIV3 - EIHP - FWVC (13) 3 + 2 + 3 + 2	10				

8 MSLB - MSIV3 - EIHP - AFW (14) 3 + 2 + 3 + 4	12				
9 MSLB - MSIV3 - MSIV2 (15) 3 + 2 + 2	7				
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.					

Notes:

1. After a main steam line break, a major concern is pressurized thermal shock (PTS). We assumed it leads to core damage.

2. There are non-return check valves (NRVs) in series with MSIVs which can protect 12 feet out of 22 feet of the Main Steam Line outside containment if any of the MSIVs fail to close.

3. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

4. Change over to High Head Recirculation automatically takes place on RWST low level.

5. There are commonalities between the inside and outside RS systems, such as plugging of containment sump and failure of SW as a support system. Accordingly, a credit of 1 multi-train system is used.

Table 3.10 SDP Worksheet for North Anna, Units 1 and 2 — Anticipated Transients Without Scram (ATWS)

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Turbine Trip (TTP)	AMSAC trips the turbine and starts AFW (1 train)
Secondary Heat Removal (AFW)	2/3 AFW trains (1 multi-train system)
Primary Relief (SRV)	3/3 SRVs with 2/2 PORVs with associated block valves open (1 train)
Emergency Boration (HPI)	Operator conducts emergency boration using 1/2 charging pumps [(1)] (operator action = 2)

Circle Affected Functions		**IEL**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Recovery Credit**	**Results**
1 ATWS - HPI (2) **6 + 2**	**8**				
2 ATWS - SRV (3) **6 + 2**	**8**				
3 ATWS - AFW (4) **6 + 3**	**9**				
4 ATWS - TTP (5) **6 + 2**	**8**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Note:

1. Sufficient time is not available to align the third pump. No credit is given to the third pump.

Table 3.11 SDP Worksheet for North Anna, Units 1 and 2 — Loss of Instrument Air (LIA) [(1)]

<u>Safety Functions Needed</u>:	<u>Full Creditable Mitigation Capability for Each Safety Function</u>:
Prevent Solid Pressurizer (OPCH)	Operator terminates charging flow to prevent pressurizer to go solid [(2)] (operator action = 2)
Trip the RCPs (RCPTRIP)	Operator trips the RCPs (operator action = 3)
RCP Seal Integrity (SEAL)	Potential seal failure when OPCH is successful (credit = 1)
PORV or SRV Closes (SORV)	All PORVs and SRVs reclose after opening in response of solid pressurizer (credit = 1)
Secondary Heat Removal (AFW)	1/2 MDAFW trains or 1/1 TDAFW train through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves with manual isolation of air operated flow control valve and use of the associated parallel MOV (operator action = 3)
Early Inventory, High Pressure Injection (EIHP1)	1/2 Charging trains (3 pumps) if OPCH successful (operator action = 2)
Early Inventory, High Pressure Injection (EIHP2)	1/2 Charging trains (3 pumps) (1 multi-train system) if OPCH failed
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) [(3)]
High Pressure Recirculation (HPR) [(4)]	1/2 Charging trains with 1/2 LHSI pump trains (1 multi-train system)
Recirculation Spray (RS)	1/2 Inside RS loop with (1A or 1B) pumps or 1/2 Outside RS loop with (2A or 2B) pumps (1 multi-train system) [(5)]

<u>Circle Affected Functions</u>		<u>IEL</u>	<u>Remaining Mitigation Capability Rating for Each Affected Sequence</u>	<u>Recovery Credit</u>	<u>Results</u>
1 LIA - AFW - RS (3, 12, 21, 27) **3 + 3 + 3**	**9**				
2 LIA - AFW - HPR (4, 13, 22, 28) **3 + 3 + 3**	**9**				
3 LIA - AFW - FB (5, 14, 23, 29) **3 + 3 + 2**	**8**				
4 LIA - AFW - EIHP1 (6, 15, 24) **3 + 3 + 2**	**8**				
5 LIA - SEAL - RS (8) **3 + 1 + 3**	**7**				
6 LIA - SEAL - HPR (9) **3 + 1 + 3**	**7**				
7 LIA - SEAL - EIHP1 (10) **3 + 1 + 2**	**6**				

8 LIA - RCPTRIP - RS (17) 3 + 3 + 3	9				
9 LIA - RCPTRIP - HPR (18) 3 + 3 + 3	9				
10 LIA - RCPTRIP - EIHP1 (19) 3 + 3 + 2	8				
11 LIA - OPCH - AFW - EIHP2 (30) 3 + 2 + 3 + 3	11				
12 LIA - OPCH - SORV - RS (32) 3 + 2 + 1 + 3	9				
13 LIA - OPCH - SORV - HPR (33) 3 + 2 + 1 + 3	9				
14 LIA - OPCH - SORV - EIHP2 (34) 3 + 2 + 1 + 3	9				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Loss of Instrument Air is expected to cause a reactor trip on loss of MFW or main steam isolation, and loss of the following components: cooling to RCP thermal barriers and condenser dump valves. Actuation of SI signal will cause both charging pumps to be running. The loss of IA will cause the charging discharge valves to go fully open. Air supply is also lost to the pressurizer PORVs and to the atmospheric dump valves, but they have backup nitrogen supply. The procedure guides the operator to trip the charging in order to prevent the pressurizer from going solid since the charging flow will be maximized. The termination of charging flow combined with isolation of cooling to RCP could result in loss of RCP seals in 15 minutes with a probability of 0.2 .We used a generic frequency of 3 for the Loss of Instrument Air since the PRA currently does not model this initiator.

2. It will take about 25 minutes for pressurizer to go solid with one charging pump operating at maximum flow per licensee's comment. For full flow from two charging pumps, an estimated time of 15 minutes is assumed.

3. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

4. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. Change over to High Head Recirculation automatically takes place on RWST low level.

5. There are support system commonalities between the inside and outside RS systems including the plugging of containment sump. Accordingly, a credit of 1 multi-train system is used.

Table 3.12 SDP Worksheet for North Anna, Units 1 and 2 — Loss of a 4.16 kV Bus (1J) (L4KVJ) [1]

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Secondary Heat Removal (AFW)	1/1 MDAFW train (1 train) or 1/1 TDAFW train (1 ASD train)
Power Conversion System (PCS)	1/2 MFW trains with 1/3 Condenser trains (operator action = 2)
Early Inventory, High Pressure Injection (EIHP)	1/1 Charging train/2 pumps (1 train)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) [2]
High Pressure Recirculation (HPR) [3]	1/1 Charging train with 1/1 LHSI pump train (1 train)
Recirculation Spray (RS)	1/1 Inside RS loop with (1A or 1B) pump or 1/1 Outside RS loop with (2A or 2B) pump (1 train) [4]

Circle Affected Functions		**IEL**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Recovery Credit**	**Results**
1 L4KVJ - AFW - PCS - RS (4) 2 + 3 + 2 + 2	9				
2 L4KVJ - AFW - PCS - HPR (5) 2 + 3 + 2 + 2	9				
3 L4KVJ - AFW - PCS - FB (6) 2 + 3 + 2 + 2	9				
4 L4KVJ - AFW - PCS - EIHP (7) 2 + 3 + 2 + 2	9				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Loss of an emergency Bus 1J can cause a reactor trip due to loss of non-vital 480 V loads. Loss of the bus results in loss of 1 train of the safety systems. The initiating event frequency for each bus is estimated at 1E-2/reactor-year.

2. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

3. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. Change over to High Head Recirculation automatically takes place on RWST low level.

4. A number of individual component failures can fail this function due to the 1/1 configuration. The failure probability of this function in the PRA is approximately 8E-2 per RS system (inside or outside). Also, there are support system commonalities between the two systems including the plugging of containment sump. Accordingly, a mitigation credit of "1 train" is assigned.

Table 3.13 SDP Worksheet for North Anna, Units 1 and 2 — Loss of a 4.16 kV Bus (1H) (L4KVH) [(1)]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Power Conversion System (PCS)	1/2 MFW trains with 1/3 Condenser trains (operator action = 2)
Secondary Heat Removal (AFW)	1/1 MDAFW train (1 train) or 1/1 TDAFW train (1 ASD train)
Early Inventory, High Pressure Injection (EIHP)	1/1 Charging train/1 pump (1 train)
Charging Cross-Tie Between Units for Seal Injection (CHX)	Operator provides seal injection from other unit when the remaining charging pump fails (operator action = 2)
RCP Seal Integrity (SEAL)	Integrity of RCP seals in 15 minutes (credit = 1)
Primary Heat Removal, Feed/Bleed (FB)	1/2 PORVs open for Feed/Bleed (operator action = 2) [(2)]
High Pressure Recirculation (HPR) [(3)]	1/1 Charging train with 1/1 LHSI pump train (1 train)
Recirculation Spray (RS)	1/1 Inside RS loop with (1A or 1B) pump or 1/1 Outside RS loop with (2A or 2B) pump (1 train) [(4)]

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 L4KVH - AFW - PCS - RS (4) **2 + 3 + 2 + 2**	9				
2 L4KVH - AFW - PCS - HPR (5) **2 + 3 + 2 + 2**	9				
3 L4KVH - PCS - AFW - FB (6) **2 + 2 + 3 + 2**	9				
4 L4KVH - EIHP - AFW - PCS (9, 12) **2 + 2 + 3 + 2**	9				
5 L4KVH - EIHP - CHX - SEAL (13) **2 + 2 + 3 + 2**	9				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Loss of an emergency Bus 1H can cause a reactor trip due to loss of non-vital 480 V loads. Loss of the bus results in loss of two charging pumps initially (swing pump can be aligned to J Bus manually). It will cause isolation of CCW to containment thereby causing potential for seal failure if charging flow is lost. It also will result in loss of one IA compressor and 1 train of remaining safety systems. The initiating event frequency for each bus is estimated at 1E-2 per reactor-year.

2. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

3. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. Change over to High Head Recirculation automatically takes place on RWST low level.

4. A number of individual component failures can fail this function due to the 1/1 configuration. The failure probability of this function in the PRA is approximately 8E-2 per RS system (inside or outside). Also, there are support system commonalities between the two systems including the plugging of containment sump. Accordingly, a mitigation credit of "1 train" is assigned.

Table 3.14 SDP Worksheet for North Anna, Units 1 and 2 — Loss of a 125 VDC Bus (LDC) [1]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
Secondary Heat Removal (SHR)	1/1 MDAFW train (1 train) or 1/1 TDAFW train (1 ASD train) or manual restoration of 1 train of MFW (operator action = 1) with steam relief through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves
Early Inventory, High Pressure Injection (EIHP)	1/1 Charging train (1 train)
Primary Heat Removal, Feed/Bleed (FB)	1/1 PORV open for Feed/Bleed (operator action = 1) [2]
High Pressure Recirculation (HPR) [3]	1/1 Charging train with 1/1 LHSI pump train (1 train)
Recirculation Spray (RS)	1/1 Inside RS loop with (1A or 1B) pump or 1/1 Outside RS loop with (2A or 2B) pump (1 train) [4]

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 LDC - SHR - RS (3) **3 + 4 + 2**	**9**				
2 LDC - SHR - HPR (4) **3 + 4 + 2**	**9**				
3 LDC - SHR - FB (5) **3 + 4 + 1**	**8**				
4 LDC - SHR - EIHP (6) **3 + 4 + 2**	**9**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Loss of a 125 VDC bus will result in loss of Main Feedwater and reactor trip. Supplies to 4160 V and 480 V switchgear is lost resulting in failure of 1 train of the safety system. Turbine-driven AFW pump inlet valve fails open allowing steam flow to the pump turbine. TDAFW pump is assumed not to be affected. The initiating event frequency for either Bus 1-I or Bus 1-III is 1.77E-3/reactor-year. The combined frequency is estimated at 3.5E-3/reactor-year.

2. The human error probability assessed in the PRA for establishing bleed and feed cooling with 1 PORV in 30 minutes is about 0.2 and a credit of 1 is assigned.

3. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. When the RWST level reaches its low setpoint, the low head SI system automatically changes over to the recirculation mode. The sump suction valves open and the RWST suction valves close. The change over to high head recirculation will automatically take place on RWST low level.

4. A number of individual component failures can fail this function due to the 1/1 configuration. The failure probability of this function in the PRA is approximately 8E-2 per RS system (inside or outside). Also, there are support system commonalities between the two systems including the plugging of containment sump. Accordingly, a mitigation credit of "1 train" is assigned.

Table 3.15 SDP Worksheet for North Anna, Units 1 and 2 — Loss of Service Water (LSW) [1]

<u>Safety Functions Needed</u>:	<u>Full Creditable Mitigation Capability for Each Safety Function</u>:
Lake to Lake Auxiliary SW (LAKESW)	Operator establishes lake to lake SW through 1/2 aux SW pumps (operator action = 3)
Trip the RCPs (RCPTRIP)	Operators trip the RCPs (operator action = 3)
Charging Pump Alternate Seal Cooling (CPASC)	Operator provides alternate charging pump cooling from Fire Protection or Primary Grade Water (operator action = 1) [2]
Alternate ESGR Cooling (AESGR)	Operator removes blank flange and installs cross-connect piping to Bearing Cooling (operator action = 2) [2]
Secondary Heat Removal (AFW)	1/2 MDAFW trains (1 multi-train system) or 1/1 TDAFW train (1 ASD train) with steam relief through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves

<u>Circle Affected Functions</u>		<u>IEL</u>	<u>Remaining Mitigation Capability Rating for Each Affected Sequence</u>	<u>Recovery Credit</u>	<u>Results</u>
1 LSW - LAKESW - AFW (3) 3 + 3 + 4	10				
2 LSW - LAKESW - AESGR (4) 3 + 3 + 2	8				
3 LSW - LAKESW - CPASC (5) 3 + 3 + 1	7				
4 LSW - LAKESW - RCPTRIP (6) 3 + 3 + 3	9				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The service water (SW) system at North Anna is common to both reactor units. It provides long term cooling in accidents (i.e., the ultimate heat sink) and supplies cooling water to safety related components during normal plant operation. The loss of SW results in loss of cooling to the charging pump seal and lube oil coolers, component cooling water system heat exchangers, emergency switchgear room chiller condensers, instrument air compressors, and recirculation spray system heat exchangers. On loss of cooling to the motor bearings of the RCPs, they have to be tripped early in the scenario (from 2 to 10 minutes after detecting the loss of cooling). Those scenarios associated with the case that the operator fails to trip RCP but recovers SW through lake to lake operation have a negligible contribution and have not been developed here. The PRA's initiating event frequency is 6E-6/reactor-year for both reservoir to reservoir and lake to lake SW operation. The lake to lake operation of SW is separated and explicitly modeled in this worksheet.

2. Operator action credit for alternate seal cooling and alternate ESGR cooling are based on the licensee's comments. Human error probabilities for these actions are not available.

Table 3.16 SDP Worksheet for North Anna, Units 1 and 2 — LOOP with Loss of One Emergency AC Bus (LEAC) [1]

Safety Functions Needed:	Full Creditable Mitigation Capability for Each Safety Function:
PORVs Reclose (SORV)	2/2 PORVs reclose (1 train)
Secondary Heat Removal (AFW)	1/1 MDAFW train (1 train) or 1/1 TDAFW train (1 ASD train) through 1/3 SGs and associated 1/1 ADV or 1/5 safety relief valves
Early Inventory, High Pressure Injection (EIHP)	1/1 Charging train (1 train)
RCS Cooldown/Depressurization (RCSDEP) [5]	Operator depressurizes and cools down RCS using 1/3 ADVs and 1/2 PORVs (operator action = 3)
Primary Heat Removal, Feed/Bleed (FB)	1/1 remaining PORV opens for Feed/Bleed (operator action = 2) [2]
High Pressure Recirculation (HPR) [3]	1/1 Charging train with 1/1 LHSI pump train (1 train)
Low Pressure Recirculation (LPR)	1/1 LHSI pump train (1 train)
Recirculation Spray (RS)	1/1 Inside RS loop with (1A or 1B) pump or 1/1 Outside RS loop with (2A or 2B) pump (1 train) [4]

Circle Affected Functions		IEL	Remaining Mitigation Capability Rating for Each Affected Sequence	Recovery Credit	Results
1 LEAC - SORV - RS (3, 6, 10) **4 + 2 + 2**	**8**				
2 LEAC - SORV - LPR (4) **4 + 2 + 2**	**8**				
3 LEAC - SORV - RCSDEP - HPR (7) **4 + 2 + 3 + 2**	**11**				
4 LEAC - SORV - EIHP (8, 13) **4 + 2 + 2**	**8**				
5 LEAC - SORV - AFW - HPR (11) **4 + 2 + 3 + 2**	**11**				
6 LEAC - SORV - AFW - FB (12) **4 + 2 + 3 + 2**	**11**				

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:
If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. North Anna has one diesel generator dedicated to each 4160 V ESF bus. If one of the diesels or one of the buses fails following a LOOP, one train of the safety system equipment is lost. A stuck-open PORV whose block valve is connected to the failed bus cannot be isolated.

2. The bleed path success criteria for Feed and Bleed is 1/2 PORVs if opened in the first 30 minutes, and 2/2 PORVs if opened 30 minutes after loss of secondary heat removal. The human error probability assessed in the PRA is 2.95E-1 for the first 30 minutes and 3.05E-3 after 30 minutes. The SDP assigns a credit of 2 when there are two PORVs available for opening and a credit of 1 when one PORV is lost as a result of the initiator (e.g., Loss of DC) with the exception of SORV scenarios where one PORV is assumed stuck fully/partially open.

3. For transients, RCS depressurization before recirculation is not certain, so the PRA only models high pressure recirculation. Change over to High Head Recirculation automatically takes place on RWST low level.

4. A number of individual component failures can fail this function due to the 1/1 configuration. The failure probability of this function in the PRA is approximately 8E-2 per RS system (inside or outside). Also, there are support commonalities between the two systems including the plugging of containment sump. Accordingly, a mitigation credit of "1 train " is assigned.

5. We assumed that IA is lost after a LOOP, so the pressurizer Aux spray is not available.

Table 3.17 SDP Worksheet for North Anna, Units 1 and 2 — Interfacing System LOCA (ISLOCA)

<u>Initiating Pathways</u>:	<u>Mitigation Capability: Ensure Component Operability for Each Pathway</u>
LHSI to Cold Leg Injection Line	Check Valves 1-SI-83 and 1-SI-195 and two normally open MOVs, 1-SI-MOV-1890C and D (for each of three Loops with different valve numbers)
LHSI to Hot Legs	Two penetration lines for each of the Loop with a MOV and check valve (SI-MOV-1890A and SI-207; and SI-MOV-1890B and SI-206) in each connected through two check valves (SI-99 and SI-209)

<u>List Affected Pathways</u>	<u>Recovery Credit</u>	<u>Remaining Mitigation Capability Rating for Each Affected Pathway</u>	<u>Color</u>

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

<u>Note</u>:

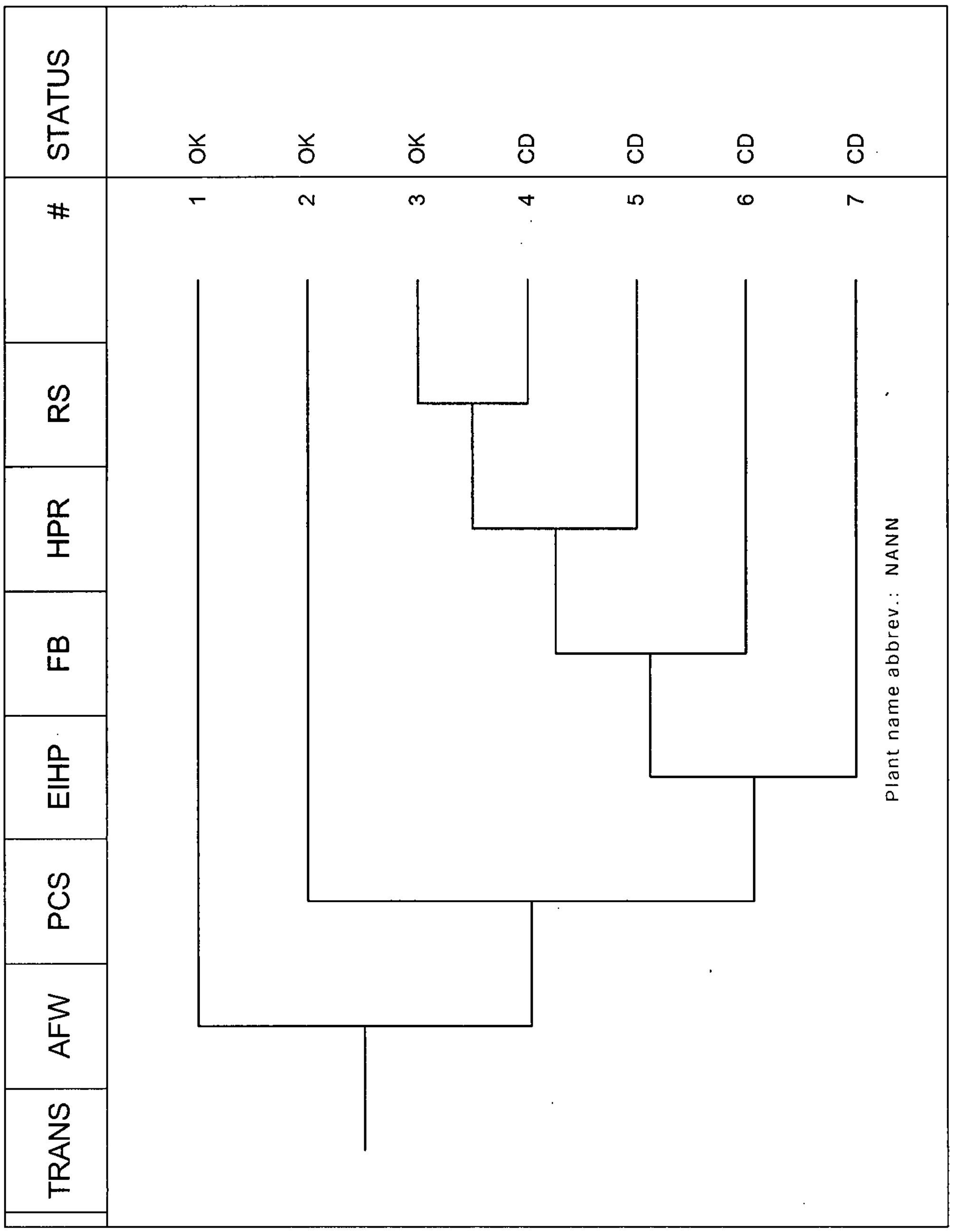
1. Information is based on the licensee's PRA. Other sources of ISLOCA are screened out in the PRA.

1.4 SDP EVENT TREES

This section provides the simplified event trees called SDP event trees used to define the accident sequences identified in the SDP worksheets in the previous section. An event tree for the stuck-open PORV is not included since it is similar to the small LOCA event tree. The event tree headings are defined in the corresponding SDP worksheets.

The following event trees are included:

1. Transients (Reactor Trip) (TRANS)
2. Transients Without PCS (TPCS)
3. Small LOCA (SLOCA)
4. Stuck-open PORV (SORV)
5. Medium LOCA (MLOCA)
6. Large LOCA (LLOCA)
7. Loss of Offsite Power (LOOP)
8. Steam Generator Tube Rupture (SGTR)
9. Main Steam Line Break Outside Containment (MSLB)
10. Anticipated Transients Without Scram (ATWS)
11. Loss of Instrument Air (LIA)
12. Loss of a 4.16 kV Bus (1J) (L4KVJ)
13. Loss of a 4.16 kV Bus (1H) (L4KVH)
14. Loss of a 125 VDC Bus (LDC)
15. Loss of Service Water (LSW)
16. LOOP with Loss of One Emergency AC Bus (LEAC)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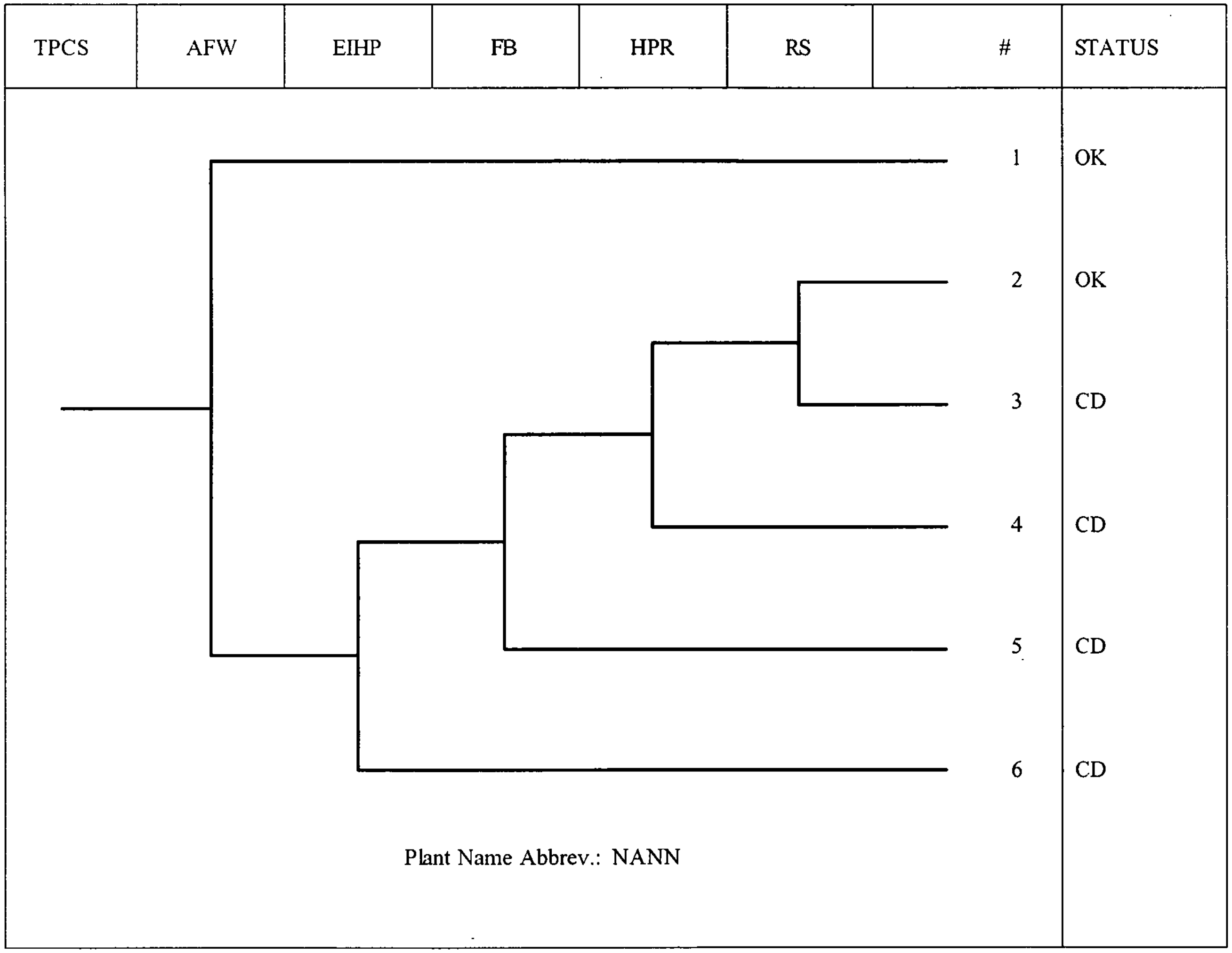
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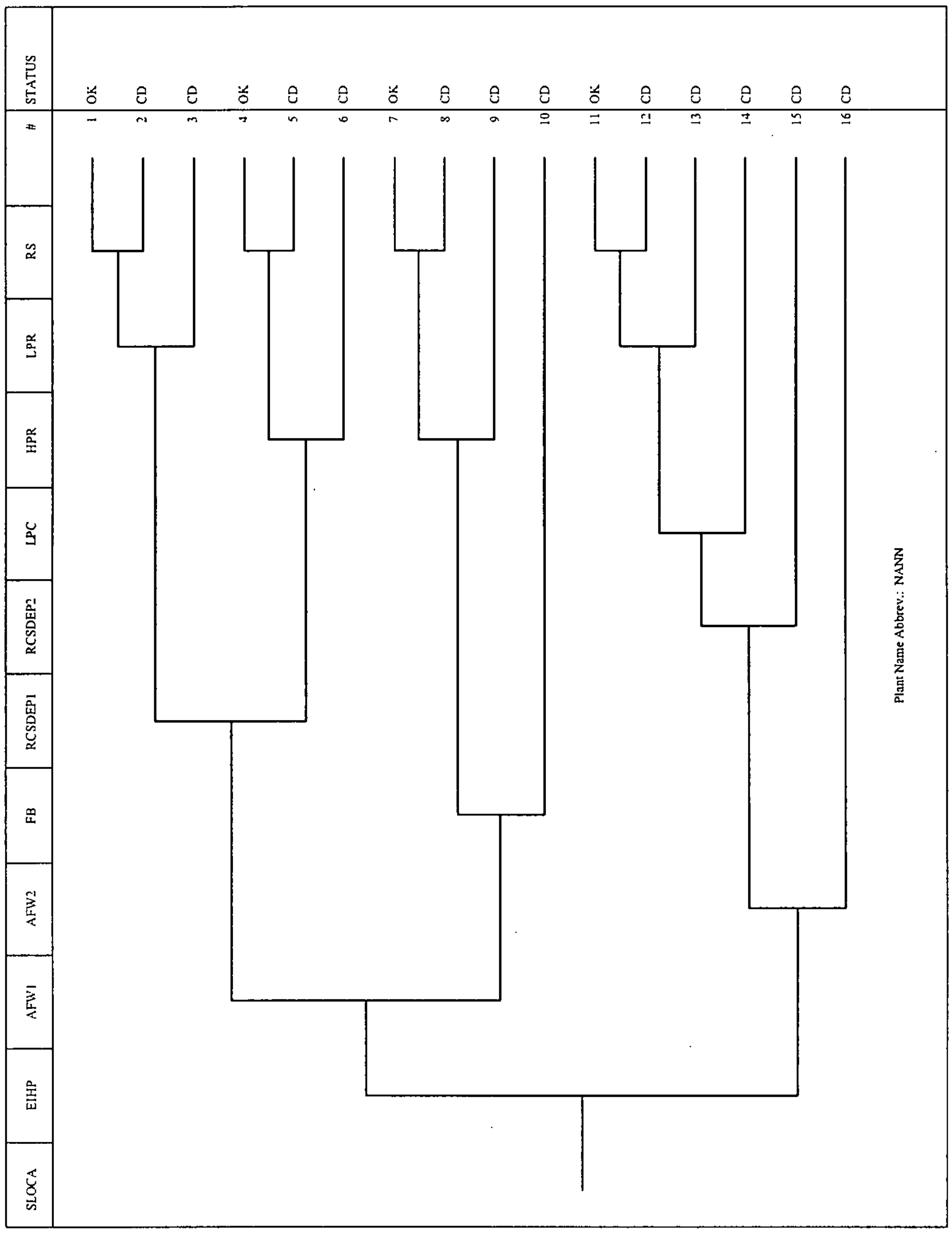
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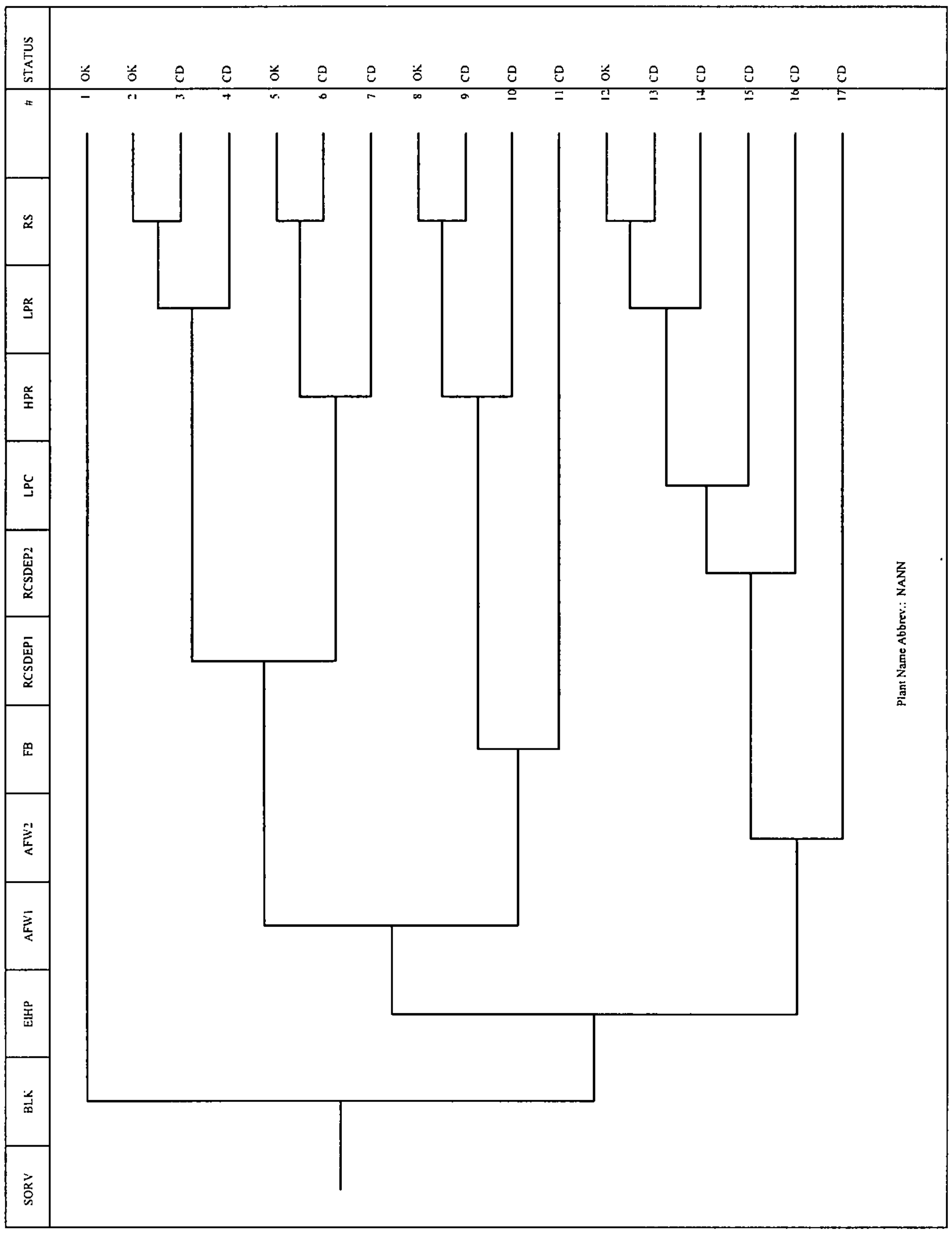
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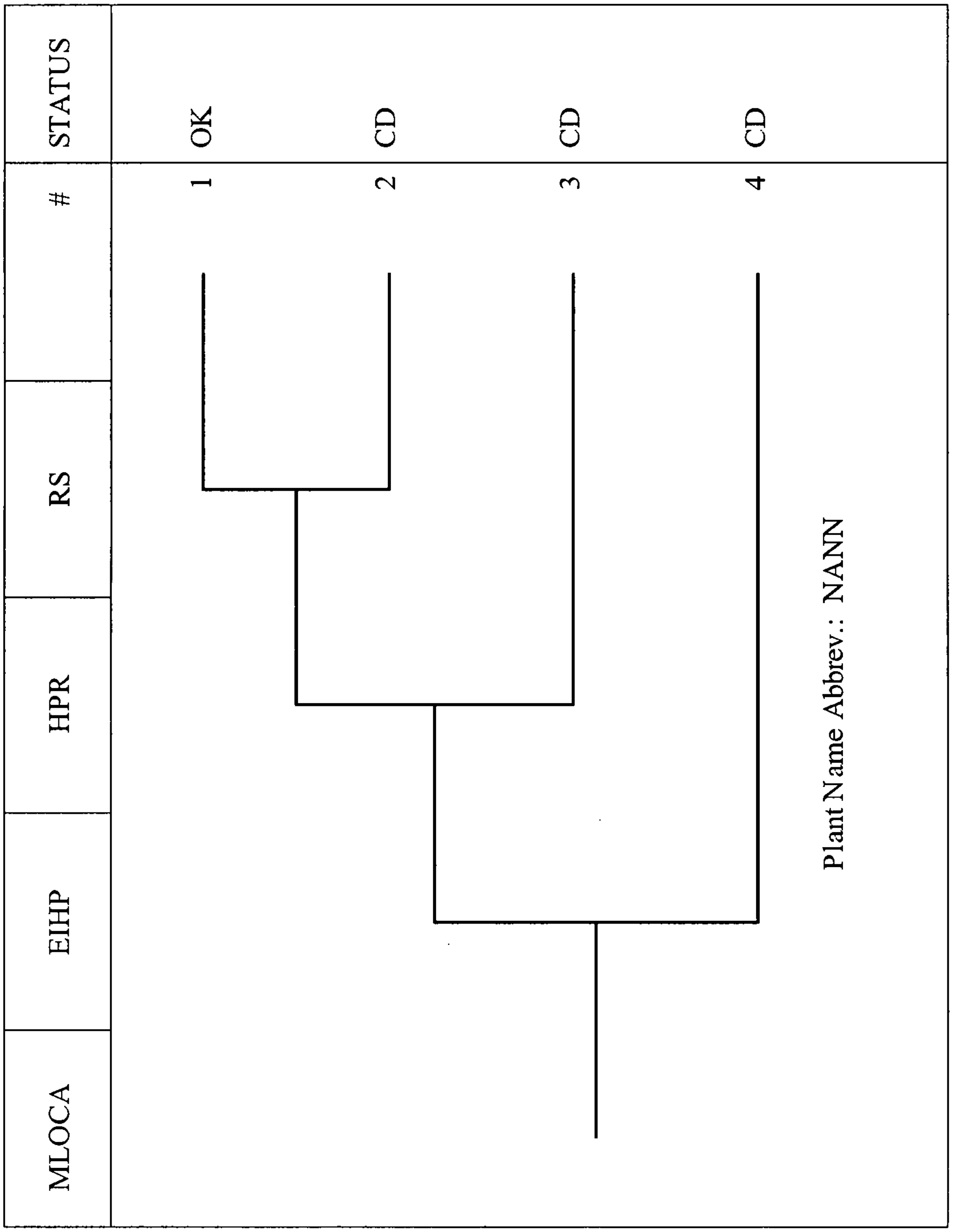
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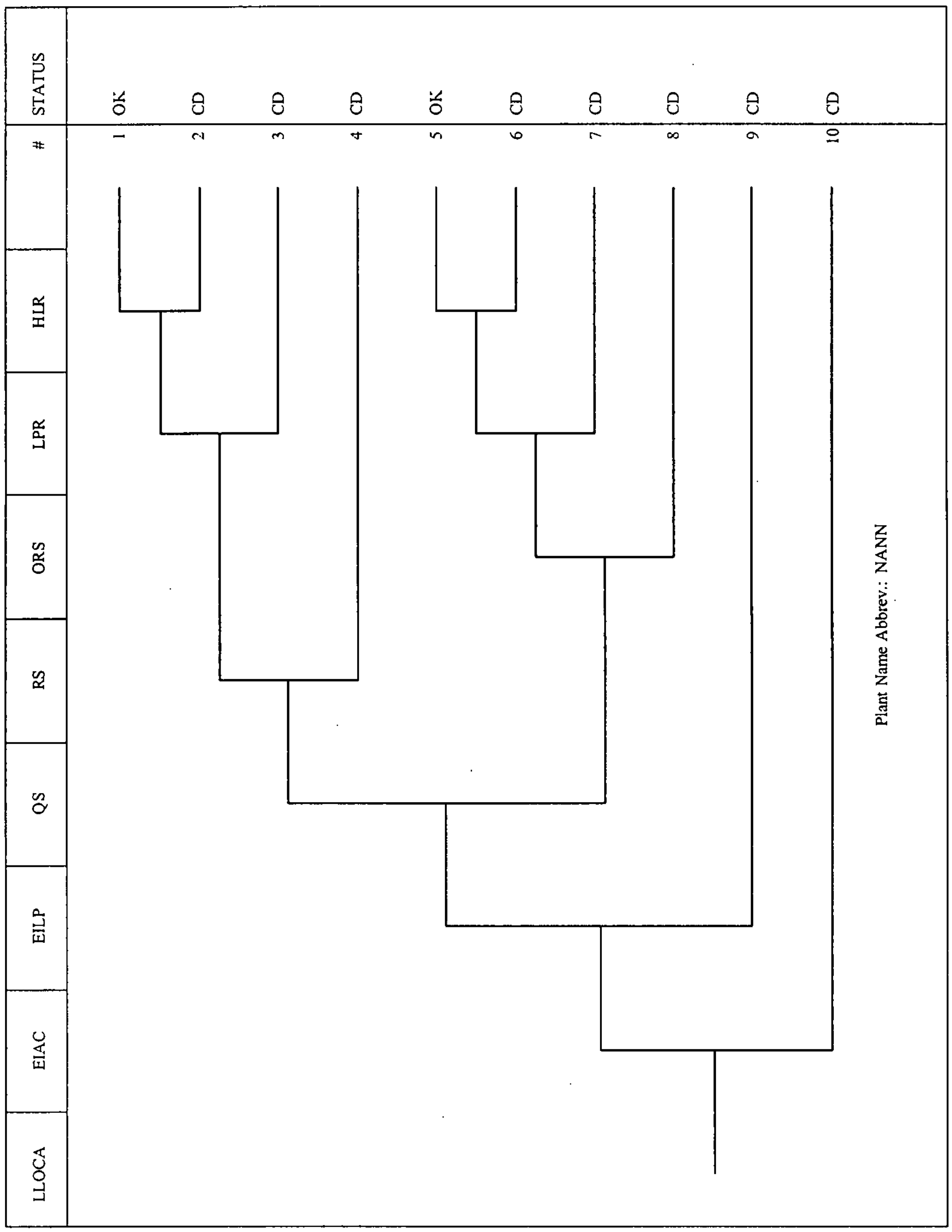

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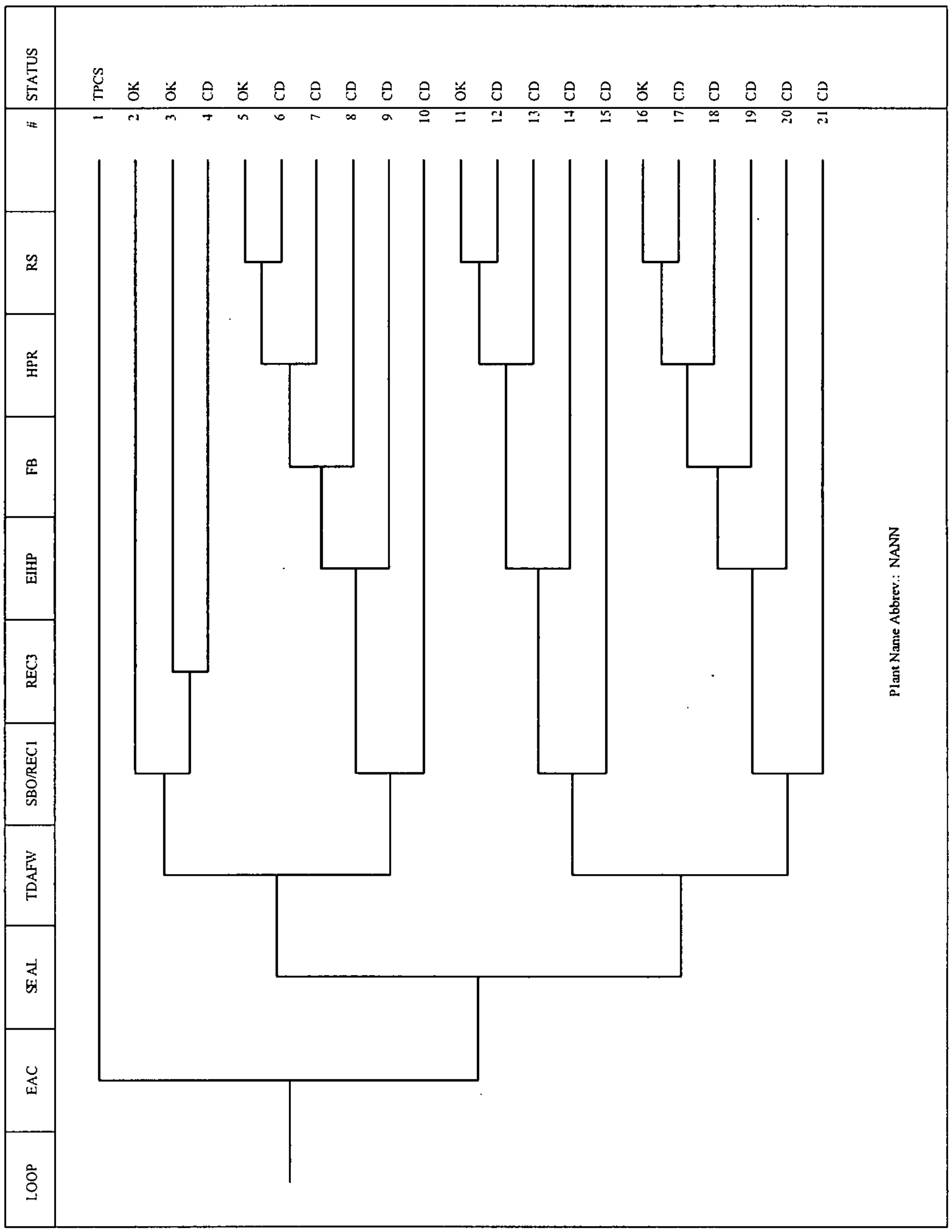
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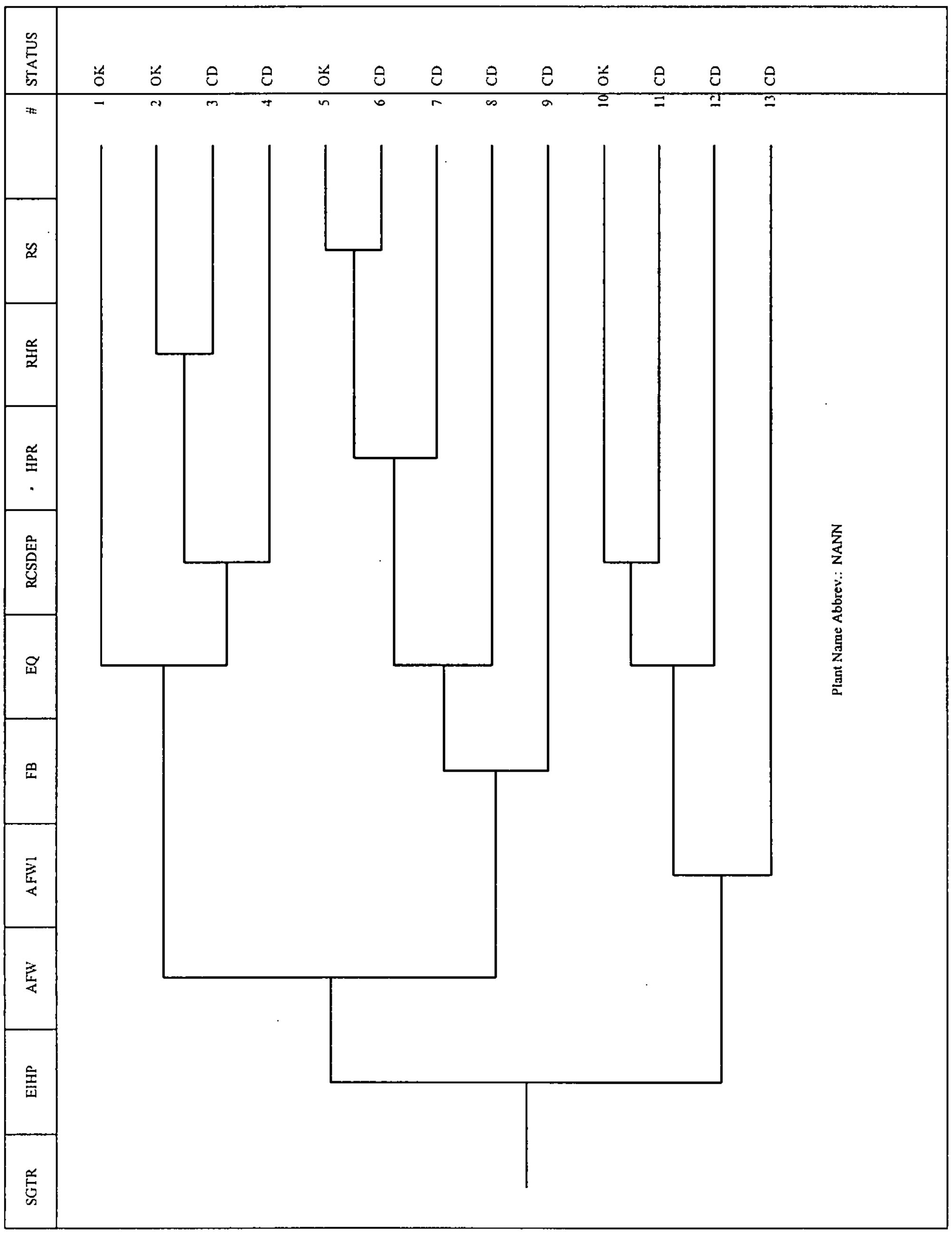
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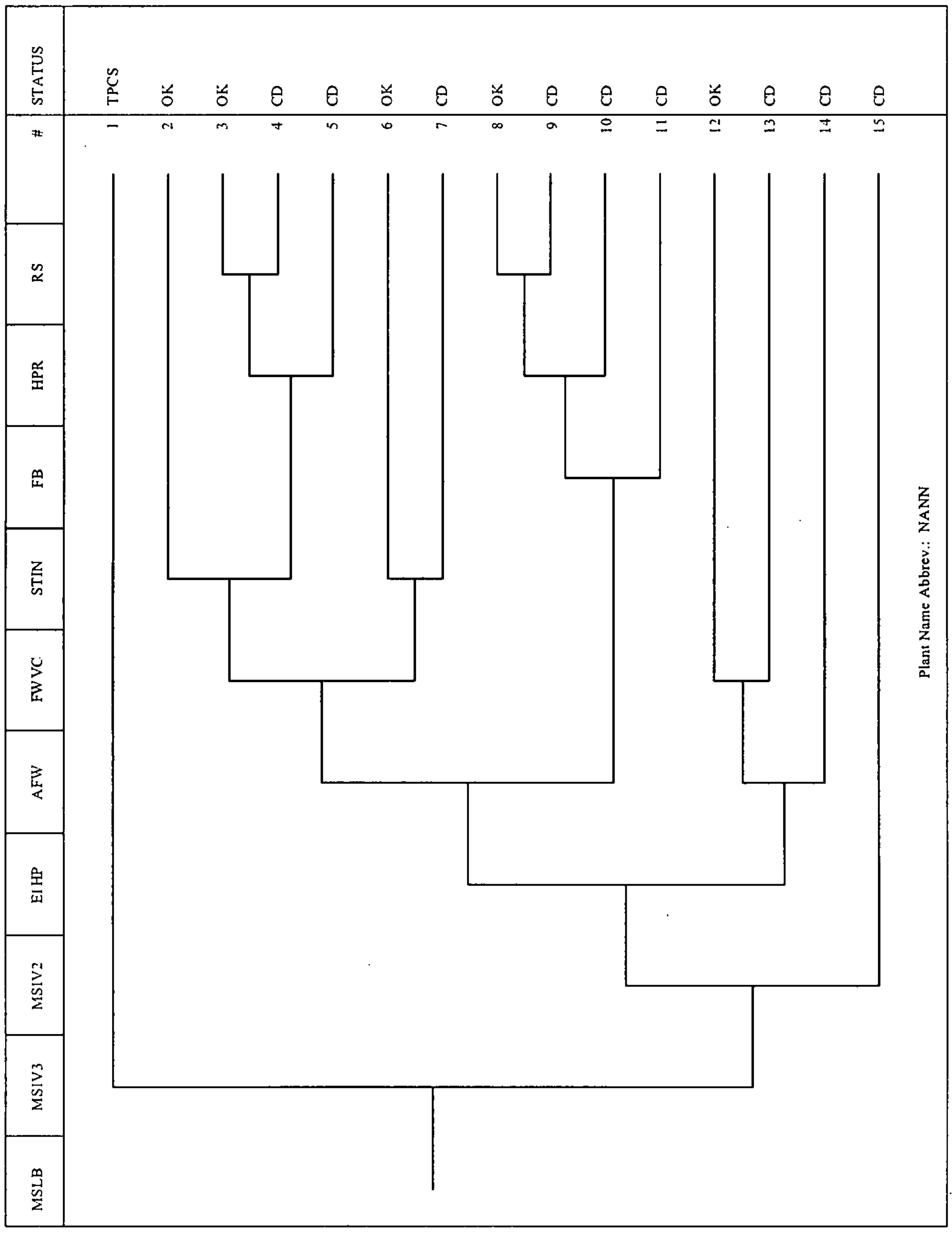
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9 CD
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12 OK
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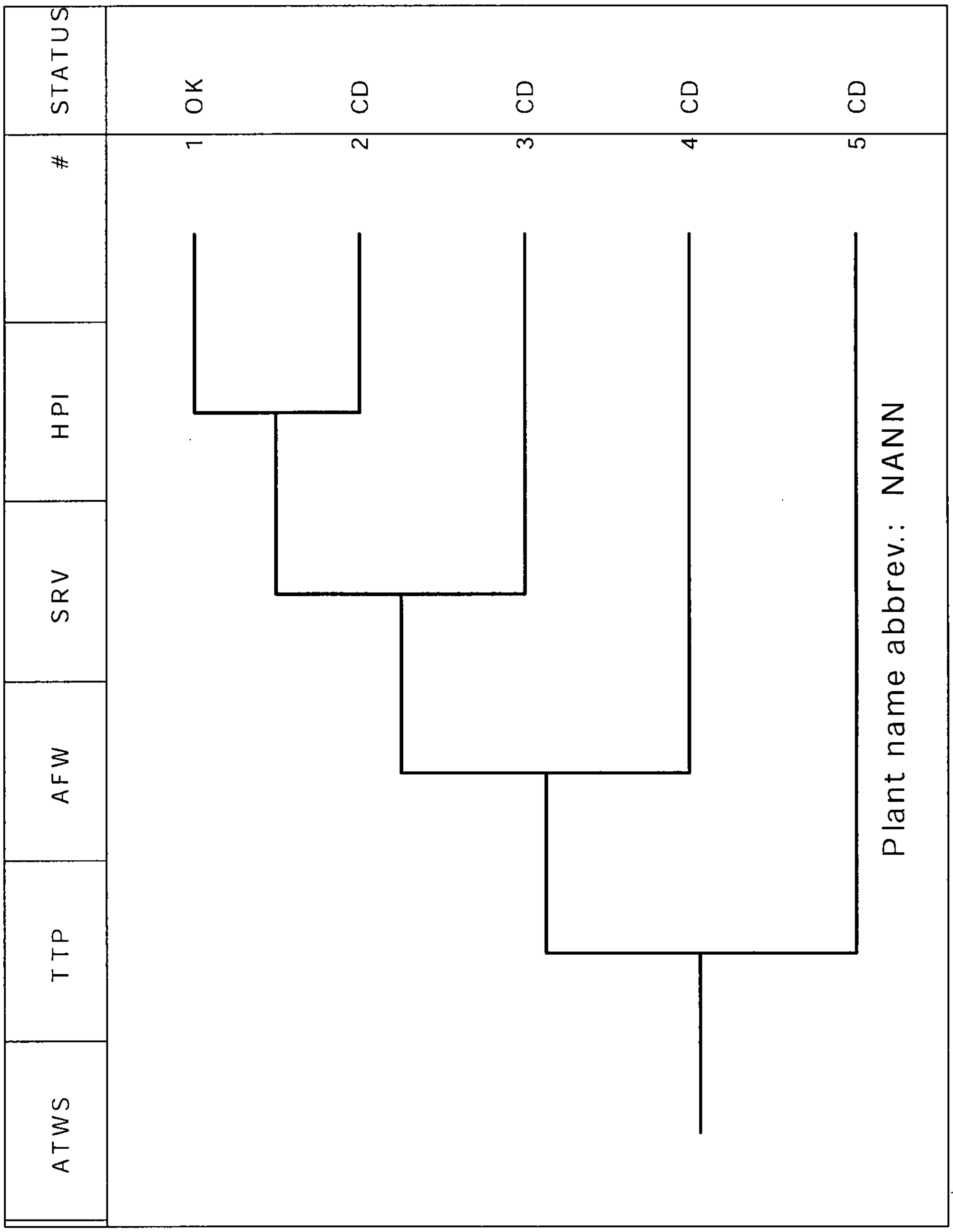
14 CD
15 CD
Plant Name Abbrev.: NANN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TTP
AFW
SRV
HPI
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STATUS
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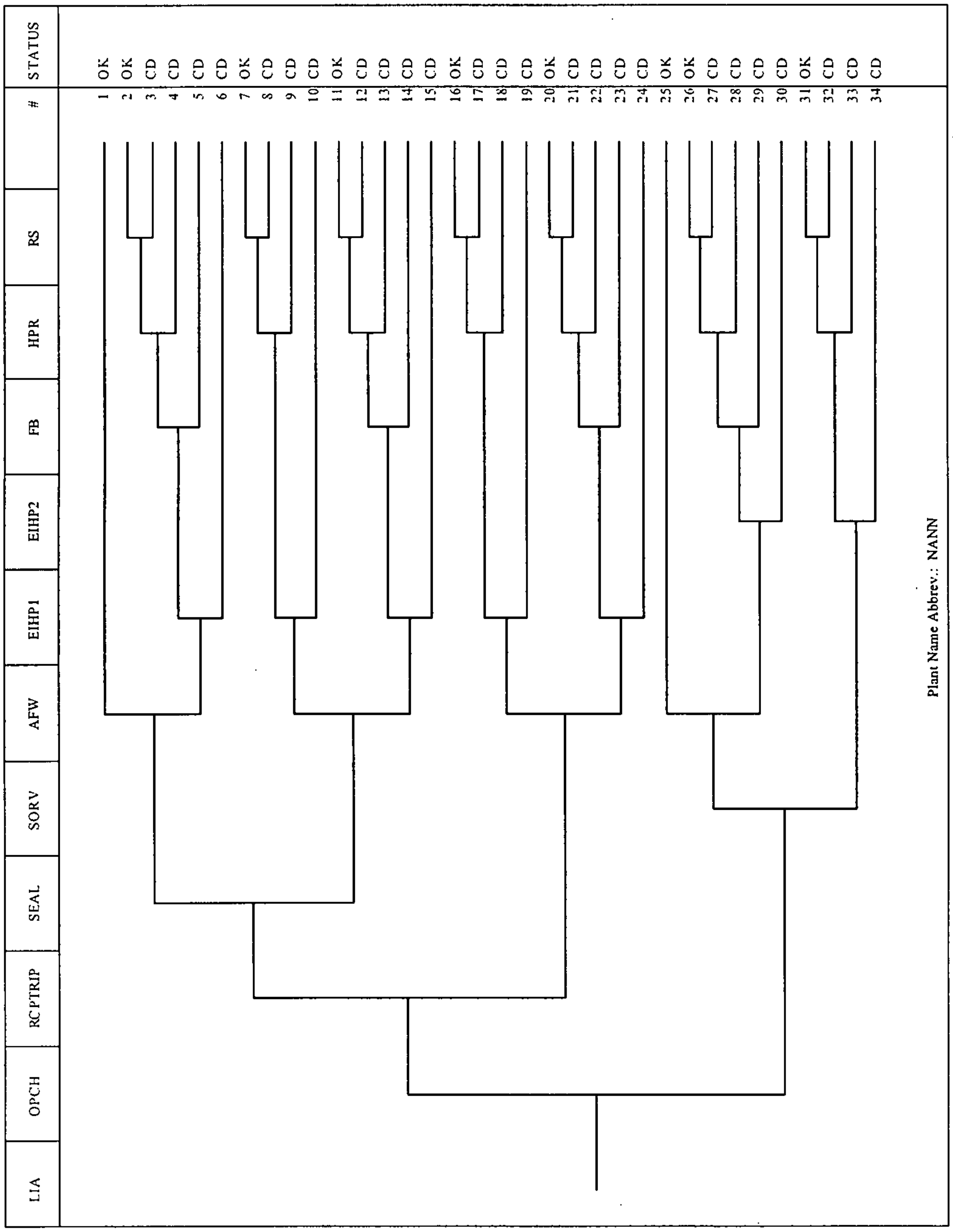
2 CD
3 CD
4 CD
5 CD
Plant name abbrev.: NANN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OPCH
RCPTRIP
SEAL
SORV
AFW
EIHP1
EIHP2
FB
HPR
RS
#
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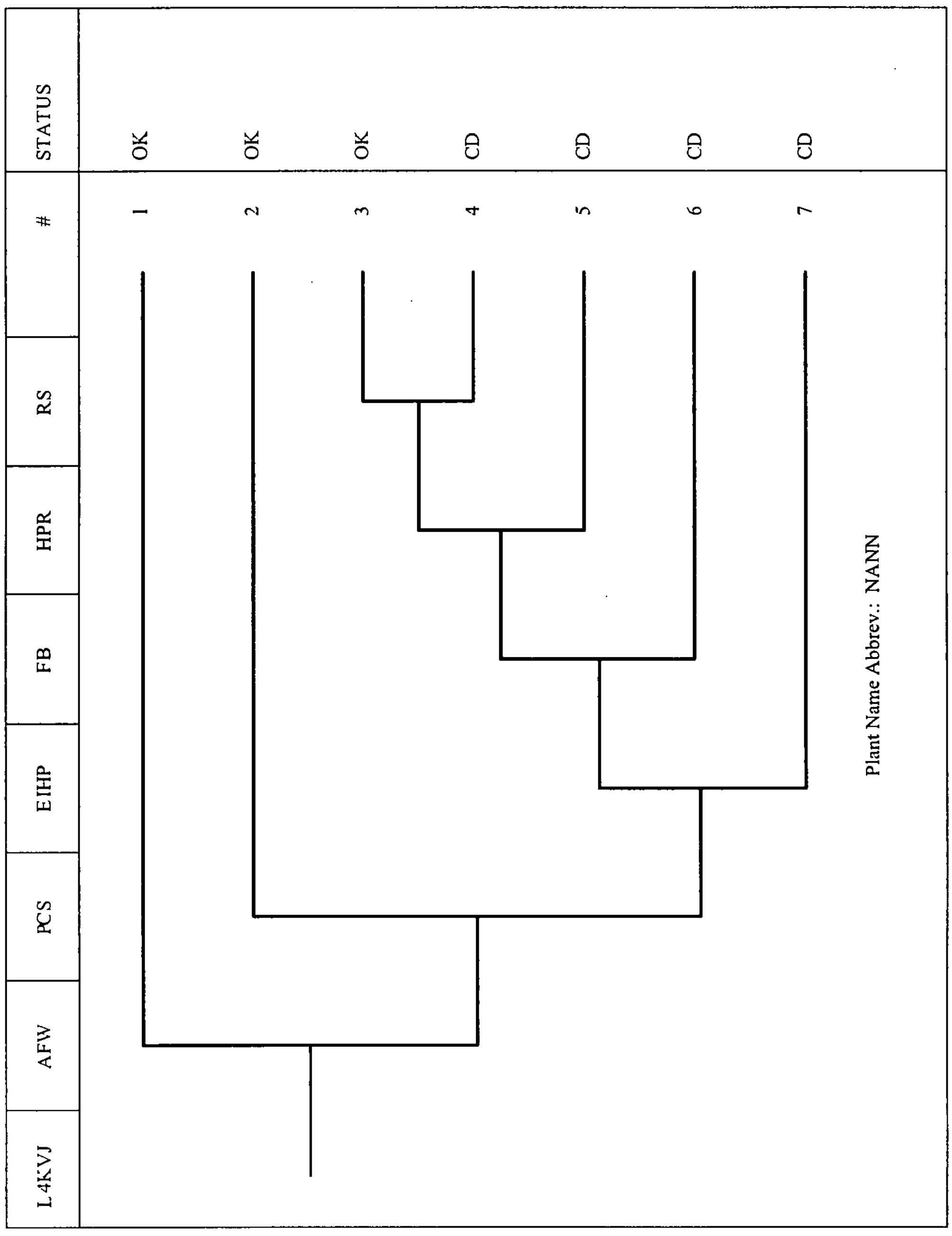
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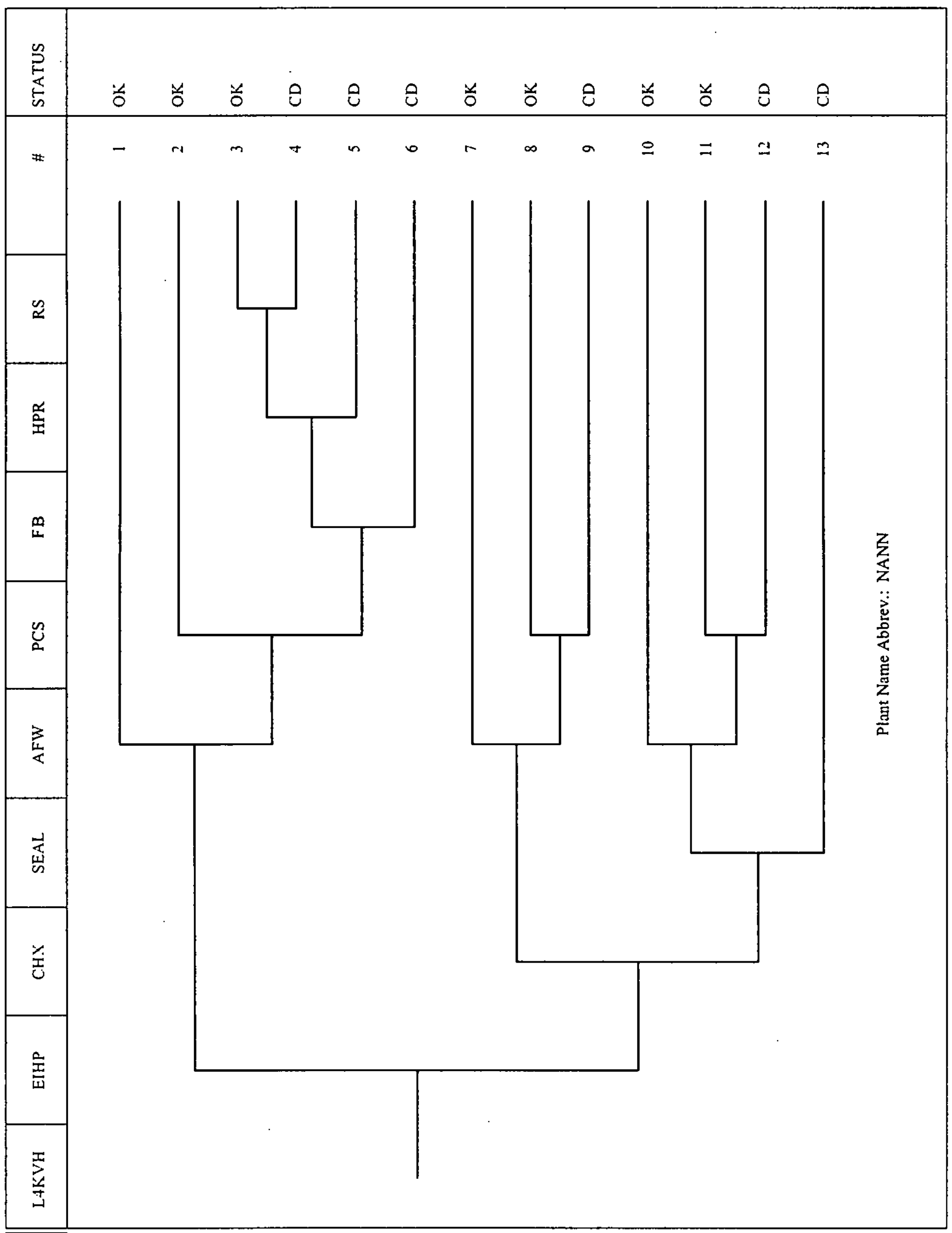

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CHX
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AFW
PCS
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HPR
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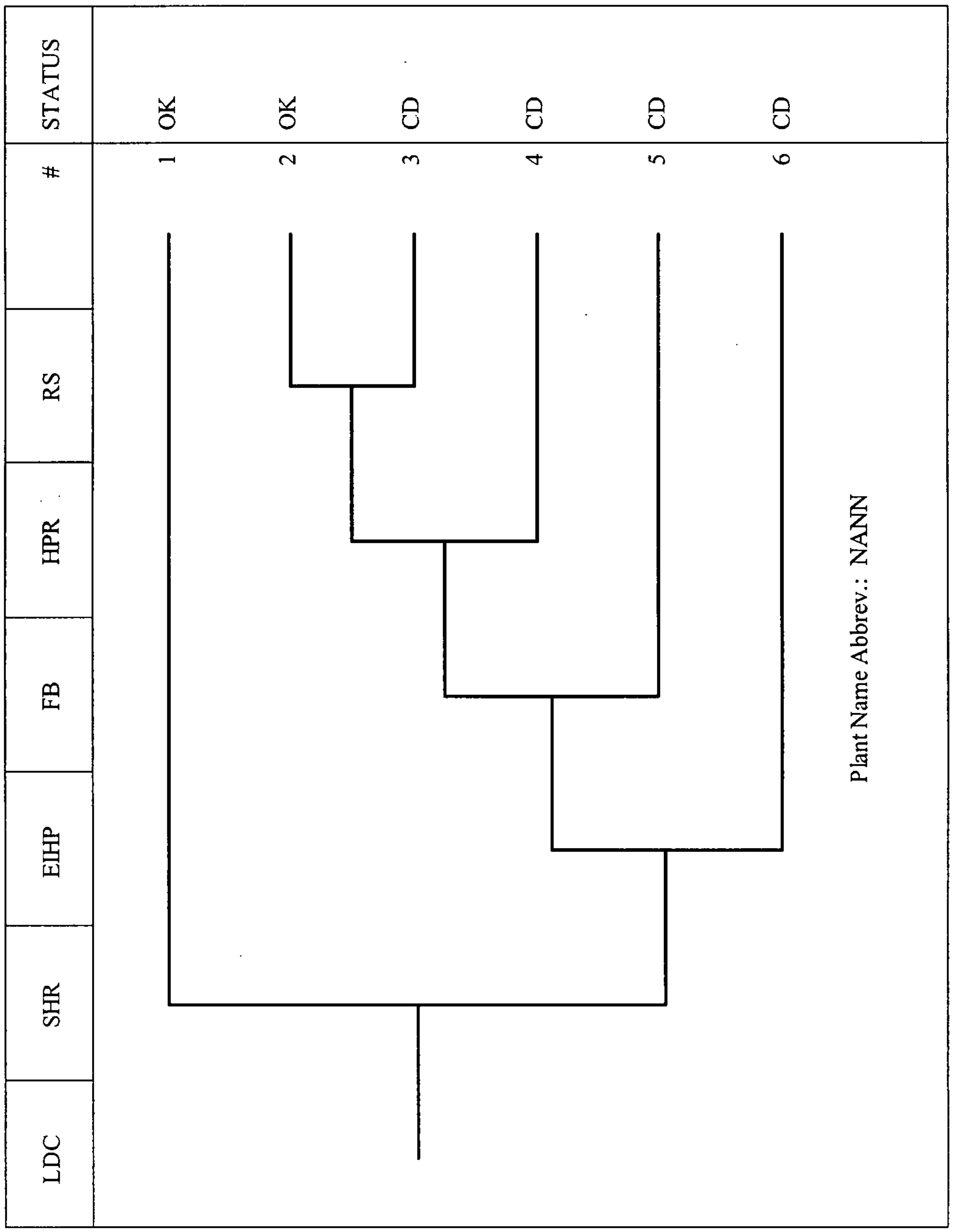
Plant Name Abbrev.: NANN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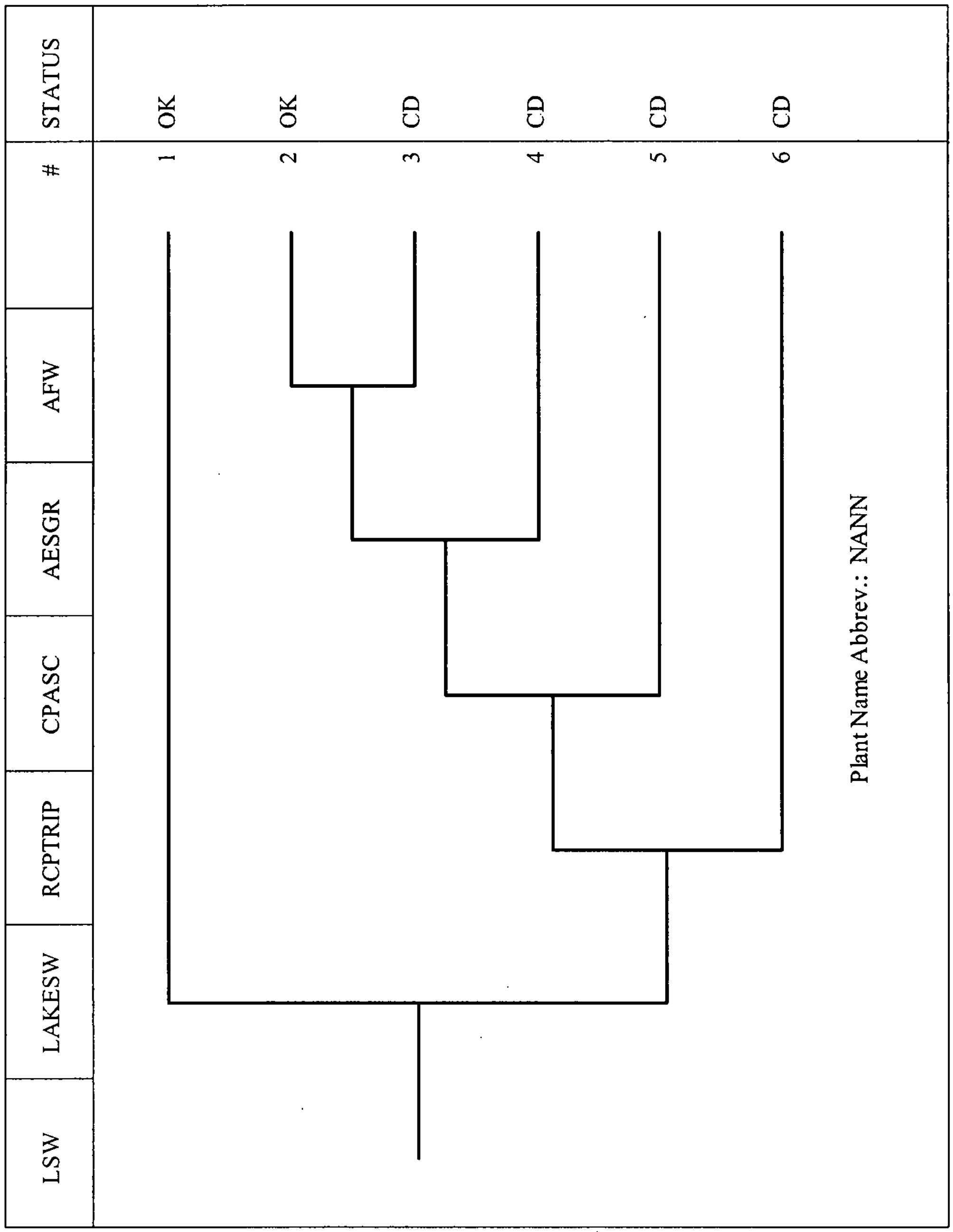
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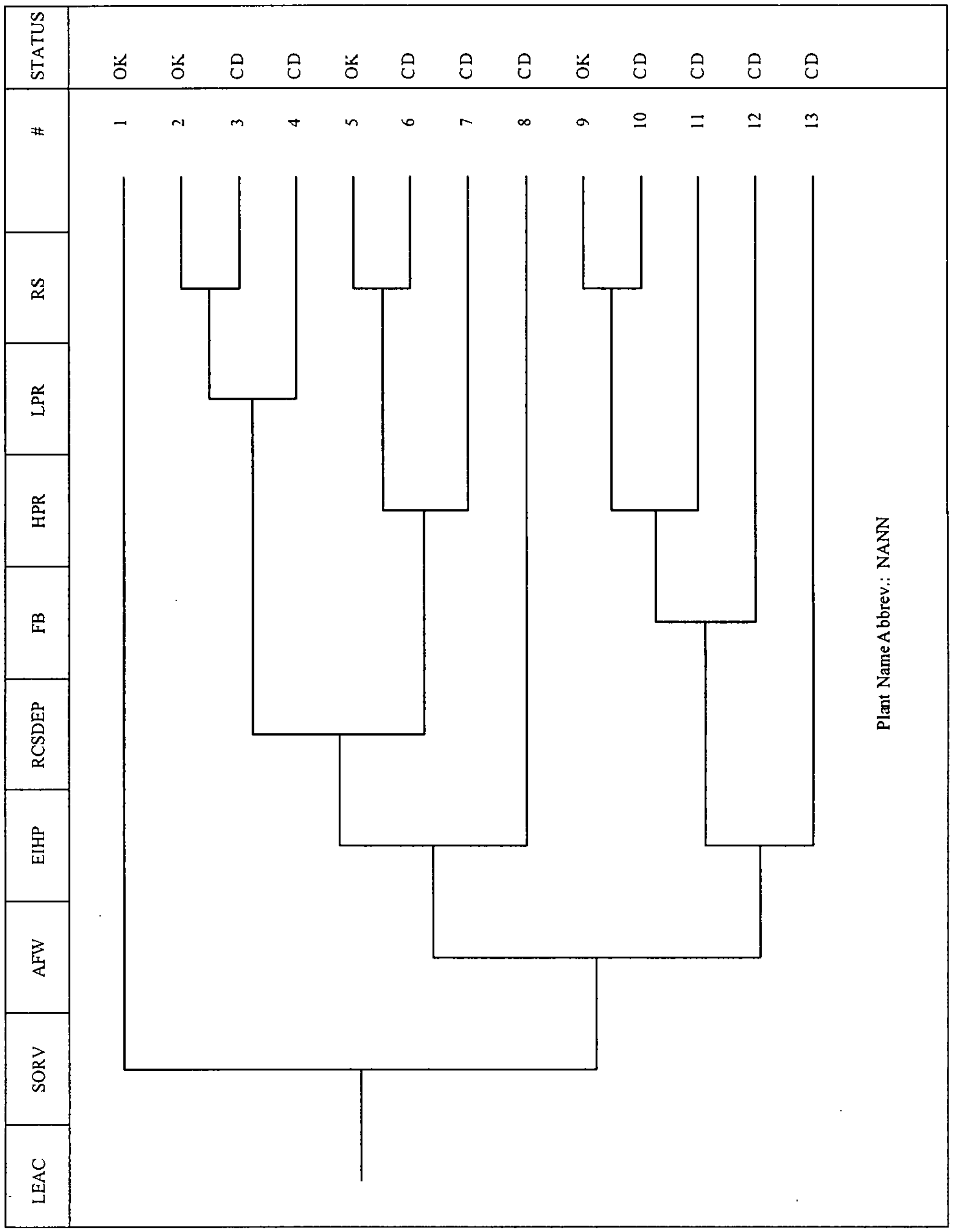
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Plant Name Abbrev.: NANN

2. RESOLUTION AND DISPOSITION OF COMMENTS

This section is composed of two subsections. Subsection 2.1 summarizes the generic assumptions that were used for developing the Rev. 1 SDP worksheets for the PWR plants. These guidelines were refined while addressing the plant-specific comments provided by the licensee on the draft SDP worksheets and considering the applicability of those comments to similar plants. These assumptions which are used as guidelines for developing the SDP worksheets help the reader better understand the worksheets' scope and limitations. The generic guidelines and assumptions for PWRs are given here. Subsection 2.2 documents the plant-specific comments received on the draft version of the materials included in this notebook, including their resolution and the changes made to the worksheets after the benchmarking.

2.1 GENERIC GUIDELINES AND ASSUMPTIONS (PWRs)

1. Assignment of plant-specific IEs into frequency rows:

Transient (Reactor trip) (TRANS), transients without PCS (TPCS), small, medium, and large LOCA (SLOCA, MLOCA, LLOCA), stuck-open PORV/SRV (SORV), main steam line break (MSLB), anticipated transients without scram (ATWS), and interfacing system LOCAs (ISLOCA) are assigned into rows based on a consideration of the industry-average frequency. Plant-specific frequencies are considered for loss of offsite power (LOOP) and special initiators, and are assigned to the appropriate rows in Table 1.

2. Stuck-open PORV/SRV as an IE in PWRs:

The failure of the PORVs/SRVs to re-close after opening is typically modeled within the transient event trees subsequent to the initiators. In addition, the intermittent failure or excessive leakage through PORVs as an initiator, albeit with much lower frequency, needed to be considered. To account for such failures and to keep the transient worksheets simple in the SDP, a separate worksheet for the SORV initiator was set up to explicitly model the contribution from such failures. This SDP worksheet, and the associated event tree, is similar to that of SLOCA. The likelihood of PORV to re-close depends on the status of pressurizer. If the pressurizer is solid, then the likelihood would be higher than the case in which the pressurizer level is maintained. Typically, this depends on early availability of secondary heat removal. However, a generic estimate for the SORV initiator is used for all PWR plants in Table 1.

3. Inclusion of special initiators:

The special initiators included in the worksheets are those applicable to this plant. A separate worksheet is included for each of them. The applicable special initiators are primarily based on the plant-specific IPEs/PRAs. In other words, the special initiators included are those modeled in the IPEs/PRAs unless shown to be negligible contributors. In some cases, a particular special initiator may be added for a plant even if it is not included in the IPE/PRA, if it is included in other plants of similar design, and is considered applicable for the plant. However, no attempt is made at this time to have a consistent set of special initiators across similarly designed plants. Except for the interfacing system LOCA (ISLOCA), if the occurrence of the special initiator results in a core damage, i.e., no mitigation capability exists for the initiating event, then a separate worksheet is not developed. For such cases, the inspection's focus is on the initiating event and the risk implication of the finding can be directly assessed. For ISLOCA, a separate worksheet is included noting the pathways that can lead to it.

4. Inclusion of systems under the support system column of the Initiating Event and System Dependency Table:

This Table shows the support systems for the support- and frontline systems. The intent is to include only the support systems, and not the systems supporting that support system, i.e., those systems whose failure will result in failure of the system being supported. Partial dependency, e.g., a backup system, is not included. If they are, this should be so noted. Sometimes, some subsystems on which inspection findings may be noted were included as a support system, e.g., the EDG fuel oil transfer pump as a support system for EDGs.

5. Coverage of system/components and functions included in the SDP worksheets:

The Initiators and System Dependency Table includes systems and components which are included in the SDP worksheets and those which can affect the performance of these systems and components. As such, direct system dependency on AC, DC, component cooling, HVAC, and actuation systems are denoted in the table. One-to-one matching of the event tree headings/functions to that included in the Table was not considered necessary.

6. Crediting of non-safety related equipment:

SDP worksheets credit or include safety-related equipment and also, non-safety related equipment as used in defining the accident sequences leading to core damage. In defining the success criteria for the functions needed, the components included are typically those covered under the Technical Specifications (TS) and the Maintenance Rule (MR). No evaluation was performed to assure that the components included in the worksheets are covered under TS or MR. However, if a component was included in the worksheet, and the licensee requested its removal, it may not have been removed if it was considered that the component is included in either the TS or the MR.

7. No credit for certain plant-specific mitigation capability:

The significance determination process (SDP) screens inspection findings for Phase 3 evaluations. Some conservative assumptions are made which result in not crediting some plant-specific features. These assumptions are usually based on comparisons with plants of similar design and maintain consistency across the SDP worksheets of such similar plants.

8. Crediting system trains with high unavailability:

Some system component/trains may have unavailability higher than 1E-2, but they are treated similarly to other trains with lower unavailability in the range of 1E-2. In this screening, this approach is considered adequate to keep the process simple. Exceptions to this rule are made for such components as steam-driven and diesel-driven pumps. As an example, the turbine driven auxiliary feedwater pump is designated as Automatic Steam Driven (ASD) train with a credit of 1, corresponding to an unavailability of 1E-1.

9. Treating passive components (of high reliability) the same as active components:

Passive components, namely accumulators, are credited similarly to active components, even though they exhibit higher reliability. Considering the potential for common-cause failures, the reliability of a passive system is not expected to differ by more than an order of magnitude from active systems. Pipe failures were excluded, except as part of initiating events where the appropriate frequency is used. Accordingly, a separate designation for passive components was not considered necessary.

10. Crediting accumulators:

SDP worksheets assume the loss of the accumulator unit associated with the failed leg in LOCA scenarios. Accordingly, in defining the mitigation capability for the accumulators, the worksheets refer to the remaining accumulators. For example, in a plant with 4 accumulators with a success criteria of 1 out of 4, for large LOCA the mitigation capability is defined as 1/3 remaining accumulators (1 multi-train system), assuming the loss of the accumulator in the failed leg. For a plant with a success criteria of 2 out of 4 accumulators, the mitigation capability is defined as 2/3 remaining accumulators (1 multi-train system).

The inspection findings are then assessed as follows (using the example of the plant with 4 accumulators and success criteria of 2 out of 4):

4 Acc. Available	Credit=3
3 Acc. Available (1 Acc. is considered unavailable, based on inspection findings)	Credit=2
< 3 Acc. Available (2 or more Acc. are considered unavailable, Based on inspection findings)	Credit=0

11. Crediting operator actions:

The operator's actions modeled in the worksheets are categorized as follows: operator action=1 representing an error probability of 5E-2 to 0.5; operator action=2 representing an error probability of 5E-3 to 5E-2; and operator action=3 representing an error probability of 5E-4 to 5E-3. Actions with error probability > 0.5 are not credited. Actions with error probability lower than 5E-4 are typically not credited; equipment failures usually have the dominating influence in determining the significance of the finding. A special case of operator action associated with hot leg/cold leg recirculation (discussed below) is assigned a credit of 4 because of the low error probability due to the ample time available and the previous success (following the on-set of the accident) of the equipment used in this action. Thus, operator actions are associated with credits of 1, 2, or 3. Since there is large variability in similar actions among different plants, a survey of the error probability across plants of similar design was used to categorize different operator actions. From this survey, similar actions across plants of similar design are assigned the same credit. If a plant uses a lower credit or recommends a lower credit for a particular action compared to our assessment of similar action based on plant survey, then the lower credit is assigned.

12. Difference between plant-specific values and SDP designated credits for operator actions:

As noted, operator actions are assigned to a particular category based on a review of similar actions for plants with similar design. This results in some differences between plant-specific values and credit for the action in the worksheet. The plant-specific values are usually noted at the bottom of the worksheet, when such differences exist.

13. Dependency among multiple operator actions:

IPEs or PRAs, in general, account for dependencies among the multiple operator actions that may be applicable. In the SDP screening approach, if multiple actions are involved in one function, then the credit for the function is designated as one operator action to the extent possible, considering the dependency involved.

14. Crediting the standby high-pressure pump:

The high-pressure injection system in some plants consists of three pumps with two of them auto-aligned and the third spare pump requiring manual action. The mitigating capability then is defined as: 1/2 HPI trains or use of a spare pump (1 multi-train system). Also, a footnote is added to reflect that the use of a spare pump could be given a credit of 1 (i.e., equivalent to an unavailability of 1E-1) as a recovery action.

15. Treatment of HPR and LPR:

The operation of both the HPR and LPR rely on the operation of the RHR pumps and the associated heat exchangers. Therefore, failure of LPR could imply failure of both HPR and LPR. A sequence which contains failure of both HPR and LPR as independent events will significantly underestimate the CDF contribution. To properly model this configuration within the SDP worksheets, the following procedure is used. Consider the successful depressurization and use of LPR as the preferred path. HPR is credited when depressurization has failed. In this manner, a sequence containing both HPR and LPR failures together is not generated.

16. Hot leg/Cold leg switchover:

The hot leg to cold leg switchover during ECCS recirculation is typically done to avoid boron precipitation. This is typically part of the procedure for PWRs during medium and large LOCA scenarios. Many IPEs/PRAs do not consider the failure of this action as relevant to core damage. When modeled in the plant-specific PRA, it is included in the worksheets. An operator action with a credit of 4 is assigned for the mitigation credit considering the ample time available to perform the action. This is not limited by equipment failure since the equipment involved has previously functioned following the on-set of the accident.

17. Emergency AC Power:

The full mitigating capability for emergency AC could include dedicated Emergency Diesel Generators (EDG), Swing EDG, SBO EDG, and finally, nearby fossil-power plants. The following guidelines are used in the SDP modeling of the Emergency AC power capability:

1. Describe the success criteria and the mitigation capability of dedicated EDGs.

2. Assign a mitigating capability of "operator action=1" for a swing EDG. The SDP worksheet assumes that the swing EDG is aligned to the other unit at the time of the LOOP (in a sense a dual unit LOOP is assumed). The operator, therefore, should trip, transfer, re-start, and load the swing EDG.

3. Assign a mitigating capability of "operator action=1" for an SBO EDG similar to the swing EDG. Note, some of the PWRs do not take credit for an SBO EDG for non-fire initiators. In these cases, credit is not given.

4. Do not credit the nearby power station as a backup to EDGs. The offsite power source from such a station could also be affected by the underlying cause for the LOOP. As an example, overhead cables connecting the station to the nuclear power plant also could have been damaged due to the bad weather which caused the LOOP. This level of detail should be left for a Phase 3 analysis.

18. Recovery of losses of offsite power:

Recovery of losses of offsite power is assigned an operator-action category even though it is usually dominated by a recovery of offsite AC, independent of plant activities. Furthermore, the probability of recovery of offsite power in "X" hours (for example 4 hours) given it is not recovered earlier (for example, in the 1st hour) would be different from recovery in 4 hours with no condition. The SDP worksheet uses a simplified approach for treating recovery of AC by denoting it as an operator action=1 or 2 depending upon the HEP used in the IPE/PRA. A footnote highlighting the actual value used in the IPE/PRA is provided, when available.

19. RCP Seal LOCA:

The RCP seal LOCA is considered in LOOP worksheets as part of the SBO scenarios and in special initiators which address loss of support function (e.g., loss of CCW or loss of SW) for the RCP seals. Considerations for modeling RCP seal LOCA for these situations are discussed below.

20. RCP Seal LOCA for Westinghouse Plants during SBO scenarios:

The modeling of the RCP seal failures upon loss of cooling and injection as occurs during SBO scenarios has been the subject of many studies (e.g., BNL Technical report W6211-08/99 and NUREG/CR-4906P). These studies are quite complex and assign probabilities of seal failure as a function of time (duration of SBO) and the associated leak rates. The leak rates, in turn, will determine what would be the safe period for recovery of the AC source and the use of SI pumps before core uncovery and damage. The SDP worksheets simplify the analysis of the RCP seal LOCA during the SBO scenarios using the following two assumptions: (1) The probability of catastrophic RCP seal failure is assumed to be 1 if the SBO lasts beyond two hours, and (2) Given a catastrophic seal LOCA, the available time prior to core damage for recovery of offsite power and establishing injection is about two hours. Therefore, in almost all cases, to prevent a core damage, a source of AC should be recovered within 4 hours in SBO scenarios.

21. RCP Seal LOCA for CE plants during SBO scenarios:

CE plants use RCPs equipped with Byron Jackson (BJ) seals. The BJ design is typically composed of three stages of balanced hydrodynamic seals and sometimes are equipped with the fourth stage of vapor seal. For these designs, seal cooling is provided by the component cooling water (CCW) system. The SDP modeling of the RCP seal failures upon loss of cooling as occurs during SBO scenarios is based on the following understanding derived from CEOG model.

In a SBO scenario where loss of CCW has occurred and the RCPs are tripped, the SDP assumptions are that seal failure and consequential LOCA could occur beyond four hours and the likelihood of such occurrence depends on the operator's success in isolating the bleed-off line. The probability of seal LOCA is estimated to be 2E-5 if the operator isolates the bleed-off line in the first hour, and it is 1E-3 if he does not. To account for the seal LOCA, the SDP worksheet models a top event "Seal" which questions the success of the operator to close the bleed-off line with a recovery credit of 3; if the operator fails in this action, then a seal LOCA is assumed. In some CE plants, seal LOCA may not need to be modeled since the more limiting timing could result from the depletion of batteries.

22. Tripping the RCP on loss of CCW:

Upon loss of CCW, the motor cooling will be lost. The operation of RCPs without motor cooling could result in overheating and failure of bearings. Bearing failure, in turn, could cause the shaft to vibrate and thereby result in the potential for seal failure if the RCP is not tripped. In such cases, the operator is instructed to trip the RCPs early in the scenario (from 2 to 10 minutes after detecting the loss of cooling). Failure to perform this action is conservatively assumed to result in seal failure and, potentially in a LOCA. This failure mechanism (occurrence of seal LOCA) due to failure to trip the RCPs upon loss of cooling is not considered likely in some plants, whereas it has been modeled explicitly in other plants. To ensure consistency, the trip of the RCPs are modeled in the SDP worksheets for special initiators involving loss of cooling to the RCPs, and the operator failure to do this is assumed to result in a LOCA. In some cases, the failure to trip

RCP following a loss of CCW results in core damage. For CE plants, as discussed under the item, RCP Seal LOCA for CE plants during SBO Scenarios, the operator action involved is to isolate the bleed-off line.

23. Crediting MDAFW following failures of TDAFW and DDAFW and recovery of AC power in a SBO:

In Westinghouse plants, MDAFW is not credited in a SBO scenario with failure of AC-independent AFW pumps and recovery of AC power after SG dry out. It is assumed that the SG feed will not be performed per procedure after SG dry out. However, refilling SGs after dry-out in CE plants does not jeopardize the SG integrity, therefore, it is permissible per plant procedure and are credited in the worksheets for CE plants.

24. SGTR event tree:

Event trees for SGTR vary from plant to plant depending on the size of primary-to-secondary leak, SG relief capacity, and the rate of rapid depressurization. However, there are several common functional steps that are addressed in the SDP worksheet: early isolation of the affected SG, initiation of primary cool-down and depressurization, and prevention of the SG overfill. These actions also include failure to maintain the secondary pressure below that of Main Steam Safety Valves which could occur either due to the failure of the relief valves to open or the operator's failure to follow the procedure. Failure to perform this task (sometimes referred to as early isolation and equalization) is assumed to cause continuous leakage of primary outside the containment. The success of this step implies the need for high-pressure makeup for a short period, followed by depressurization and cooldown for RHR entry (note, relief valves are assumed to re-close when primary pressure falls below that of the secondary). If the early makeup is not available or the operator fails to perform early isolation and equalization, rapid depressurization to RHR entry is usually assumed. This would typically require some kind of intermediate- or low-pressure makeup. Finally, depending on the size of the Refueling Water Storage Tank (RWST), sometimes it would be necessary to establish makeup to the RWST to allow sufficient time to enter the RHR mode.

25. ATWS scenarios:

The ATWS SDP worksheet assumes that these scenarios are not recoverable by operator actions, such as a manual trip. The failure of the scram system, therefore, is not recoverable, neither by the actuation of a back-up system nor through the actuation of manual scram. The initiator frequency, therefore, should only account for non-recoverable scrams, such as mechanical failure of the scram rods.

26. No credit for manual action in early stages of ATWS:

In ATWS scenarios, SDP for PWR plants do not credit manual start and alignment of the AFW pumps or cross-connection to the other unit AFW pumps. In the early stages of an ATWS, there would be insufficient time to perform any such action.

27. Main Steam Line Break:

The SDP worksheets typically model MSLB down stream of MSIVs to reflect the importance of the MSIV closures. An un-isolated MSLB has the potential for Pressurized Thermal Shock (PTS). A consistent approach is followed using the following conservative assumptions:

- Blow down of one SG due to failure of the associated MSIV to close will not result in PTS as long as the feed to the affected SG is isolated. If the feed to the affected SG is not isolated, then the HPI should be secured to allow primary pressure to be maintained below PTS limit of concern.

- Blow down of two or more SGs due to failure of two or more MSIVs to close will result in PTS even if the feed to the affected SGs are isolated.

Deviation from these conservative assumptions could be made in the SDP worksheet per plant-specific analyses which have addressed PTS in MSLB scenarios.

28. Inclusion of LEAC initiator:

A separate initiator called LEAC (LOOP with loss of one Emergency AC Bus) is included for many plants to address risk-significant sequences associated with failure of PORVs to re-close (i.e., SORVs) after they are demanded in a LOOP. The SDP worksheet for LOOP does not include the sequences involving failure of the PORVs to re-close (i.e., SORV). The LEAC worksheet specifically takes into account the inability to close the block valve associated with the stuck-open PORV due to loss of power from the unavailable emergency AC bus. Almost all Westinghouse plants include the LEAC worksheet since PORVs are demanded in a LOOP. In CE plants however, the LEAC worksheet is not typically included since the PORVs may not be demanded (or demanding PORVs/SRVs have a probability of about 0.1) in a LOOP. In some CE plants, however, the LEAC worksheet was included to explicitly account for the asymmetry in electrical loading of the emergency AC Buses. In such cases, a top event called SORV with a credit of 3 is defined which includes 1E-1 for the probability of being demanded, and 1E-2 for the probability of failing to re-close.

2.2 RESOLUTION OF PLANT-SPECIFIC COMMENTS

The following changes were recommended and incorporated to Revision 1 of the SDP notebook based on the discussion with the licensee staff on the benchmarking trip that took place in August 5-7, 2003.

Table 1:

1. Moved LOOP from Row I to Row II and added a footnote that LOOP frequency is 2.6E-2 per reactor-year.

2. Moved loss of 125 VDC Bus to Row III and added a footnote that the initiating event frequency is 1.77E-3 per reactor-year for either bus 1-I or 1-III.

3. Separated L4KV to L4KVJ and L4KVH to more properly account for the differences between the impact of these two initiators.

4. Added loss of instrument air to Row III and included a footnote reflecting that this initiator is not currently modeled in the licensee's PRA and that assignment of this initiator to Row III is based on similar designs in other plants.

5. Added a footnote describing the sizes of SLOCA, MLOCA, and LLOCA.

6. Added a footnote describing the various modes of operating SW and that the lake to lake operation of the SW is explicitly modeled in the SDP worksheet for LSW.

Table 2:

1. Added a footnote to AFW describing the air backup to prevent the SG overfill.

2. Added a footnote that the CCW pumps are air cooled and that SW is required for only the heat exchangers.

3. Added a footnote reflecting that the CCW containment isolation valves will go shut on loss of either air or DC power.

4. Added the exhaust fan to the support system for EDGs.

5. Added a footnote to room cooling for ESGR to describe that the SW valves will go fully open on loss of air. This will cause a trip of the AHUs due to low temperature which require manual recovery.

6. Modified the footnote for IA to describe both service and instrument air and added service air to the instrument air in the table.

7. Added a footnote describing the power source of SG PORVs and the operation of the manual block valves.

8. Explicitly identified that both units have high temperature W RCP seals.

9. Separated the recirculation spray to inside and outside. Added casing cooling pumps and tanks to ensure the NPSH for outside recirculation.

10. Updated the CDF and recorded the current licensee's PRA revision.

11. Added a footnote that the battery chargers are not capable of carrying the SI loads and identified the battery duration during SBO scenarios.

12. Modified the footnote for EDG fuel oil to specify that there are two pumps of fuel oil per each EDG.

13. Added a footnote that the seal injection can be manually cross-tied.

Generic Modifications to the Worksheets: Tables 3.1 through 3.15:

1. Where applicable, modified to ensure the consistent use of the word "Train" rather than pump.

2. Updated the HEP values in the footnote and the credits in the SDP worksheet when appropriate.

3. Added a footnote where appropriate to explicitly discuss the two success criteria for feed and bleed operation during transient scenarios.

Table 3.3:

1. Modified the mitigation capability for LPC from 2/2 accumulators to 2/3 accumulators.

Table 3.7:

1. Modified the event tree and the worksheet for LOOP to reflect the currently accepted NRC seal failure model for high temperature qualified seals.

Table 3.8:

1. Changed the credit for RHR from multi-train to 1 train to reflect that there is only one drop line for RHR.

2. Removed sequence 7 from the event tree and the worksheet.

Table 3.9:

1. Added a footnote reflecting that the plant has non-return valves (NRVs) as backup to MSIVs.

2. Modified the event tree to show that failure of STIN could cause opening of the primary relief, therefore requiring HPR and RS.

Table 3.10:

1. Changed the mitigation capability for Turbine Trip to explicitly reflect the start of AFW.

2. Changed the mitigation capability for SRVs to 3/3 SRVs with 2/2 PORVs.

Table 3.11:

1. Developed a new event tree and worksheet for LIA based on the preliminary understanding of the initiator impact and the plant response. This initiator is not modeled in the licensee's PRA.

Table 3.12 & 3.13:

1. Separated and developed two worksheets for loss of 4KV bus J and H (L4KVJ and L4KVH). This is to reflect the differences between the two buses regarding the seal injection function.

Table 3.14:

1. Added manual restoration of 1 train of MFW to mitigation capability of SHR.

Table 3.15:

1. Modified the event tree for LSW to explicitly reflect the SW operation for lake to lake operation.

Prior Changes

Plant-specific comments are addressed in developing this version of the notebook. In addition, information obtained from the licensee is used to develop worksheets for special initiators in this notebook. A summary of the plant-specific comments received from the licensee is presented below.

1. Additional information was obtained on systems, particularly support systems and dependencies of systems. This information was used to improve Table 2, Initiators and System Dependency for North Anna, Units 1 and 2.

2. Medium LOCA worksheet and event tree were modified to remove credit for Accumulators and Auxiliary feedwater systems.

3. Large LOCA worksheet and event tree were modified to include the need for hot leg recirculation.

4. SGTR worksheet and event tree were modified to include RCS depressurization and RHR entry with secondary heat removal available but failure of the high head injection.

5. Loss of a DC Bus, Loss of an AC Bus, and Loss of Service Water worksheets and event trees are developed using the information provided by the licensee. Some changes are made in the event tree modeling considering the assumptions for similar plants in the SDP development and to maintain consistency across the worksheets for the North Anna units.

REFERENCES

1. NRC SECY-99-007A, Recommendations for Reactor Oversight Process Improvements (Follow-up to SECY-99-007), March 22, 1999.

2. "North Anna Power Station, Units 1 and 2 – Individual Plant Examination Report," December 1992.