UNITED STATES

NUCLEAR REGULATORY COMMISSION

REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

January 14, 2005

EA-05-008

South Carolina Electric & Gas Company
ATTN: Mr. Jeffery B. Archie
          Senior Vice President, Nuclear Operations
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - NRC INSPECTION REPORT
             05000395/2005006; PRELIMINARY WHITE FINDING

Dear Mr. Archie:

This letter and the enclosed supporting documentation discuss a finding that appears to have
low to moderate safety significance [White]. Section 4OA5.2.1.1 of NRC Inspection Report
05000395/2004009, issued on December 22, 2004, identified this finding [Unresolved Item
(URI) 05000395/2004009-01] which concerned inadequacies in your corrective actions
associated with a deficiency in the design of the emergency feedwater (EFW) system flow
control valves. This deficiency could have resulted in a common mode failure of the EFW
system as a result of plugging of the valves by tubercles and debris in the service water system.
This item was unresolved pending the NRC's determination of the safety significance.

This finding was assessed based on the best available information, including influential
assumptions, using the applicable Significance Determination Process (SDP) and was
preliminarily determined to be a White finding (i.e., a finding with some increased importance to
safety, which may require additional NRC inspection).

As indicated in the enclosed SDP Phase III Analysis, the issue appears to have a low to
moderate safety significance due to the importance of continued EFW system availability, when
supplied by the service water suction source, during events which deplete or render the
condensate storage tank inoperable. However, the risk associated with this deficiency was
somewhat mitigated by the fact that the finding only affected the alternate suction source for the
EFW system and did not impact normal EFW system operation. Additionally, other core cooling
mechanisms, such as use of the main feedwater system or primary system feed and bleed
were not affected.

This finding does not present an immediate safety concern because you instituted
compensatory measures including operator actions to install temporary hoses to bypass the
EFW flow control valves if they become plugged.

Two apparent violations (AV) of 10 CFR 50, Appendix B were identified regarding this finding. The first, an apparent violation of Criterion III, Design Control, is identified as AV 05000395/2005006-01: EFW Flow Control Valves Are Susceptible to Plugging by Tubercles and Other Debris from Service Water. The second, an apparent violation of Criterion XVI, Corrective Actions, is identified as AV 05000395/2005006-02: Inadequate Corrective Actions in Response to Potential EFW Control Valve Plugging. These apparent violations are being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions (Enforcement Policy), NUREG-1600." The current Enforcement Policy is included on the NRC's website at http://www.nrc.gov/what-we-do/regulatory/enforcement/enforce-pol.html. Accordingly, for administrative purposes, URI 05000395/2004009-01, is considered closed.

Before we make a final decision on this matter, we are providing you an opportunity (1) to present to the NRC your perspectives on the facts and assumptions, used by the NRC to arrive at the finding and its significance, at a Regulatory Conference or (2) submit your position on the finding to the NRC in writing. If you request a Regulatory Conference, it should be held within 30 days of the receipt of this letter and we encourage you to submit supporting documentation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a Regulatory Conference is held, it will be open for public observation and the NRC will issue a press release to announce the conference. If you decide to submit only a written response, such submittal should be sent to the NRC within 30 days of the receipt of this letter.

Please contact Mr. Charles R. Ogle at (404) 562-4605 within seven days of the date of this letter to notify the NRC of your intentions regarding the regulatory conference for the preliminary White finding. If we have not heard from you within 10 days, we will continue with our significance determination and associated enforcement processes on this finding, and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, no Notice of Violation is being issued for the inspection finding at this time. In addition, please be advised that the number and characterization of the apparent violations may change as a result of further NRC review.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

If you have any questions regarding this letter, please contact me at (404) 562-4600.

Sincerely,

/RA By R. Haag For/

Charles A. Casto, Director
Division of Reactor Safety

Docket No.:   50-395
License No.:   NPF-12

Enclosure: SDP Phase III Analysis w/Attachments

cc w/encl.:

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OFFICE	RII:DRS	RII:DRS	RII:DRS	RII:DRP	RII:EICS		
SIGNATURE	CRO	JHM2	RPS	KDL	CFE		
NAME	COgle	JMoorman	BSchin	KLandis	CEvans		
DATE	1/13/2005	1/13/2005	1/13/2005	1/13/2005	1/13/2005		
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO
PUBLIC DOCUMENT	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY   DOCUMENT NAME: E:\Filenet\ML050880440.wpd

SRA Analysis Number: SUM0403
Analysis Type: SDP Phase III
Inspection Report # : 2005006
Plant Name: V. C. Summer
Unit Number: 1
Enforcement Action #: EA-05-008

I.   Background - At V.C. Summer the Condensate Storage Tank (CST) is the normal suction supply for the Emergency Feedwater System (standard Westinghouse design - two motor driven and one turbine driven prime movers). Since the CST is not design to withstand tornados, an alternate supply from the Service Water System was provided. The piping interconnecting the two systems contains stagnant service water. Microbiological tubercles are growing and have been growing for many years on the inside diameter of these stagnant pipe segments.

The most flow-restricting passages in the system are in the flow control valves (IFV-3531-EF, IFV-3541-EF, IFV-3551-EF, IFV-3536-EF, IFV-3546-EF, and IFV-3556-EF). The flow control valves contain a cylindrical trim with several hundred orifices through which the EFW flow to each steam generator passes. Based upon observing a spare flow control valve trim, the orifices are widened with a countersink to about 0.125 inches in diameter on the flow entry side and narrow to 0.049 inches in diameter on the flow exit side. The total flow area of the orifices in a single valve trim is about 0.91 square inches. There are no strainers in the EFW system that would prevent particles larger than the these flow-restricting passages from entering the system. The NRC team physically agitated samples of tubercles by rapidly shaking them in a container, to simulate turbulent flow through an EFW pump, and found that most of the tubercle pieces did not pulverize but instead broke into small solid pieces approximately 0.125 to 0.25 inches in diameter. The tubercle pieces were larger than the orifices and therefore could potentially plug the orifices. The team calculated that, with an operating differential pressure across a flow control valve of about 100 pounds per square inch, the differential pressure across each orifice would be about 0.2 pounds. The team found that the sample tubercle pieces were resistant to compressive forces, so that if they became wedged into the orifices, they would likely be able to withstand much more than 0.2 pounds of compressive forces without breaking up.

The original purchase specification for the EFW flow control valves (SP-620-044461-000, dated October 16, 1974) had identified the process fluid as "cold condensate." Therefore, these EFW valves had been specified for use with clean condensate water and not for use with comparatively unclean SW which could contain silt and other debris from the SW pond plus clam shells, tubercles, and other debris from the SW piping. This mis-application of the purchased EFW flow control valves, which were designed for clean condensate, to handle unclean SW in the plant represented inadequate design control.

The licensee became aware of this potential blockage issue in 1986 and has had other opportunities to identify the significance of this design vulnerability since that time. Licensee corrective actions have been inadequate to resolve this design vulnerability.

Enclosure

Performance Deficiency - The licensee's corrective actions in response to a deficiency in the design of the EFW flow control valves was inadequate.

Specifically, the licensee's design control failed to specify that the EFW flow control valves were required to be able to handle relatively unclean SW without plugging. Instead, the EFW flow control valves were specified to handle a process fluid of clean 'cold condensate'. Tubercles as well as other debris in the service water system could plug the valves thereby resulting in a common mode failure of the EFW system. Despite multiple opportunities, the licensee's corrective action program failed to correct the condition in a timely manner.

Exposure Time - 1 year

Date of Occurrence - Condition has existed for numerous years

II.   Safety Impact: WHITE

III.   Risk Analysis/Considerations

       Assumptions

       1.   Upon transfer of the Emergency Feedwater System (EFW) suction to the Service Water System (SWS) the tubercles will plug the FCVs stopping sufficient flow to any Steam Generator.

       2.   Failure of the CST as the suction source for the Emergency Feedwater System will cause a reactor trip during the ensuing plant shutdown. The failure of the CST is estimated at 1E-7 failure/hour * 8760 hours/yr = 8.76E-4/yr. {INEEL telecon of database search for equipment failure}

       3.   For every reactor trip recovery of Main Feedwater is assumed to occur 90% of the time. This is the estimate from the Phase 2 Screening Sheets due to plant modifications that allow this. These modifications are not reflected in the licensee's full scope model.

       4.   In the absence of the tubercles the failure of the Service Water System as a suction for the Emergency Feedwater System is estimated at 1E-3 (a multi-train system). Therefore, the non-conforming condition will be assumed to be the delta CDF since the conforming case CDF is <<. (Unless specifically quantified by computer models)

Enclosure

5. Recovery of the Emergency Feedwater System, once transferred to the SWS suction source will not be considered. The FCV cages are assumed to be plugged to the point of insufficient flow to the Steam Generators. Operators would be able to recognize that insufficient flow was going to the Steam Generators.

6. However, there would be no procedure direction, training or experience that allow the operators to unplug the FCVs or provide a bypass around the plugged valves. Also, there would be no equipment available to accomplish such a task.

7. The CST function will be assumed to be lost at the medium wind speed/intensity of a F2 tornado (135 mph). The frequency of all tornadoes of this intensity or higher striking the site is estimated to be 6E-5/yr as extrapolated from Figure 3-2 "Tornado Hazard Curve - Exceedance" (page 3-6) contained in the June 1995 IPEEE High Winds Evaluation in response to Generic Letter 88-20, Supplement 4. All tornadoes assumed to cause loss of the CST function will also cause Loss of Offsite Power without recovery.

8. The critical piping segment from CST to EFW is estimated at 30 yards in length with 10 welds. Failure consideration will be by Design and Construction Defects (D&C) and Corrosion Attack (COR) mechanisms. From Table A-33, Pipe failure Rates for Westinghouse Feedwater and Condensate Systems, of EPRI TR-111880, "Piping System Failure Rates and Rupture Frequencies for Use In Risk Informed In-service Inspection Applications," the per foot or per weld failure probability is:

$$\text{COR} = 8.47E\text{-}8 \text{ failure/yr/ft} * 90 \text{ ft} = 7.6E\text{-}6 \text{ failure/yr}$$

$$\text{D\&C} = 6.89E\text{-}7 \text{ failure/yr/weld} * 10 \text{ welds} = 6.89E\text{-}6 \text{ failure/yr}$$

$$\text{Total} = 6.89E\text{-}6 + 7.6E\text{-}6 = 1.45E\text{-}5 \text{ failure/yr}$$

9. Based upon a review of the licensee's safe shutdown strategy procedures following a fire, it is assumed that when operators remain in the Main Control Room (MCR), the train used for safe shutdown is assumed to be fully protected either by 3 hour barrier, 1 hour barrier with suppression or a separation of 20 feet between trains. Those procedures presently indicate that the CST would be the suction source for the protected EFW train unless the CST was expended. Consequently, fire effects causing actuation of the alternate EFW suction source (SWS) could only happen to the unprotected train. For the unprotected train to affect the protected EFW train it would require a significant number of spurious actuations, including pump start and two suction valves to open before the protected train would be impacted. This is screened as not credible.

Enclosure

Premature transfer of the protected train suction to SWS will be considered credible due to random events and a fully developed fire in the 7.2KV Switchgear Room (Train A) will be used as the surrogate for this situation.

Possible spurious actuation of the SWS valves to the EFW suction source caused by the fire will be considered for those cases where alternate shutdown (shutdown from outside the MCR) is used. The fire in the Main Control Room will be used as the surrogate to screen this situation. Also, in all fire accident sequences it is assumed the licensee will execute a plant shutdown to cold shutdown before the CST volume is expended.

PRA Model used for basis of the risk analysis: Combination of hand calculation, modified Phase 2 Screening Sheet and SPAR run in the GEM mode.

Significant Influence Factor(s) [if any]: The failure of the SWS to EFW function is always lost when called upon and the tornado severity at which the CST function as a suction source to EFW is lost.

IV.   Calculations

BASE CASE - N/A

NON-CONFORMING CASE

a.   Internal Events

In the non-conforming case two broad conditions will be analyzed. First the full demand spectrum from all initiating events normally included in an internal events model will be considered. In this case the normal EFW suction path fails upon demand. The SPAR model is used to calculate the delta CDF by setting the basic event EFW-XHE-XA-SWS, OPERATOR FAILS TO ALIGN SW TO EFW, to always fail (TRUE). The model quantification details are provided in Attachment 2. Summarizing the delta CDF was 4.7E-8/yr. Due to its small contribution it will be excluded from the quantification.

Second there is a special case not explicitly covered by the internals event model that must be included. This involves the special case where the normal EFW suction source is known to be out of service and requires plant shutdown with an ensuing reactor trip. The failure of the CST and the failure the piping segments from the CST to EFW pump suctions will be quantified to estimate this initiating event. As indicated in the assumptions section, tank failure is set at 8.76E-4 and the piping segment failure is set at 1.45E-5. The collective loss of the CST function is estimated at 8.9E-4/yr. This represents the Initiating Event frequency.

Enclosure

To acquire the CCDP portion of the CDF the SPAR model in the GEM mode was solved for the transient initiating event with:

EFW-TNK-FC-CST1 set to TRUE - this sets the CST to always fail this will later be substituted with the new initiating event frequency that correlates to tank loss.

EFW-XHE-XA-SWS set to TRUE - this sets the Service Water System supply to the EFW pumps to always fail - the performance deficiency.

MFW-XHE-XL-TRANS & MFW-XHE-XL-TRIP set to 0.1 - this provides a possible site- specific use of MFW as a viable secondary side heat removal mechanism (consistent with assumption 3).

The details of the computer run is provided as Attachment 3. In summary the derived CCDP was 6.2E-3. The non-conforming CDF is 8.9E-4/yr * 6.2E-3 = 5.5E-6

Correlation with the Phase 2 Screening Sheets - The Phase 2 Screening Sheet for Transients is solved using the 8.9E-4 IEL converted to a 3 and the EFW function set to zero. The accident sequences are shown in Attachment 4 and result in a 6,6 & 7 or White. This is consistent with the computerized calculation.

b.   External Events

Earthquake - Based upon the licensee's IPEEE (page 13-2) estimated that the High Confidence of Low Probability of Failure (HCLPF) for the Service Water Pond Dam was 0.22g while the CST was estimated at > 0.3g. Therefore, Service Water is estimated to fail before the CST due to earthquake and will be excluded from quantification.

Fire - Fully developed fire with operators shutting down from the MCR - Compartment 1DA is the surrogate and considered the dominant fire since there are almost 40 ignition sources capable of causing a fully developed fire and the compartment does not contain a fixed suppression system. A fire of 16 minutes duration will be postulated to cause operators to enact the mitigation strategy which includes inducing a Station Blackout and re-establishing power to the B train via the B Emergency Diesel Generator. Therefore, MFW recovery will not be considered. From 0609, Appendix F page F8-6 the non-suppression probability of an electrical fire is 0.15. Possible mechanisms that could cause EFW suction transference to SWS are spurious valve operations, spurious failure of 2 of the 4 level transmitters or tank failure. For purposes of scoping only a single valve or level transmitter failure will be quantified at 5E-7/hr for the valve (NUREG 4550) + 5E-6/hr for an instrument + 1E-7/hr for tank failure over a 24 hr mission time yields 1E-4. A conservative scoping quantification would be:

The fully developed fire frequency would be 2.3E-3 (fire frequency) * 1.5E-1 (suppression failure Pr) * 1E-4 (EFW transfer to SWS) = 3E-8

Enclosure

Fully developed fire with operators shutting down from outside the MCR. Use the MCR fire as the screen. From SDP Appendix F, MCR fire frequency is 8E-3. Assuming a fire of approximately 16 minutes would be needed to cause spurious operation of the applicable valves, the manual suppression failure probability is estimated to be 0.02 (Appendix F page F8-6).

Partitioning the MCR into the critical panel portion that could impact these valves to be 1/4 of the MCR panels would provide an addition 0.25 reduction factor. Two valves in the train to be used for shutdown from outside the MCR would have to change state in this critical portion of the MCR panel. Appendix F page F-48 estimates a spurious operation of 0.6. Calculating 8E-3 * 2E-2 * 2.5E-1 * 6E-1 * 6E-1 = 1.4E-5. This would be a fully developed fire requiring MCR evacuation with subsequent failure of the EFW System due to transferring onto the SWS suction source. However, even though not procedurialized there would be adequate time to establish feed & bleed as a mitigation strategy. Using a 2E-2 failure probability as representative of this strategy failing (1E-2 for the F&B portion and 1E-2 for the HPR portion), the CDF would screen at 3E-7.

These two scoping quantifications provide the perspective that the fire initiating event would not be a major risk contributor for this performance deficiency.

Tornado - The CST was not designed to withstand a tornado or the effects of a tornado. Using the exceedence probability for wind speeds at an F2 median frequency as the initiating event, yields 6E-5/yr. SPAR was run in the GEM mode with:

> the LOSP initiating event for severe weather set at 6E-5

> EFW-TNK-FC-CST1 set to TRUE - this sets the CST to always fail due to a tornado

> EFW-XHE-XA-SWS set to TRUE - this sets the Service Water System supply to the EFW pumps to always fail - the performance deficiency

The non-conforming CDF result was 1.4E-6. See Attachment 5 for th details of the computer run.

As a sensitivity analysis for tornado wind speeds in excess of 150 mph (the upper end of the F2 scale) correlates to a 1E-6 CDF..

Correlation with the Phase 2 Screening Sheets - The surrogate for external events is LOSP. By altering the LOOP Screening Sheet from the Phase 2 Notebook to 6E-5 for the initiating event correlates to a 4 for the IEL, the EFW function is set to zero and the REC functions are set to zero. The accident sequences are shown in Attachment 6 and resulted in a 6, 6, 7 & 7 or White and consistent with the computerized calculation.

Enclosure

External Events Summary - The external events analysis was to ascertain whether the White result of the internal events is altered by the external events. Evaluation of the external events contribution indicates that the risk significance is not sufficient to increase internal events results.

<u>DELTA CDF FOR EXPOSURE TIME</u>

Since the exposure time is for one year there is no alteration of the delta CDF from the previous section.

<u>LERF CONSIDERATION</u>

The dominant accident sequences involving this performance deficiency do not include SGTR or ISLOCA as the initiating event. Therefore, the LERF contribution is considered not to exceed the CDF risk bands.

V.   Conclusions/Recommendations - Risk increase over the base case was >1E-6 but <1E-5.

VI.   Attachments
1.   Phase I Screening Sheets
2.   Sws to efw.wpd   *
3.   CCDP for Loss of CST as Initiating Event
4.   Phase 2 Screening Sheet - Trans Initiating Event
5.   Tornado SWS to EFW.wpd
6.   Phase 2 Screening Sheet - LOOP Initiating Event

Analyst: W. Rogers   Date: 12/22/04
Reviewed By: R. Bernhard   Date: 12/22/04
                        M. Franovich Date: 12/29/04 per telecon

SWS TO EFW.WPD

C O N D I T I O N   A S S E S S M E N T

```
Code Version: 7:22                        Model Version  : 2004/12/10
Project      : SUMM_3                      Duration (hrs) :  8.8E+003
User Name    : IDAHO NATIONAL LABORATORY (INL)   Total CCDP     :  1.4E-005
Event ID     : SWS-TO-EFW-OOS             Total CDP      :  1.4E-005
                                          Importance     :  4.7E-008
Description : Condition Assessment sws to efw failed for one year
```

BASIC EVENT CHANGES

Event Name	Description	Base Prob	Curr Prob	Type
EFW-XHE-XA-SWS	OPERATOR FAILS TO ALIGN SW T	1.0E-003	1.0E+000	TRUE

SEQUENCE PROBABILITIES

Truncation : Cummulative : 100.0% Individual :   1.0%

Event Tree Name	Sequence Name	CCDP	CDP	Importance
TRANS	17	4.5E-007	4.1E-007	3.4E-008
LDCA	20	7.8E-007	7.7E-007	6.0E-009
TRANS	16	5.0E-008	4.6E-008	3.7E-009
LOOP	17	3.3E-008	3.1E-008	1.6E-009

NOTE: Percent contribution to total Importance.

SEQUENCE LOGIC

Event Tree	Sequence Name	Logic	
TRANS	17	/RPS	EFW
		MFW	FAB
LDCA	20	/RPS	EFW
		FAB	
TRANS	16	/RPS	EFW
		MFW	/FAB
		HPR	
LOOP	17	/RPS	/EPS
		EFW-L	FAB-L

Fault Tree Name	Description
EFW	EMERGENCY FEEDWATER
EFW-L	SUMMER PWR B EMERGENCY FEEDWATER SYSTEM DURING LOOP

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EPS                     EMERGENCY POWER
FAB                     FEED AND BLEED
FAB-L                   FEED AND BLEED DURING LOOP
HPR                     HPR PRESSURE RECIRCULATION
MFW                     MAIN FEEDWATER SYSTEM
RPS                     REACTOR TRIP
```

_____

         SEQUENCE CUT SETS

              Truncation: Cummulative: 100.0% Individual: 1.0%

         Event Tree: TRANS   CCDF: 4.5E-007
         Sequence: 17

CCDF	% Cut Set	Cut Set Events	
1.6E-007	36.04	EFW-MDP-CF-FRAB	EFW-TDP-FR
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
4.1E-008	9.22	EFW-MDP-CF-FRAB	EFW-TDP-TM
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
4.0E-008	9.01	EFW-MDP-CF-FRAB	EFW-TDP-FR
		MFW-SYS-FC-TRANS	HPI-XHE-XM-FB
3.4E-008	7.68	EFW-MDP-CF-FRAB	EFW-TDP-FS-1
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
2.7E-008	6.04	EFW-TNK-FC-CST1	MFW-SYS-FC-TRIP
		HPI-XHE-XM-FB	
2.5E-008	5.62	EFW-MDP-CF-FSAB	EFW-TDP-FR
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
1.0E-008	2.30	EFW-MDP-CF-FRAB	EFW-TDP-TM
		MFW-SYS-FC-TRANS	HPI-XHE-XM-FB
8.6E-009	1.92	EFW-MDP-CF-FRAB	EFW-TDP-FS-1
		MFW-SYS-FC-TRANS	HPI-XHE-XM-FB
7.6E-009	1.70	EFW-CKV-CF-DIS	MFW-SYS-FC-TRIP
		HPI-XHE-XM-FB	
7.6E-009	1.70	EFW-CKV-CF-SUCT	MFW-SYS-FC-TRIP
		HPI-XHE-XM-FB	
7.6E-009	1.70	EFW-CKV-CF-SGS	MFW-SYS-FC-TRIP
		HPI-XHE-XM-FB	
7.4E-009	1.66	EFW-PMP-CF-ALL	MFW-SYS-FC-TRIP
		HPI-XHE-XM-FB	
6.7E-009	1.51	EFW-TNK-FC-CST1	MFW-SYS-FC-TRANS
		HPI-XHE-XM-FB	
6.4E-009	1.44	EFW-MDP-CF-FSAB	EFW-TDP-TM
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
6.3E-009	1.40	EFW-MDP-CF-FSAB	EFW-TDP-FR
		MFW-SYS-FC-TRANS	HPI-XHE-XM-FB
5.7E-009	1.28	EFW-MDP-CF-FRAB	EFW-XHE-XR-TDP1
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB
5.3E-009	1.20	EFW-MDP-CF-FSAB	EFW-TDP-FS-1
		MFW-SYS-FC-TRIP	HPI-XHE-XM-FB

```
        Event Tree: LDCA                                           CCDF:  7.8E-007
        Sequence:  20

    CCDF      % Cut Set                          Cut Set Events
  ---------   ---------    -------------------------------------------------
  3.5E-007      45.34      EFW-MDP-TM-1B              EFW-TDP-FR
  7.5E-008       9.66      EFW-MDP-TM-1B              EFW-TDP-FS-1
  7.0E-008       9.07      EFW-TDP-FR                 EFW-XHE-XR-MDP1B
  3.6E-008       4.62      EFW-MDP-CF-FRAB            EFW-TDP-FR
  2.8E-008       3.63      EFW-PMP-FR-1A              EFW-TDP-FR
  2.7E-008       3.50      EFW-MDP-FR-1B              EFW-TDP-FR
                           EFW-XHE-XL-MDPFRB
  1.8E-008       2.32      EFW-TDP-TM                 EFW-XHE-XR-MDP1B
  1.8E-008       2.29      EFW-MDP-FS-1B              EFW-TDP-FR
                           EFW-XHE-XL-MDPFSB
  1.5E-008       1.93      EFW-TDP-FS-1               EFW-XHE-XR-MDP1B
  1.3E-008       1.61      EFW-MDP-TM-1B              EFW-XHE-XR-TDP1
  1.2E-008       1.55      DCP-BDC-LP-1B
  9.2E-009       1.18      EFW-MDP-CF-FRAB            EFW-TDP-TM

        Event Tree: TRANS                                          CCDF:  5.0E-008
        Sequence:  16

    CCDF      % Cut Set                          Cut Set Events
  ---------   ---------    -------------------------------------------------
  1.6E-008      32.19      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-FR                 MFW-SYS-FC-TRIP
  4.1E-009       8.23      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-TM                 MFW-SYS-FC-TRIP
  4.0E-009       8.05      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-FR                 MFW-SYS-FC-TRANS
  3.4E-009       6.86      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-FS-1               MFW-SYS-FC-TRIP
  2.7E-009       5.39      HPR-XHE-XM                 EFW-TNK-FC-CST1
                           MFW-SYS-FC-TRIP
  2.5E-009       5.02      HPR-XHE-XM                 EFW-MDP-CF-FSAB
                           EFW-TDP-FR                 MFW-SYS-FC-TRIP
  1.0E-009       2.06      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-TM                 MFW-SYS-FC-TRANS
  8.6E-010       1.72      HPR-XHE-XM                 EFW-MDP-CF-FRAB
                           EFW-TDP-FS-1               MFW-SYS-FC-TRANS
  7.6E-010       1.52      HPR-XHE-XM                 EFW-CKV-CF-SGS
                           MFW-SYS-FC-TRIP
  7.6E-010       1.52      HPR-XHE-XM                 EFW-CKV-CF-DIS
                           MFW-SYS-FC-TRIP
  7.6E-010       1.52      HPR-XHE-XM                 EFW-CKV-CF-SUCT
                           MFW-SYS-FC-TRIP
  7.4E-010       1.49      HPR-XHE-XM                 EFW-PMP-CF-ALL
                           MFW-SYS-FC-TRIP
  6.7E-010       1.35      HPR-XHE-XM                 EFW-TNK-FC-CST1
                           MFW-SYS-FC-TRANS
```

Attachment 2

```
6.4E-010       1.28     HPR-XHE-XM              EFW-MDP-CF-FSAB
                        EFW-TDP-TM              MFW-SYS-FC-TRIP
6.3E-010       1.25     HPR-XHE-XM              EFW-MDP-CF-FSAB
                        EFW-TDP-FR              MFW-SYS-FC-TRANS
5.7E-010       1.14     HPR-XHE-XM              EFW-MDP-CF-FRAB
                        EFW-XHE-XR-TDP1         MFW-SYS-FC-TRIP
5.3E-010       1.07     HPR-XHE-XM              EFW-MDP-CF-FSAB
                        EFW-TDP-FS-1            MFW-SYS-FC-TRIP

        Event Tree: LOOP                               CCDF:  3.3E-008
        Sequence:   17

    CCDF       % Cut Set                        Cut Set Events
 ---------     ---------     -------------------------------------------------
 9.5E-009       29.09     EFW-MDP-CF-FRAB         EFW-TDP-FR
                          HPI-XHE-XM-FB
 2.4E-009        7.44     EFW-MDP-CF-FRAB         EFW-TDP-TM
                          HPI-XHE-XM-FB
 2.0E-009        6.20     EFW-MDP-CF-FRAB         EFW-TDP-FS-1
                          HPI-XHE-XM-FB
 2.0E-009        6.05     EFW-MDP-TM-1B           EFW-TDP-FR
                          EPS-DGN-FR-1A           HPI-XHE-XM-FB
 2.0E-009        6.05     EFW-MDP-TM-1A           EFW-TDP-FR
                          EPS-DGN-FR-1B           HPI-XHE-XM-FB
 1.6E-009        4.87     EFW-TNK-FC-CST1         HPI-XHE-XM-FB
 1.5E-009        4.53     EFW-MDP-CF-FSAB         EFW-TDP-FR
                          HPI-XHE-XM-FB
 4.5E-010        1.37     EFW-CKV-CF-SUCT         HPI-XHE-XM-FB
 4.5E-010        1.37     EFW-CKV-CF-DIS          HPI-XHE-XM-FB
 4.5E-010        1.37     EFW-CKV-CF-SGS          HPI-XHE-XM-FB
 4.4E-010        1.34     EFW-PMP-CF-ALL          HPI-XHE-XM-FB
 4.2E-010        1.29     EFW-MDP-TM-1B           EFW-TDP-FS-1
                          EPS-DGN-FR-1A           HPI-XHE-XM-FB
 4.2E-010        1.29     EFW-MDP-TM-1A           EFW-TDP-FS-1
                          EPS-DGN-FR-1B           HPI-XHE-XM-FB
 4.0E-010        1.21     EFW-TDP-FR              EFW-XHE-XR-MDP1B
                          EPS-DGN-FR-1A           HPI-XHE-XM-FB
 4.0E-010        1.21     EFW-TDP-FR              EFW-XHE-XR-MDP1A
                          EPS-DGN-FR-1B           HPI-XHE-XM-FB
 3.8E-010        1.16     EFW-MDP-CF-FSAB         EFW-TDP-TM
                          HPI-XHE-XM-FB
 3.7E-010        1.14     EFW-MDP-TM-1B           EFW-TDP-FR
                          EPS-DGN-FS-1A           HPI-XHE-XM-FB
 3.7E-010        1.14     EFW-MDP-TM-1A           EFW-TDP-FR
                          EPS-DGN-FS-1B           HPI-XHE-XM-FB
 3.4E-010        1.03     EFW-MDP-CF-FRAB         EFW-XHE-XR-TDP1
                          HPI-XHE-XM-FB
```

_____

Attachment 2

```
        BASIC EVENTS (Cut Sets Only)

Event Name               Description                                     Curr Prob
------------------------ ----------------------------------------------- ---------
DCP-BDC-LP-1B            DIVISION 1B 125VDC BUS DP-1B ED FAILS           4.8E-006
EFW-CKV-CF-DIS           COMMON CAUSE FAILURE OF EFW PUMPS DISCHARGE C   6.8E-007
EFW-CKV-CF-SGS           COMMON CAUSE FAILURE OF SGS EFW CHECK VALVES    6.8E-007
EFW-CKV-CF-SUCT          COMMON CAUSE FAILURE OF EFW PUMPS SUCTION CHE   6.8E-007
EFW-MDP-CF-FRAB          CCF FAILURE OF EFW MDPS TO RUN                  5.1E-004
EFW-MDP-CF-FSAB          CCF EFW MDP FAIL TO START                       7.9E-005
EFW-MDP-FR-1B            EFW MDP 1B FAILS TO RUN                         5.2E-004
EFW-MDP-FS-1B            EFW MDP 1B FAILS TO START                       1.2E-003
EFW-MDP-TM-1A            EFW MDP 1A UNAVAILABLE DUE TO TEST AND MAINTE   5.0E-003
EFW-MDP-TM-1B            EFW MDP 1B UNAVAILABLE DUE TO TEST AND MAINTE   5.0E-003
EFW-PMP-CF-ALL           COMMON CAUSE FAILURE OF EFW PUMPS               6.6E-007
EFW-PMP-FR-1A            FAILURE OF EFW PUMP 1A TO RUN (PUMP UNIT ONLY   4.0E-004
EFW-TDP-FR               EFW TDP FAILS TO RUN                            2.8E-002
EFW-TDP-FS-1             EFW TDP FAILS TO START                          6.0E-003
EFW-TDP-TM               EFW TDP UNAVAILABLE DUE TO TEST AND MAINTENAN   7.2E-003
EFW-TNK-FC-CST1          FAILURE OF CONDENSATE STORAGE TANK              2.4E-006
EFW-XHE-XL-MDPFRB        OPERATOR FAILS TO RECOVER EFW MDP 1B (FAILS T   7.5E-001
EFW-XHE-XL-MDPFSB        OPERATOR FAILS TO RECOVER EFW MDP 1B (FAILS T   2.1E-001
EFW-XHE-XR-MDP1A         OP FAILS TO RESTORE EFW MDP 1A AFTER T&M        1.0E-003
EFW-XHE-XR-MDP1B         OP FAILS TO RESTORE EFW MDP 1B                  1.0E-003
EFW-XHE-XR-TDP1          OP FAILS TO RESTORE EFW TDP AFTER T&M           1.0E-003
EPS-DGN-FR-1A            DIESEL GENERATOR A FAILS TO RUN                 2.1E-002
EPS-DGN-FR-1B            DIESEL GENERATOR B FAILS TO RUN                 2.1E-002
EPS-DGN-FS-1A            DIESEL GENERATOR A FAILS TO START               4.0E-003
EPS-DGN-FS-1B            DIESEL GENERATOR B FAILS TO START               4.0E-003
HPI-XHE-XM-FB            OPERATOR FAILS TO INITIATE FEED AND BLEED COO   2.0E-002
HPR-XHE-XM               OPERTATOR FAILS TO INITIATE HPR                 2.0E-003
MFW-SYS-FC-TRANS         MFW IS UNAVAILABLE (TRANSIENT INTIATOR)         2.0E-001
MFW-SYS-FC-TRIP          MFW IS UNAVAILABLE (TRANSIENT INTIATOR)         8.0E-001
```

Attachment 2

CCDP FOR LOSS OF CST FUNCTION AS THE INITIATING EVENT

I N I T I A T I N G   E V E N T   A S S E S S M E N T

```
                                    Code  Ver : 7:22
Fam  : SUMM_3                       Model Ver : 2004/12/10
User : IDAHO NATIONAL LABORATORY (INL)   Init Event: IE-TRANS
Ev ID: TRANS-W-O-CST--SWAFW         Total CCDP:  6.2E-003
Desc : Initiating Event Assessment
```

```
                        BASIC EVENT CHANGES
Event Name              Description              Base Prob Curr Prob  Type
---------------------   ----------------------   --------- --------- ------
EFW-TNK-FC-CST1         FAILURE OF CONDENSATE STORAG 2.4E-006  1.0E+000 TRUE
EFW-XHE-XA-SWS          OPERATOR FAILS TO ALIGN SW T 1.0E-003  1.0E+000 TRUE
IE-LDCA                 LOSS OF DC POWER BUS 1A INIT 2.5E-003 +0.0E+000
IE-LLOCA                LARGE LOSS OF COOLANT ACCIDE 5.0E-006 +0.0E+000
IE-LOCCW                LOSS OF COMPONENT COOLING WA 2.0E-004 +0.0E+000
IE-LOOP                 LOSS OF OFFSITE POWER        3.3E-002 +0.0E+000
IE-LOSW                 LOSS OF SERVICE WATER INITIA 4.0E-004 +0.0E+000
IE-MLOCA                MEDIUM LOSS OF COOLANT ACCID 4.0E-005 +0.0E+000
IE-RHR-CLDIS-V          ISLOCA OCCURS WITH REACTOR A 1.0E+000 +0.0E+000
IE-RHR-HLDIS-V          ISLOCA OCCURS WITH REACTOR A 1.0E+000 +0.0E+000
IE-RHR-SUC-V            ISLOCA OCCURS WITH REACTOR A 1.0E+000 +0.0E+000
IE-SGTR                 STEAM GENERATOR TUBE RUPTURE 4.0E-003 +0.0E+000
IE-SI-CLDIS-V           ISLOCA OCCURS WITH REACTOR A 1.0E+000 +0.0E+000
IE-SI-HLDIS-V           ISLOCA OCCURS WITH REACTOR A 1.0E+000 +0.0E+000
IE-SLOCA                SMALL LOSS OF COOLANT ACCIDE 4.0E-004 +0.0E+000
IE-TRANS                TRANSIENT                    7.0E-001  1.0E+000
MFW-XHE-XL-TRANS        OPERATOR FAILS TO RECOVER MF 1.0E+000  1.0E-001
MFW-XHE-XL-TRIP         OPERATOR FAILS TO RECOVER MF 1.0E+000  1.0E-001
```

```
        SEQUENCE PROBABILITIES

        Truncation :  Cummulative : 100.0%  Individual :   1.0%

Event Tree Name                 Sequence Name               CCDP      %Cont
----------------------          ----------------------      --------- -----
TRANS                           17                          5.9E-003
TRANS                           16                          2.3E-004
```

```
        SEQUENCE LOGIC
Event Tree    Sequence Name                        Logic
-------------- -------------   -------------------------------------------------
TRANS          17             /RPS                    EFW
                              MFW                     FAB

TRANS          16             /RPS                    EFW
                              MFW                    /FAB
                              HPR
```

```
    2004/12/21                  10:06:37                      page     1
```

Attachment 3

```
Fault Tree Name          Description
------------------------ ------------------------------------------------
EFW                      EMERGENCY FEEDWATER
FAB                      FEED AND BLEED
HPR                      HPR PRESSURE RECIRCULATION
MFW                      MAIN FEEDWATER SYSTEM
RPS                      REACTOR TRIP
```

```
        SEQUENCE CUT SETS

            Truncation:  Cummulative: 100.0%  Individual:  1.0%

      Event Tree: TRANS                                CCDP:  5.9E-003
      Sequence:  17

   CCDP      % Cut Set                      Cut Set Events
 ---------  ---------   -------------------------------------------------
 5.5E-003     92.92     MFW-SYS-FC-TRIP          MFW-XHE-XL-TRIP
                        HPI-XHE-XM-FB1
 4.0E-004      6.73     MFW-SYS-FC-TRANS         MFW-XHE-XL-TRANS
                        HPI-XHE-XM-FB

      Event Tree: TRANS                                CCDP:  2.3E-004
      Sequence:  16

   CCDP      % Cut Set                      Cut Set Events
 ---------  ---------   -------------------------------------------------
 1.6E-004     71.03     HPR-XHE-XM               MFW-SYS-FC-TRIP
                        MFW-XHE-XL-TRIP
 4.0E-005     17.76     HPR-XHE-XM               MFW-SYS-FC-TRANS
                        MFW-XHE-XL-TRANS
 4.3E-006      1.92     MFW-SYS-FC-TRIP          MFW-XHE-XL-TRIP
                        RHR-MDP-CF-FSAB
```

```
        BASIC EVENTS (Cut Sets Only)

Event Name               Description                                   Curr Prob
------------------------ --------------------------------------------- ---------
HPI-XHE-XM-FB            OPERATOR FAILS TO INITIATE FEED AND BLEED COO  2.0E-002
HPI-XHE-XM-FB1           OPERATOR FAILS TO INITIATE FEED AND BLEED COO  6.9E-002
HPR-XHE-XM              OPERTATOR FAILS TO INITIATE HPR                2.0E-003
MFW-SYS-FC-TRANS        MFW IS UNAVAILABLE (TRANSIENT INTIATOR)         2.0E-001
MFW-SYS-FC-TRIP         MFW IS UNAVAILABLE (TRANSIENT INTIATOR)         8.0E-001
MFW-XHE-XL-TRANS        OPERATOR FAILS TO RECOVER MFW (TRANSIENT INIT   1.0E-001
MFW-XHE-XL-TRIP         OPERATOR FAILS TO RECOVER MFW (TRANSIENT INIT   1.0E-001
RHR-MDP-CF-FSAB         COMMON CAUSE FAILURE OF RHR MDPS TO START       5.4E-005
```

```
    2004/12/21                  10:06:37                      page    2
```

Attachment 3

TORNADO TO SWS TO EFW.WPD

```
            I N I T I A T I N G   E V E N T   A S S E S S M E N T

                                     Code  Ver : 7:22
Fam  : SUMM_3                        Model Ver : 2004/12/10
User : IDAHO NATIONAL LABORATORY (INL)    Init Event: IE-LOOP
Ev ID: LOOP-SEVERE-TEST              Total CCDP:  1.4E-006
Desc : Initiating Event Assessment


                           BASIC EVENT CHANGES
Event Name               Description                   Base Prob Curr Prob  Type
------------------------  ----------------------------  --------- ---------  ------
EFW-TNK-FC-CST1          FAILURE OF CONDENSATE STORAG  2.4E-006  1.0E+000  TRUE
EFW-XHE-XA-SWS           OPERATOR FAILS TO ALIGN SW T  1.0E-003  1.0E+000  TRUE
IE-LDCA                  LOSS OF DC POWER BUS 1A INIT  2.5E-003  +0.0E+000
IE-LLOCA                 LARGE LOSS OF COOLANT ACCIDE  5.0E-006  +0.0E+000
IE-LOCCW                 LOSS OF COMPONENT COOLING WA  2.0E-004  +0.0E+000
IE-LOOP                  LOSS OF OFFSITE POWER         3.3E-002  6.0E-005
IE-LOSW                  LOSS OF SERVICE WATER INITIA  4.0E-004  +0.0E+000
IE-MLOCA                 MEDIUM LOSS OF COOLANT ACCID  4.0E-005  +0.0E+000
IE-RHR-CLDIS-V           ISLOCA OCCURS WITH REACTOR A  1.0E+000  +0.0E+000
IE-RHR-HLDIS-V           ISLOCA OCCURS WITH REACTOR A  1.0E+000  +0.0E+000
IE-RHR-SUC-V             ISLOCA OCCURS WITH REACTOR A  1.0E+000  +0.0E+000
IE-SGTR                  STEAM GENERATOR TUBE RUPTURE  4.0E-003  +0.0E+000
IE-SI-CLDIS-V            ISLOCA OCCURS WITH REACTOR A  1.0E+000  +0.0E+000
IE-SI-HLDIS-V            ISLOCA OCCURS WITH REACTOR A  1.0E+000  +0.0E+000
IE-SLOCA                 SMALL LOSS OF COOLANT ACCIDE  4.0E-004  +0.0E+000
IE-TRANS                 TRANSIENT                     7.0E-001  +0.0E+000
OEP-XHE-XL-NR01H         OPERATOR FAILS TO RECOVER OF  5.3E-001  4.6E-001
OEP-XHE-XL-NR02H         OPERATOR FAILS TO RECOVER OF  3.7E-001  3.6E-001
OEP-XHE-XL-NR03H         OPERATOR FAILS TO RECOVER OF  2.8E-001  3.0E-001
OEP-XHE-XL-NR04H         OPERATOR FAILS TO RECOVER OF  2.2E-001  2.5E-001
OEP-XHE-XL-NR05H         OPERATOR FAILS TO RECOVER OF  1.9E-001  2.2E-001
OEP-XHE-XL-NR06H         OPERATOR FAILS TO RECOVER OF  1.6E-001  2.0E-001
OEP-XHE-XL-NR07H         OPERATOR FAILS TO RECOVER OF  1.4E-001  1.8E-001
OEP-XHE-XL-NR08H         OPERATOR FAILS TO RECOVER OF  1.2E-001  1.6E-001
OEP-XHE-XL-NR09H         OPERATOR FAILS TO RECOVER OF  1.1E-001  1.4E-001
OEP-XHE-XL-NR10H         OPERATOR FAILS TO RECOVER OF  1.0E-001  1.3E-001
OEP-XHE-XL-NR10H2        OPERATOR FAILS TO RECOVER OF  2.7E-001  3.7E-001
OEP-XHE-XL-NR10H4        OPERATOR FAILS TO RECOVER OF  4.5E-001  5.2E-001
OEP-XHE-XL-NR11H         OPERATOR FAILS TO RECOVER OF  9.5E-002  1.2E-001
OEP-XHE-XL-NR12H         OPERATOR FAILS TO RECOVER OF  8.9E-002  1.1E-001
OEP-XHE-XL-NR13H         OPERATOR FAILS TO RECOVER OF  8.5E-002  1.0E-001
OEP-XHE-XL-NR14H         OPERATOR FAILS TO RECOVER OF  8.2E-002  9.7E-002
OEP-XHE-XL-NR15H         OPERATOR FAILS TO RECOVER OF  7.9E-002  9.0E-002
OEP-XHE-XL-NR16H         OPERATOR FAILS TO RECOVER OF  7.6E-002  8.4E-002
OEP-XHE-XL-NR17H         OPERATOR FAILS TO RECOVER OF  7.4E-002  7.9E-002
OEP-XHE-XL-NR18H         OPERATOR FAILS TO RECOVER OF  7.2E-002  7.4E-002
OEP-XHE-XL-NR19H         OPERATOR FAILS TO RECOVER OF  7.1E-002  7.0E-002
OEP-XHE-XL-NR20H         OPERATOR FAILS TO RECOVER OF  6.9E-002  6.6E-002
OEP-XHE-XL-NR21H         OPERATOR FAILS TO RECOVER OF  6.8E-002  6.2E-002
OEP-XHE-XL-NR22H         OPERATOR FAILS TO RECOVER OF  6.7E-002  5.9E-002
```

Attachment 5

```
OEP-XHE-XL-NR23H        OPERATOR FAILS TO RECOVER OF  6.6E-002  5.6E-002
OEP-XHE-XL-NR24H        OPERATOR FAILS TO RECOVER OF  6.5E-002  5.3E-002
OEP-XHE-XL-NR30M        OPERATOR FAILS TO RECOVER OF  6.6E-001  5.6E-001
OEP-XHE-XL-NR90M        OPERATOR FAILS TO RECOVER OF  4.4E-001  4.0E-001
ZV-LOOP-EW-LAMBDA       EXTREME WEATHER RELATED LOSS  2.3E-003  +0.0E+000
ZV-LOOP-GR-LAMBDA       GRID RELATED LOSS OF OFFSITE  1.7E-002  +0.0E+000
ZV-LOOP-PC-LAMBDA       PLANT CENTERED LOSS OF OFFSI  2.4E-003  +0.0E+000
ZV-LOOP-SC-LAMBDA       SWITCHYARD CENTERED LOSS OF   8.7E-003  +0.0E+000
ZV-LOOP-SW-LAMBDA       SEVERE WEATHER RELATED LOSS   3.0E-003  1.0E+000
```

```
                         SEQUENCE PROBABILITIES

          Truncation :  Cummulative : 100.0%  Individual :   1.0%

Event Tree Name                Sequence Name                  CCDP        %Cont
----------------------         -----------------------        ---------   -----
LOOP                           17                             1.2E-006
LOOP                           14                             1.1E-007
LOOP                           18-45                          4.3E-008
LOOP                           16                             3.8E-008
```

```
                              SEQUENCE LOGIC
Event Tree    Sequence Name                      Logic
-------------- -------------- -------------------------------------------------
LOOP           17             /RPS                      /EPS
                              EFW-L                      FAB-L

LOOP           14             /RPS                      /EPS
                              EFW-L                     /FAB-L
                              /OPR-06H                   HPR

LOOP           18-45          /RPS                       EPS
                              EFW-B                      OPR-01H
                              DGR-01H

LOOP           16             /RPS                      /EPS
                              EFW-L                     /FAB-L
                              OPR-06H                    HPR-L
```

```
 Fault Tree Name         Description
----------------------- -------------------------------------------------------
 DGR-01H                 OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 1 HOUR
 EFW-B                   SUMMER PWR B EMERGENCY FEEDWATER SYSTEM DURING SBO
 EFW-L                   SUMMER PWR B EMERGENCY FEEDWATER SYSTEM DURING LOOP
 EPS                     EMERGENCY POWER
 FAB-L                   FEED AND BLEED DURING LOOP
 HPR                     HIGH PRESSURE RECIRC
 HPR-L                   HIGH PRESSURE RECIRC
 OPR-01H                 OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 HOUR
```

```
    2004/12/21               16:57:15                    page    2
```

Attachment 5

```
OPR-06H                      OFFSITE POWER RECOVERY IN 6 HRS
RPS                          REACTOR SHUTDOWN
```

_____

```
            SEQUENCE CUT SETS

                 Truncation:  Cummulative: 100.0%  Individual:  1.0%

       Event Tree: LOOP                               CCDP:  1.2E-006
       Sequence:   17

    CCDP        % Cut Set                      Cut Set Events
  ---------    ---------    -------------------------------------------------
  1.2E-006       98.00      HPI-XHE-XM-FB

       Event Tree: LOOP                               CCDP:  1.1E-007
       Sequence:   14

    CCDP        % Cut Set                      Cut Set Events
  ---------    ---------    -------------------------------------------------
  9.7E-008       89.00      HPR-XHE-XM              /OEP-XHE-XL-NR06H
  2.6E-009        2.41      /OEP-XHE-XL-NR06H       RHR-MDP-CF-FSAB

       Event Tree: LOOP                               CCDP:  4.3E-008
       Sequence:   18-45

    CCDP        % Cut Set                      Cut Set Events
  ---------    ---------    -------------------------------------------------
  1.4E-008       32.02      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-CF-FRAB
  1.1E-008       24.48      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-FR-1A          EPS-DGN-FR-1B
  4.5E-009       10.41      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-TM-1A          EPS-DGN-FR-1B
  4.5E-009       10.41      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-TM-1B          EPS-DGN-FR-1A
  2.0E-009        4.62      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-FS-1A          EPS-DGN-FR-1B
  2.0E-009        4.62      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-FS-1B          EPS-DGN-FR-1A
  2.0E-009        4.57      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-CF-FSAB
  8.4E-010        1.97      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-TM-1B          EPS-DGN-FS-1A
  8.4E-010        1.97      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-DGN-TM-1A          EPS-DGN-FS-1B
  5.0E-010        1.16      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-XHE-XR-DGN1A       EPS-DGN-FR-1B
  5.0E-010        1.16      EPS-XHE-XL-NR01H       OEP-XHE-XL-NR01H
                            EPS-XHE-XR-DGN1B       EPS-DGN-FR-1A
```

Attachment 5

```
       Event Tree: LOOP                                      CCDP:  3.8E-008
       Sequence:   16

     CCDP        % Cut Set                      Cut Set Events
   ---------     ---------     -------------------------------------------------
   2.3E-008        61.34       HPR-XHE-XM                  OEP-XHE-XL-NR06H
   1.5E-009         3.90       OEP-XHE-XL-NR06H            EPS-DGN-FR-1A
                               RHR-MDP-TM-1B
   1.5E-009         3.90       OEP-XHE-XL-NR06H            EPS-DGN-FR-1B
                               RHR-MDP-TM-1A
   6.3E-010         1.66       OEP-XHE-XL-NR06H            RHR-MDP-CF-FSAB
   6.2E-010         1.62       OEP-XHE-XL-NR06H            EPS-DGN-FR-1A
                               CCW-HTX-TM-1B
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            BASIC EVENTS (Cut Sets Only)

   Event Name              Description                                Curr Prob
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   CCW-HTX-TM-1B           CCW HTX 1B UNAVAILABLE DUE TO T&M          2.5E-003
   EPS-DGN-CF-FRAB         DIESEL GENERATOR COMMON CAUSE FAILS TO RUN 5.9E-004
   EPS-DGN-CF-FSAB         DIESEL GENERATOR COMMON CAUSE FAILS TO START 8.4E-005
   EPS-DGN-FR-1A           DIESEL GENERATOR A FAILS TO RUN            2.1E-002
   EPS-DGN-FR-1B           DIESEL GENERATOR B FAILS TO RUN            2.1E-002
   EPS-DGN-FS-1A           DIESEL GENERATOR A FAILS TO START          4.0E-003
   EPS-DGN-FS-1B           DIESEL GENERATOR B FAILS TO START          4.0E-003
   EPS-DGN-TM-1A           DIESEL GENERATOR 1A UNAVAILABLE DUE TO T&M 9.0E-003
   EPS-DGN-TM-1B           DIESEL GENERATOR 1B UNAVAILABLE DUE TO T&M 9.0E-003
   EPS-XHE-XL-NR01H        OPERATOR FAILS TO RECOVER EMERGENCY DIESEL IN 8.4E-001
   EPS-XHE-XR-DGN1A        OPERATOR FAILS TO RESTORE DIESEL GENERATOR A 1.0E-003
   EPS-XHE-XR-DGN1B        OPERATOR FAILS TO RESTORE DIESEL GENERATOR B 1.0E-003
   HPI-XHE-XM-FB           OPERATOR FAILS TO INITIATE FEED AND BLEED COO 2.0E-002
   HPR-XHE-XM              OPERTATOR FAILS TO INITIATE HPR            2.0E-003
   OEP-XHE-XL-NR01H        OPERATOR FAILS TO RECOVER OFFSITE POWER IN 1 4.6E-001
   OEP-XHE-XL-NR06H        OPERATOR FAILS TO RECOVER OFFSITE POWER IN 6 2.0E-001
   RHR-MDP-CF-FSAB         COMMON CAUSE FAILURE OF RHR MDPS TO START  5.4E-005
   RHR-MDP-TM-1A           RHR MDP 1A UNAVAILABLE DUE TO TEST AND MAINTE 6.0E-003
   RHR-MDP-TM-1B           RHR MDP 1B UNAVAILABLE DUE TO TEST AND MAINTE 6.0E-003
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Attachment 5