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Your ref: Docket No. 52-006
Our ref: DCP/NRC1632

October 6, 2003

SUBJECT: Transmittal of Responses to AP1000 DSER Open Items

This letter transmits the Westinghouse responses to Open Items in the AP1000 Design Safety Evaluation Report (DSER). A list of the DSER Open Item responses transmitted with this letter is Attachment 1. The proprietary responses are transmitted as Attachment 2. The non-proprietary responses are provided as Attachment 3 to this letter.

The Westinghouse Electric Company Copyright Notice, Proprietary Information Notice, Application for Withholding, and Affidavit are also enclosed with this submittal letter as Enclosure 1. Attachment 2 contains Westinghouse proprietary information consisting of trade secrets, commercial information or financial information which we consider privileged or confidential pursuant to 10 CFR 2.790. Therefore, it is requested that the Westinghouse proprietary information attached hereto be handled on a confidential basis and be withheld from public disclosures.

This material is for your internal use only and may be used for the purpose for which it is submitted. It should not be otherwise used, disclosed, duplicated, or disseminated, in whole or in part, to any other person or organization outside the Commission, the Office of Nuclear Reactor Regulation, the Office of Nuclear Regulatory Research and the necessary subcontractors that have signed a proprietary non-disclosure agreement with Westinghouse without the express written approval of Westinghouse.

DOe3

October 6, 2003

Correspondence with respect to the application for withholding should reference AW-03-1717, and should be addressed to Hank A. Sepp, Manager of Regulatory Compliance and Plant Licensing, Westinghouse Electric Company, P.O. Box 355, Pittsburgh, Pennsylvania, 15230-0355.

Please contact me at 412-374-5355 if you have any questions concerning this submittal.

Very truly yours,



M. M. Corletti
Passive Plant Projects & Development
AP600 & AP1000 Projects

/Enclosure

1. Westinghouse Electric Company Copyright Notice, Proprietary Information Notice, Application for Withholding, and Affidavit AW-03-1717.

/Attachments

1. List of the AP1000 Design Certification Review, Draft Safety Evaluation Report Open Item Responses transmitted with letter DCP/NRC1632
2. Proprietary AP1000 Design Certification Review, Draft Safety Evaluation Report Open Item Responses dated October 6, 2003
3. Non-Proprietary AP1000 Design Certification Review, Draft Safety Evaluation Report Open Item Responses dated October 6, 2003

October 6, 2003

Attachment 1

List of

Proprietary and Non-Proprietary Responses

Table 1 "List of Westinghouse's Responses to DSER Open Items Transmitted in DCP/NRC1632"	
14.2.1.j Revision 1 14.2.10-1 Revision 2 15.2.7-1 Item 1 Revision 1 *15.2.7-1P Item 1 Revision 1 15.2.7-1 Item 12 *Proprietary	19.1.10.1-3 Revision 1 19.4-1 Revision 1

DCP/NRC1632
Docket No. 52-006

October 6, 2003

Enclosure 1

**Westinghouse Electric Company
Application for Withholding and Affidavit**



Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

October 6, 2003

AW-03-1717

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Mr. John Segala

**APPLICATION FOR WITHHOLDING PROPRIETARY
INFORMATION FROM PUBLIC DISCLOSURE**

SUBJECT: Transmittal of Westinghouse Proprietary Class 2 Documents Related to
AP1000 Design Certification Review Draft Safety Evaluation Report (DSER)
Open Item Response

Dear Mr. Segala:

The application for withholding is submitted by Westinghouse Electric Company, LLC ("Westinghouse") pursuant to the provisions of paragraph (b)(1) of Section 2.790 of the Commission's regulations. It contains commercial strategic information proprietary to Westinghouse and customarily held in confidence.

The proprietary material for which withholding is being requested is identified in the proprietary version of the subject documents. In conformance with 10 CFR Section 2.790, Affidavit AW-03-1717 accompanies this application for withholding setting forth the basis on which the identified proprietary information may be withheld from public disclosure.

Accordingly, it is respectfully requested that the subject information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to this application for withholding or the accompanying affidavit should reference AW-03-1717 and should be addressed to the undersigned.

Very truly yours,

A handwritten signature in cursive script, reading 'M. M. Corletti'.

M. M. Corletti
Passive Plant Projects & Development
AP600 & AP1000 Projects

/Enclosures

COMMONWEALTH OF PENNSYLVANIA:

ss

COUNTY OF ALLEGHENY:

Before me, the undersigned authority, personally appeared James W. Winters, who, being by me duly sworn according to law, deposes and says that he is authorized to execute this Affidavit on behalf of Westinghouse Electric Company, LLC ("Westinghouse"), and that the averments of fact set forth in this Affidavit are true and correct to the best of his knowledge, information, and belief.



A handwritten signature of James W. Winters in black ink.

James W. Winters, Manager
Passive Plant Projects & Development
Nuclear Power Plants Business Unit

Sworn to and subscribed
before me this 6th day
of October, 2003

A handwritten signature of Kay E. Gongaware in black ink, written over a horizontal line.
Notary Public

Notarial Seal
Kay E. Gongaware, Notary Public
Monroeville Boro, Allegheny County
My Commission Expires Feb. 7, 2005
Member, Pennsylvania Association of Notaries

- (1) I am Acting Manager, Passive Plant Projects & Development, of the Westinghouse Electric Company LLC ("Westinghouse"), and as such, I have been specifically delegated the function of reviewing the proprietary information sought to be withheld from public disclosure in connection with nuclear power plant licensing and rulemaking proceedings, and am authorized to apply for its withholding on behalf of the Westinghouse Electric Company, LLC.
- (2) I am making this Affidavit in conformance with the provisions of 10 CFR Section 2.790 of the Commission's regulations and in conjunction with the Westinghouse application for withholding accompanying this Affidavit.
- (3) I have personal knowledge of the criteria and procedures utilized by the Westinghouse Electric Company, LLC in designating information as a trade secret, privileged or as confidential commercial or financial information.
- (4) Pursuant to the provisions of paragraph (b)(4) of Section 2.790 of the Commission's regulations, the following is furnished for consideration by the Commission in determining whether the information sought to be withheld from public disclosure should be withheld.

 - (i) The information sought to be withheld from public disclosure is owned and has been held in confidence by Westinghouse.
 - (ii) The information is of a type customarily held in confidence by Westinghouse and not customarily disclosed to the public. Westinghouse has a rational basis for determining the types of information customarily held in confidence by it and, in that connection, utilizes a system to determine when and whether to hold certain types of information in confidence. The application of that system and the substance of that system constitutes Westinghouse policy and provides the rational basis required.

Under that system, information is held in confidence if it falls in one or more of several types, the release of which might result in the loss of an existing or potential competitive advantage, as follows:

- (a) The information reveals the distinguishing aspects of a process (or component, structure, tool, method, etc.) where prevention of its use by any of Westinghouse's competitors without license from Westinghouse constitutes a competitive economic advantage over other companies.
- (b) It consists of supporting data, including test data, relative to a process (or component, structure, tool, method, etc.), the application of which data secures a competitive economic advantage, e.g., by optimization or improved marketability.
- (c) Its use by a competitor would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing a similar product.
- (d) It reveals cost or price information, production capacities, budget levels, or commercial strategies of Westinghouse, its customers or suppliers.
- (e) It reveals aspects of past, present, or future Westinghouse or customer funded development plans and programs of potential commercial value to Westinghouse.
- (f) It contains patentable ideas, for which patent protection may be desirable.

There are sound policy reasons behind the Westinghouse system which include the following:

- (a) The use of such information by Westinghouse gives Westinghouse a competitive advantage over its competitors. It is, therefore, withheld from disclosure to protect the Westinghouse competitive position.
- (b) It is information which is marketable in many ways. The extent to which such information is available to competitors diminishes the Westinghouse ability to sell products and services involving the use of the information.

- (c) Use by our competitor would put Westinghouse at a competitive disadvantage by reducing his expenditure of resources at our expense.
 - (d) Each component of proprietary information pertinent to a particular competitive advantage is potentially as valuable as the total competitive advantage. If competitors acquire components of proprietary information, any one component may be the key to the entire puzzle, thereby depriving Westinghouse of a competitive advantage.
 - (e) Unrestricted disclosure would jeopardize the position of prominence of Westinghouse in the world market, and thereby give a market advantage to the competition of those countries.
 - (f) The Westinghouse capacity to invest corporate assets in research and development depends upon the success in obtaining and maintaining a competitive advantage.
- (iii) The information is being transmitted to the Commission in confidence and, under the provisions of 10 CFR Section 2.790, it is to be received in confidence by the Commission.
 - (iv) The information sought to be protected is not available in public sources or available information has not been previously employed in the same original manner or method to the best of our knowledge and belief.
 - (v) The proprietary information sought to be withheld in this submittal is that which is appropriately marked in Attachment 2 as Proprietary Class 2 in the Westinghouse Electric Co., LLC document: (1) "AP1000 Design Certification Review, Draft Safety Evaluation Report Open Item Response."

This information is being transmitted by Westinghouse's letter and Application for Withholding Proprietary Information from Public Disclosure, being transmitted by Westinghouse Electric Company letter AW-03-1717 to the Document Control Desk, Attention: John Segala, CIPM/NRLPO, MS O-4D9A.

This information is part of that which will enable Westinghouse to:

- (a) Provide documentation supporting determination of APP-GW-GL-700, "AP1000 Design Control Document," analysis on a plant specific basis**
- (b) Provide the applicable engineering evaluation which establishes the Tier 2 requirements as identified in APP-GW-GL-700.**

Further this information has substantial commercial value as follows:

- (a) Westinghouse plans to sell the use of similar information to its customers for purposes of meeting NRC requirements for Licensing Documentation.**
- (b) Westinghouse can sell support and defense of AP1000 Design Certification.**

Public disclosure of this proprietary information is likely to cause substantial harm to the competitive position of Westinghouse because it would enhance the ability of competitors to provide similar methodologies and licensing defense services for commercial power reactors without commensurate expenses. Also, public disclosure of the information would enable others to use the information to meet NRC requirements for licensing documentation without purchasing the right to use the information.

The development of the technology described in part by the information is the result of applying the results of many years of experience in an intensive Westinghouse effort and the expenditure of a considerable sum of money.

In order for competitors of Westinghouse to duplicate this information, similar technical programs would have to be performed and a significant manpower effort, having the requisite talent and experience, would have to be expended for performing and analyzing tests.

Further the deponent sayeth not.

October 6, 2003

Copyright Notice

The documents transmitted herewith each bear a Westinghouse copyright notice. The NRC is permitted to make the number of copies for the information contained in these reports which are necessary for its internal use in connection with generic and plant-specific reviews and approvals as well as the issuance, denial, amendment, transfer, renewal, modification, suspension, revocation, or violation of a license, permit, order, or regulation subject to the requirements of 10 CFR 2.790 regarding restrictions on public disclosure to the extent such information has been identified as proprietary by Westinghouse, copyright protection notwithstanding. With respect to the non-proprietary versions of these reports, the NRC is permitted to make the number of copies beyond these necessary for its internal use which are necessary in order to have one copy available for public viewing in the appropriate docket files in the public document room in Washington, DC and in local public document rooms as may be required by NRC regulations if the number of copies submitted is insufficient for this purpose. Copies made by the NRC must include the copyright notice in all instances and the proprietary notice if the original was identified as proprietary.

October 6, 2003

PROPRIETARY INFORMATION NOTICE

Transmitted herewith are proprietary and/or non-proprietary versions of documents furnished to the NRC in connection with requests for generic and/or plant-specific review and approval.

In order to conform to the requirements of 10 CFR 2.790 of the Commission's regulations concerning the protection of proprietary information so submitted to the NRC, the information which is proprietary in the proprietary versions is contained within brackets, and where the proprietary information has been deleted in the non-proprietary versions, only the brackets remain (the information that was contained within the brackets in the proprietary versions having been deleted). The justification for claiming the information so designated as proprietary is indicated in both versions by means of lower case letters (a) through (f) located as a superscript immediately following the brackets enclosing each item of information being identified as proprietary or in the margin opposite such information. These lower case letters refer to the types of information Westinghouse customarily holds in confidence identified in Sections (4)(ii)(a) through (4)(ii)(f) of the affidavit accompanying this transmittal pursuant to 10 CFR 2.790(b)(1).

Westinghouse Non-Proprietary Class 3

**DCP/NRC1632
Docket No. 52-006**

October 6, 2003

Attachment 3

**AP1000 Design Certification Review
Draft Safety Evaluation Report Open Item Non-Proprietary Responses**

AP1000 DESIGN CERTIFICATION REVIEW

Draft Safety Evaluation Report Open Item Response

DSER Open Item Number: 14.2-1.J Revision 1

Original RAI Number(s): None

Summary of Issue:

14.2.9.1.1 Reactor Coolant System Testing

The list in the "Purpose" section of reactor coolant system (RCS) safety-related and defense-in-depth functions to be verified during the RCS preoperational test is not complete. For example, it does not include Integrated System Test stated in Regulatory Guide 1.68, Appendix A, Item 1.a, Reactor Coolant System. It also does not include many safety functions of the RCS described in DCD Tier 1, Section 2.1.2, Item 8 of Design Description of the Reactor Coolant system, such as pressurizer safety valves for overpressure protection; the reactor coolant pumps rotating inertia providing RCS flow coastdown on loss of power; the RCP flywheel assembly being able to withstand a design overspeed condition; the automatic depressurization system providing automatic depressurization during design basis events; and the RCS providing emergency letdown during design basis event.

In addition, there is a mismatch between the RCS functions described in the "Purpose" section and the scope of tests described in the "General Test Method and Acceptance Criteria" section for verification of these functions. Many RCS functions to be verified are not covered by the RCS preoperational tests abstract.

Please provide a complete list of important RCS functions to be verified during the preoperational tests, and a corresponding test abstract, including acceptance criteria, for verification of each of these functions.

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Draft Safety Evaluation Report Open Item Response

Westinghouse Response:

The complete set of important high-level RCS functions to be verified during the preoperational testing program are described in 14.2.9.1.1 under the Purpose heading. The individual functions identified in this open item support the higher level functions identified in 14.2.9.1.1 and are identified in various sections of Chapter 14. The attached matrix provides a cross-reference of the functions identified in this open item to the test abstracts discussed in the AP1000 DCD. The individual test abstracts identified in the table below provide the acceptance criteria for each test.

Function Discussed in Open Item	RCS High Level-Function Listed in 14.2.9.1.1	Test Abstract
Integrated System Test	NA	14.2.9.1.1 Items m through r
Pressurizer safety valves for overpressure protection	Reactor Coolant Pressure Boundary function	14.2.9.1.1 Item c
Reactor coolant pump rotating inertia	Core cooling	14.2.10.1.18 (Pre-critical test)
RCP flywheel assembly being able to withstand design overspeed condition	Reactor Coolant Pressure Boundary function	NA – this test is not conducted as part of the pre-operational test program but is performed by the pump vendor prior to pump delivery to the site.
Automatic depressurization system testing	Core Cooling	14.2.9.1.3 Item b, d, p, q, s, t
Emergency letdown	Core cooling	14.2.9.1.1 Item i

NRC Follow-on Comment:

The Westinghouse response, letter reference DCP/NRC1615, dated August 26, 2003, provided a table with a cross reference matrix to functions discussed in open item 14.2-1j. Since there is a mismatch between the Reactor Coolant System (RCS) safety-related functions described in the "Purpose" Section and the "General Test Methods and Acceptance Criteria" Section of Test Abstract 14.2.9.1.1, "Reactor Coolant System Testing," please expand the table with the cross reference matrix to include all test functions listed in the test abstract "Purpose" Section.

Westinghouse Additional Response:

The following table addresses the follow-on comment:

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14.2.9.1.1 RCS Functions Listed In "Purpose" Section	14.2.9.1.1 "RCS Tests Listed In General Test Methods and Acceptance Criteria"
Provide reactor coolant system pressure boundary integrity as described in Section 5.2	(a) (b) (c) (d) (e) (f)
Provide core cooling and boration in conjunction with the passive core cooling system as described in Sections 5.1 and 6.3	(b)
Measure process parameters required for safety-related actuations and safe shutdown as described in Sections 7.2, 7.3 and 7.4	(g) (h)
Measure selected process parameters required for post-accident monitoring as described in Section 7.5	(g)
Vent the reactor vessel head as discussed in subsection 5.4.12	(i)
Provide forced circulation cooling of the reactor core in conjunction with heat removal by the steam generator(s) as described in Section 5.1	(l) (m) (n)
Provide core cooling by natural circulation of coolant in conjunction with heat removal by the steam generator(s) as described in Section 5.1	14.2.10.3.6
In conjunction with the steam generator(s) and normal residual heat removal system, provide the capability to remove core decay heat and cool the reactor coolant to permit the reactor to be refueled and started up in a controlled manner	(l) (r)
Provide pressurizer pressure control during normal operation	(k) (p)
Provide pressurizer level control in conjunction with the chemical and volume control system	(k) (q)
Provide pressurizer spray	(j) (k) (o)

DCD Revision

None

PRA Revision

None

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Draft Safety Evaluation Report Open Item Response

DSER Open Item Number: 14.2.10-1 (Response Revision 2)

Original RAI Number(s): 261.009, 261.016

Summary of Issue:

RG 1.68, Appendix A, Item 4.c recommends performance of pseudo-rod ejection testing to verify calculation models and accident analysis assumptions during low power testing. The NRC staff could not locate an AP1000 low power test abstract that describes this testing. In RAI 261.009, the NRC staff requested that the applicant provide additional information regarding the performance of pseudo-rod ejection testing for the AP1000 design. In their November 13, 2002, RAI response, the applicant stated that sufficient test data has been obtained from previous plant startups and that licensees of new plants need only to confirm calculational models. The applicant also provided several licensing precedents associated with this position.

The NRC staff lacked sufficient information to accept the applicant's position regarding performance of low power pseudo-rod ejection testing. As described in the staff evaluation of RAI 261.007b, Item 2, below, the NRC staff requested that the applicant provide additional information relating to the conduct of pseudo-rod ejection testing. This request for additional information is identified as RAI 261.016. Pending resolution of RAI 261.016 and RAI 261.009, this is Open Item 14.2.10-1.

Westinghouse Response:

The responses to RAI 261.009 Rev. 0 and RAI 261.016 Rev. 0 were transmitted to the NRC via DCP/NRC1532 dated 11/15/02 and DCP/NRC1588 dated 05/13/03, respectively.

NRC Additional Comments:

Westinghouse should provide more of a basis for why the pseudo-rod-ejection test is performed at the 30 to 50% power range.

Westinghouse Additional Response: (Completely Revised In Revision 2)

The guidance of RG 1.68 item 4.c states that the pseudo-rod-ejection test should be performed at low power (less than 5%) to verify calculations models and accident analysis assumptions.

The guidance of RG 1.68 item 5e states that the pseudo-rod-ejection test should be performed at greater than 10% power. The guidance also states that this test need not be repeated for facilities using calculation models and designs identical to prototype facilities.

As advised in previous responses, for AP1000, pseudo-rod-ejection testing is performed in the 30% to 50% power range as per DCD section 14.2.10.4.6, "Rod Cluster Control Assembly Out of Bank Measurements". This testing is performed on the first plant only, which meets the guidance of RG 1.68 item 5e -- i.e. at greater than 10% power and need not be repeated for

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Draft Safety Evaluation Report Open Item Response

facilities using calculation models and designs identical to prototype facilities (in the case of AP1000, the first unit).

However, testing is not performed at low power (i.e. not consistent with RG 1.68 item 4.c) because Westinghouse has amassed sufficient data from the low power operation of operating plants to conclude that the Westinghouse nuclear physics codes are established nuclear design tools with validated performance records. Thus, there is no need to re-verify calculations models and accident analysis assumptions at low power. As the amassed data was obtained under conditions outside of the control of Westinghouse, it cannot be included in a WCAP but is available in a Westinghouse letter, "Core Physics Code Validation, PGD-82-109 dated March 16, 1982", which is proprietary. A copy of PGD-82-109 will be made available for viewing in the Westinghouse offices in Rockville, MD. The abstract and page 32 apply to this open item.

Design Control Document (DCD) Revision:

None

PRA Revision:

None

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Draft Safety Evaluation Report Open Item Response

DSER Open Item Number: 15.2.7-1 Item 1 Revision 1

Original RAI Number(s): None

Summary of Issue:

Westinghouse used selected G1 and G2 full-scale boil-off tests at pressure and power levels, which are prototypic of AP1000 conditions, to validate the WCOBRA/TRAC core model. The validation also determined, via sensitivity studies, that it was necessary to apply a corrective multiplier of 0.8 to the interfacial drag model to accurately predict the average core void fraction. However, Westinghouse stated that in the AP1000 DEDVI event during LTC, the average core exit quality is always less than 50%. This flow regime is quite different than the boil-off scenarios of the G1 and G2 tests. In the boil-off mode the exit quality is approximately 1.0.

Justify the applicability of the G1 and G2 tests to the AP1000 LTC conditions for use in validating the WCOBRA/TRAC results, and justify the validity of the corrective multiplier that was determined from benchmarks against the G1 and G2 tests for the AP1000 LTC model.

Westinghouse Response:

The WCOBRA/TRAC validation presented in response to DSER Open Item 15.2.7-1 and discussed in the Revision 1 of WCAP-15644-P was extended by including the simulation of the post-quench phase for FLECHT-SEASET Run 31805. This is a 0.8 in/sec forced reflood experiment at 40 psia. During the test, the bundle is gradually quenched from bottom up. The experiment was continued for a time period following the bundle quenching time (~ 700 seconds) and useful data was collected during that period which was used to assess the WCOBRA/TRAC interfacial drag model. The conditions at 700 seconds are the following:

Pressure = 40 psia
Average Linear Power = 0.22 kW/ft
Inlet Flow = 0.81 in/sec
Inlet Subcooling = 143 F

Once the bundle is quenched, a quasi-steady state is reached and the exit quality can be calculated from an energy balance by knowing the inlet flow and inlet subcooling. At 700 seconds the exit quality for this test was estimated to be equal to 50%. Therefore flow conditions at the top of the bundle are similar to the AP1000.

The FLECHT-SEASET test was simulated using WCOBRA/TRAC. The FLECHT-SEASET model is the same utilized for the validation of the Westinghouse WCOBRA/TRAC LBLOCA model and is discussed in WCAP-12945-P-A. The 12 ft heated section is divided in 14 axial nodes, which is consistent with G1 and G2 modeling guidelines discussed in the Revision 1 of WCAP-15644-P.

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The simulation was repeated using both the base interfacial drag model ($YDRAG=1.0$) and setting the multiplier $YDRAG$ to 0.8 similar to the G1/G2 assessment.

The bundle is predicted to quench at about 650 seconds. Figure 1 shows the predicted collapsed liquid levels obtained with the base model ($YDRAG=1.0$). The two levels correspond to the inner and outer channels modeling the heated section. The levels are plotted in the time period which follows the reflood phase. After the bundle is quenched a quasi-steady state is reached where the collapsed liquid level slowly increases during the transient. The predicted collapsed liquid level is slightly higher in the periphery of the bundle than in the central region. On the average at 700 seconds, when the bundle is quenched, the collapsed liquid level is about 6.5 ft. This value was found to be in good agreement with the observation. The measured collapsed liquid level at 700 seconds is 6.44 ft.

The same calculation was repeated with $YDRAG$ set to 0.8. Figure 2 shows that there is a small effect on the collapsed liquid level. Consistent with a reduction in interfacial drag the predicted collapsed liquid level is higher than the base case as more water is retained in the bundle, however the effect is small.

In conclusion, based on the results from the previous code validation against G1 and G2 experiments and additional results presented herein the WCOBRA/TRAC interfacial drag model is found to be adequate to model the AP1000 LTC conditions.

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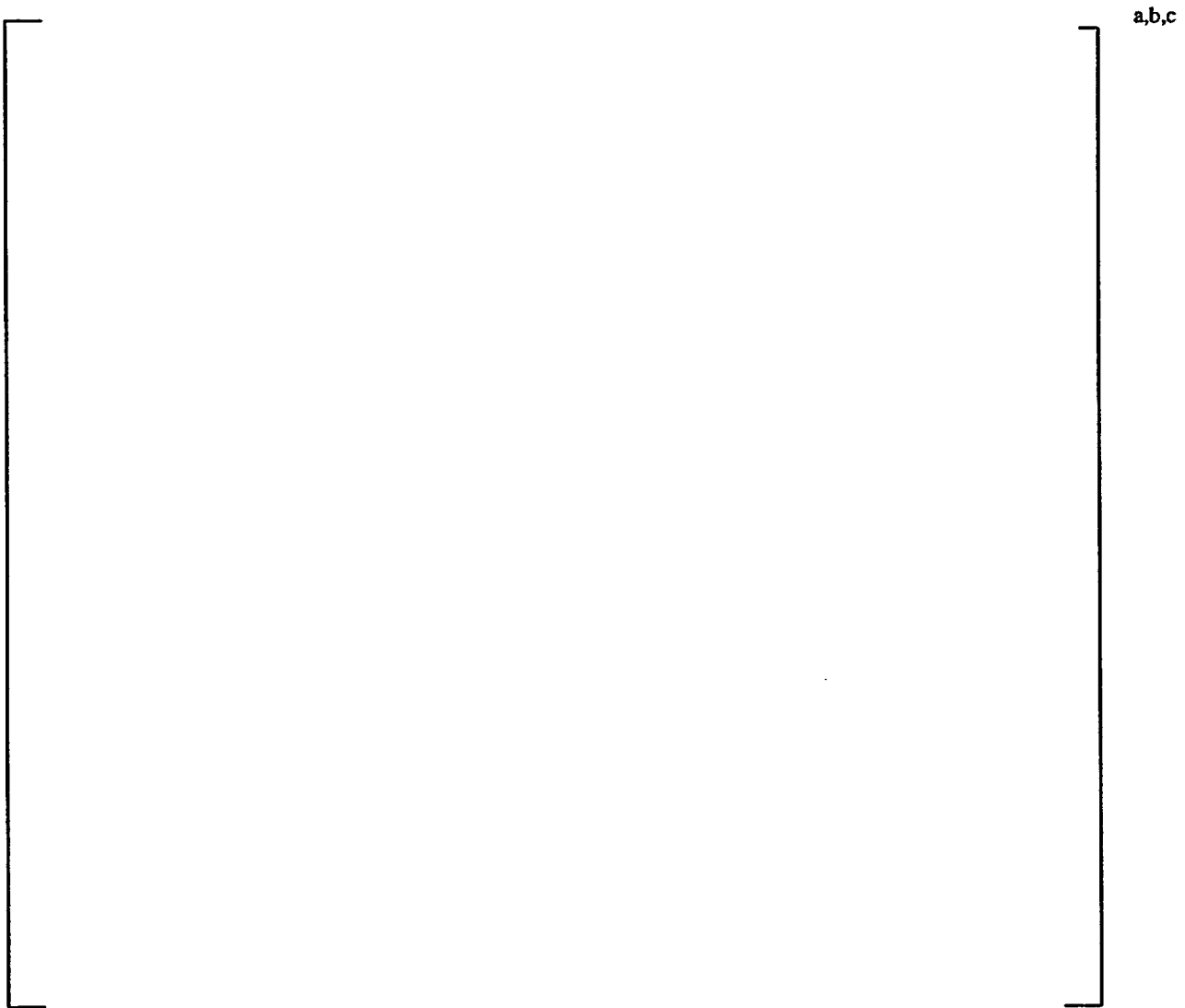


Figure 1

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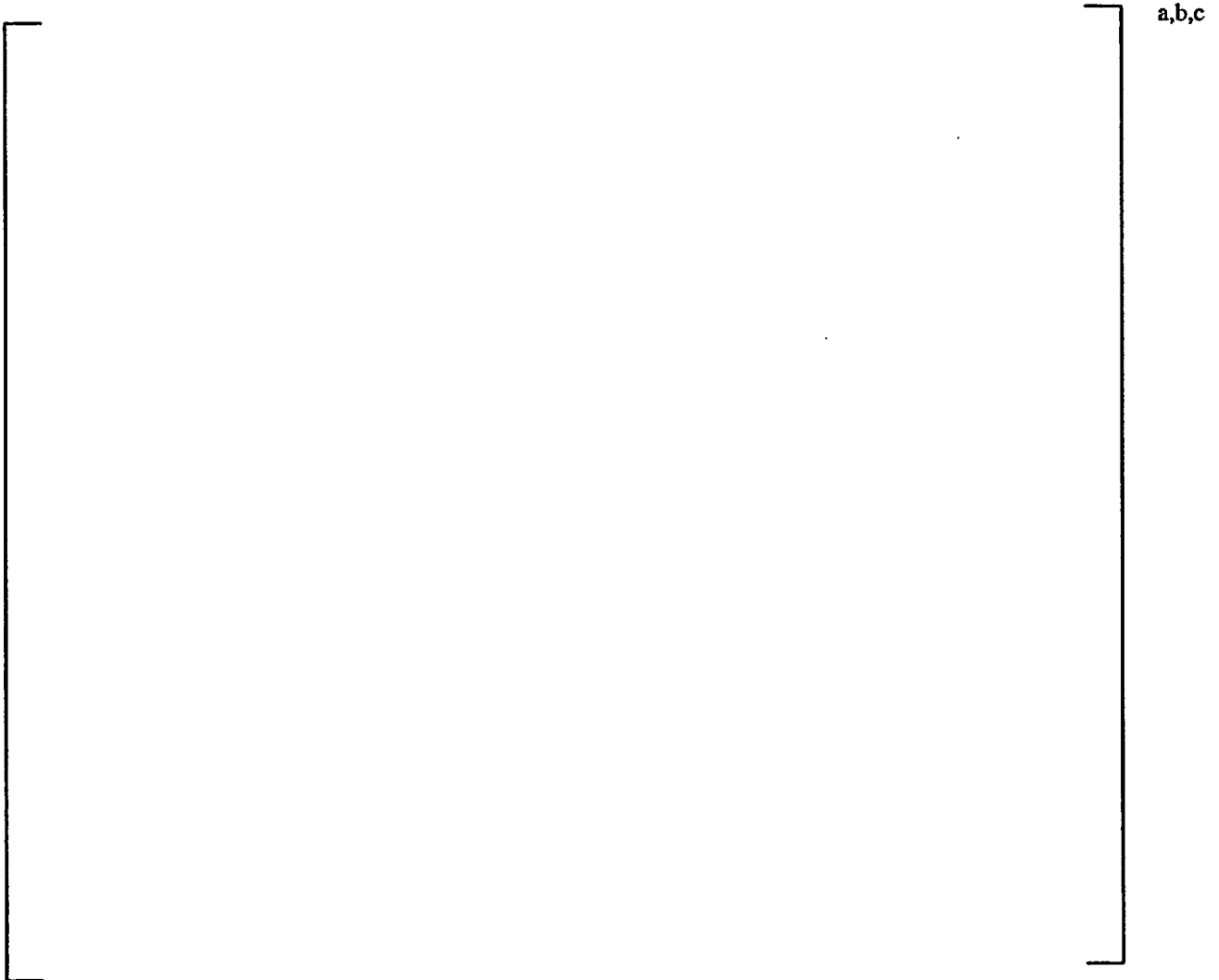


Figure 2

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Design Control Document (DCD) Revision:

None

PRA Revision:

None

NRC Additional Comment:

At the meeting held at the NRC on October 2, 2003, the staff requested additional data used in the AP1000 level swell evaluation. The information requested is provided in Attachment 1.

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ATTACHMENT 1

Figure 1



a,b,c

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ATTACHMENT 1

Figure 2

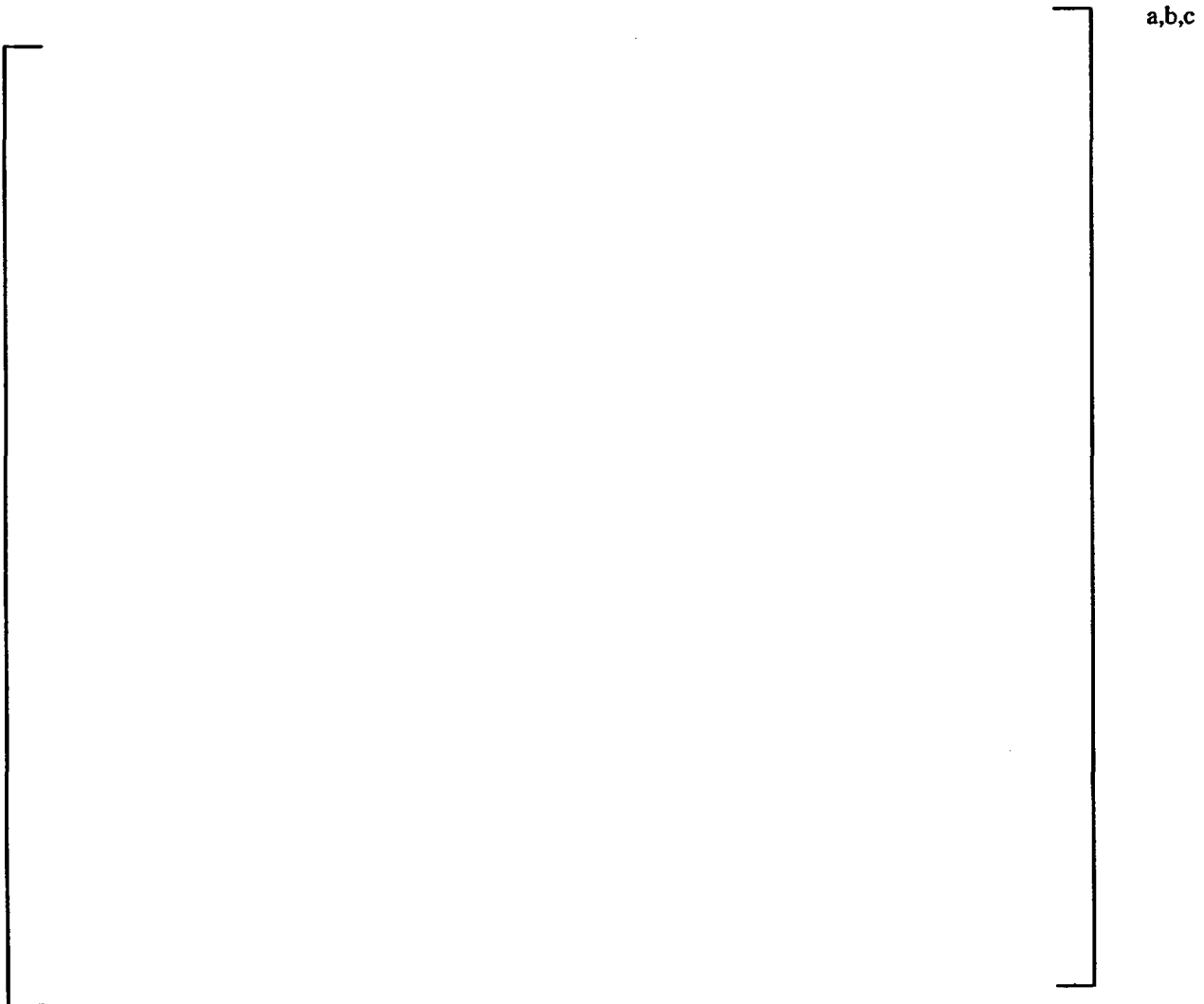
a,b,c

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ATTACHMENT 1

Figure 3



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ATTACHMENT 1 Figure 4

a,b,c

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ATTACHMENT 1 Figure 5

a,b,c

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ATTACHMENT 1 Figure 6



Draft Safety Evaluation Report Open Item Response

Table 1: Pertinent Test Results & Calculations of V_{gl}

a,c



10/06/2003

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DSER Open Item Number: 15.2.7-1 Item 12

Original RAI Number(s): None

Summary of Issue:

Please provide the following information regarding the boron concentration analysis given in DCP/NRC1612 entitled "Transmittal of Westinghouse Response to Boron Precipitation during LTC Phase" dated August 15, 2003:

- A. ADS-4 quality and liquid mass flow rate versus time used to generate Fig. 5.
- B. RCS injection mass flow rate versus time for the analysis in Fig. 5 (CMTs, accumulators, IRWST, and Sump).
- C. Core inlet mass flow rate and fluid temperature versus time for Fig. 5
- D. A plot of the core exit steaming mass flow rate versus time from Fig. 5.
- E. Hot leg void fraction versus time
- F. Core exit void fraction versus time

Westinghouse Response:

As discussed in our 8/15/03 response, the T/H analysis that supports the results shown in Fig 5 are taken from two sources. The detailed WCOBRA-TRAC LTC analysis provided in the DCD (subsection 15.6.5.4C) is used for the first 3.5 hours and a simplified hand calculation model is used after that time. Note that the WCOBRA-TRAC analysis covers the limiting time for peak core boron concentration.

The detailed WCOBRA-TRAC LTC analysis results, using the large-LOCA like core nodding, are shown in the DCD revision 7 (subsection 15.6.5.4C). This analysis is carried out for 12,500 sec (~3.5 hr), until quasi-steady-state recirculation conditions are established. These results show that the average ADS 4 vent quality increases from below 40% at the start of IRWST injection to below 50% at the end of IRWST injection. The ADS 4 vent quality then trends downward, reaching 43% at 12,500 sec. Attached are plots of the information requested. Note that these plots use smoothing techniques so that it is easy to read the average values. The times start at the beginning of the WCOBRA-TRAC analysis phase which is 2500 sec after the accident; a time of 10,000 sec on one of these plots is 12,500 sec transient time.

The simplified analysis used in the longer-term assumes steady-state conditions, such that the RCS injection, core inlet / outlet and ADS 4 vent flows are all equal. The core inlet temperature vs time is shown on Fig 5 of our 8/15/03 response. The simplified model is applied at fixed times such that the results at any time are independent of the calculations at other times. For the purposes of determining the plant performance after the end of the detailed WCOBRA-TRAC analysis (at 3.5 hr) only a few times are required to follow the slowly changing conditions. The plant conditions change slowly during recirc because the injection supply is essentially constant and the decay heat is slowly decreasing. Note that in the core boron concentration calculations,

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some margin has been added to the ADS 4 vent qualities; for example at 6 hour the simplified model calculates a ADS 4 vent quality of 34.5%, however 40% is used in the core boron calculations.

The following table provides results from the simplified model:

Times (hr)	ADS 4 Quality (%)	Inject (lb/sec)	ADS 4 Liq (lb/sec)	Core Exit Steam (lb/sec)	Core Exit Void	HL Void
3.0	38.0%	84.9	52.6	31.2	0.997	0.57
6.0	34.5%	89.0	58.3	29.6	0.997	0.56
12.0	26.4%	93.4	68.7	23.5	0.995	0.45

The following table shows the ASD 4 vent quality used in calculating the core boron concentration (listed under "Max") as compared with the results from WCOBRA-TRAC and the simplified model.

Time (hr)	(day)	ADS 4 Vent Quality		
		Max	WCT	Simplified
0	-	60.0%	41%	-
3	-	60.0%	46%	38.0%
12	0.5	29.0%	-	26.4%
24	1.0	21.9%	-	21.9%
-	3.0	14.7%	-	14.7%
-	7.0	10.7%	-	10.7%
-	14.0	7.7%	7.5%	7.7%
-	30.0	5.0%	-	5.0%

Design Control Document (DCD) Revision:

None

PRA Revision:

None

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DEDVI Break LTC Transient Plots

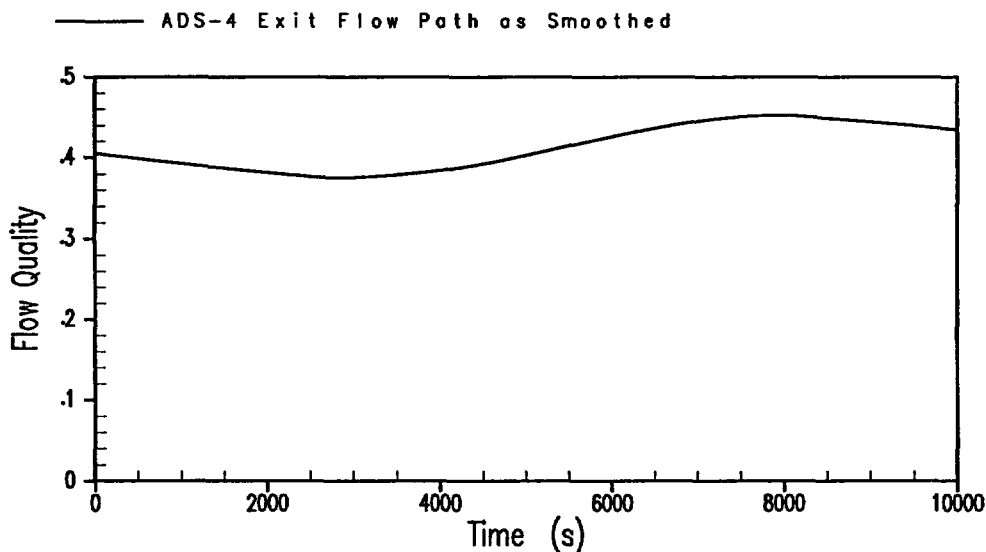


Figure 15.2.7-1-1 ADS 4 Flow Quality

DEDVI Break LTC Transient Plots

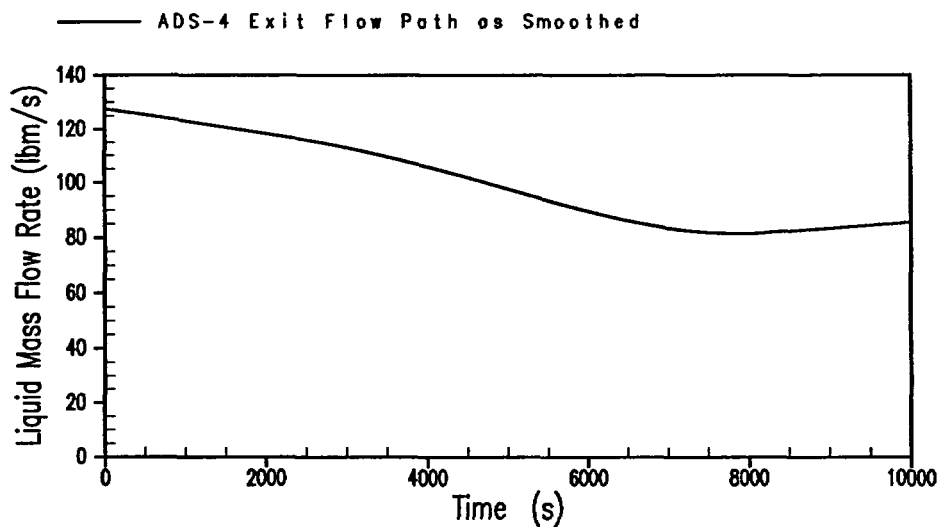


Figure 15.2.7-1-2 ADS-4 Liquid Mass Flow Rate

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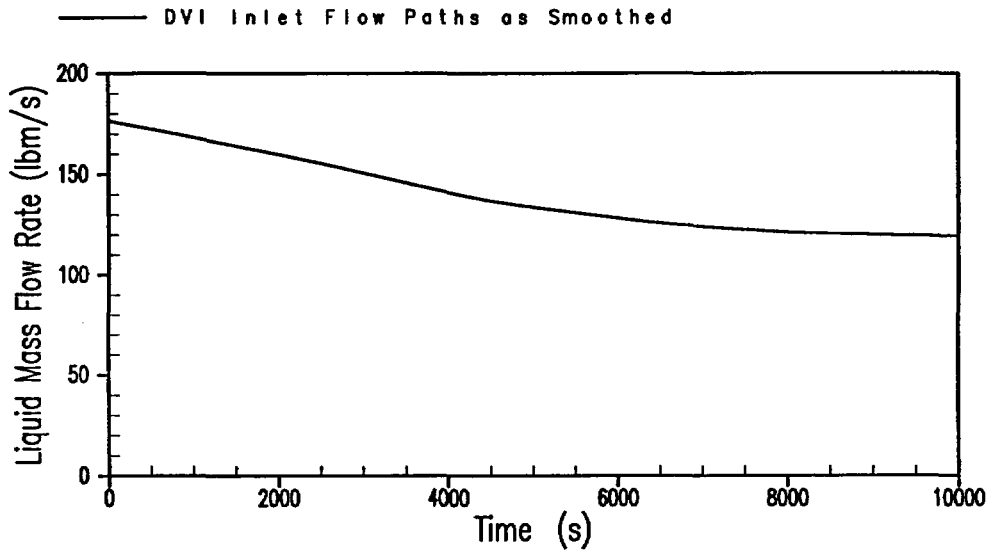


Figure 15.2.7-1-3 DVI Injection Flow

DEDVI Break LTC Transient Plots

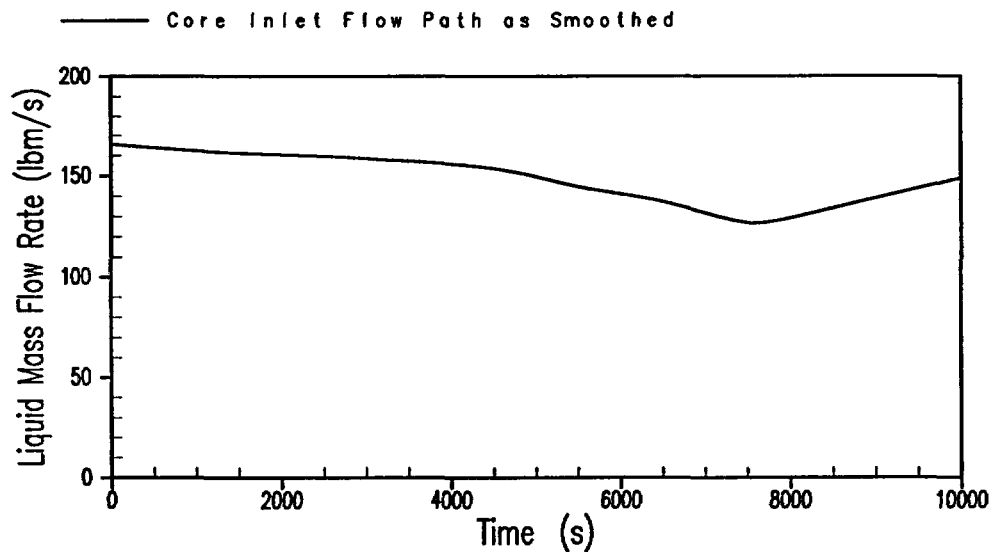


Figure 15.2.7-1-4 Core Inlet Flow

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DEDVI Break LTC Transient Plots

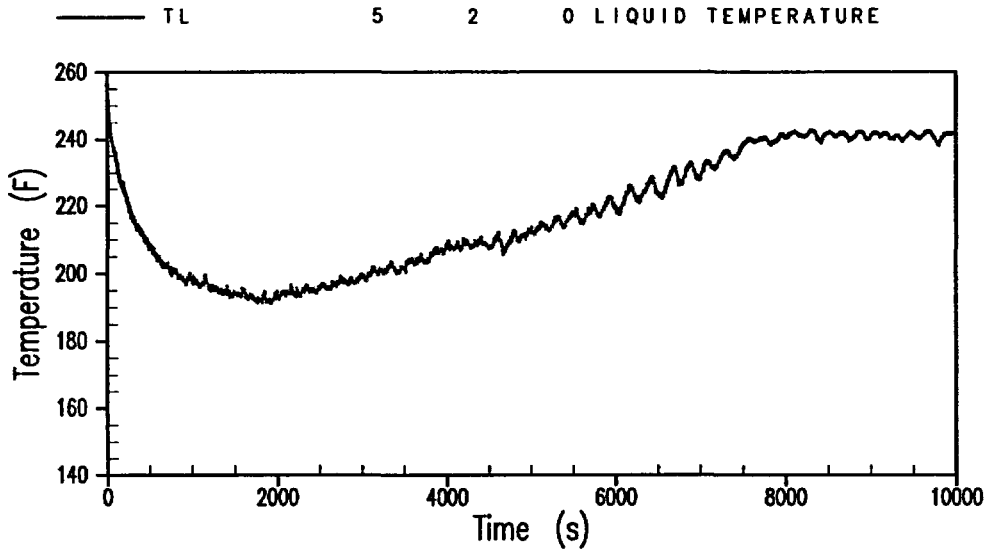


Figure 15.2.7-1-5 Core Inlet Temperature

DEDVI Break LTC Transient Plots

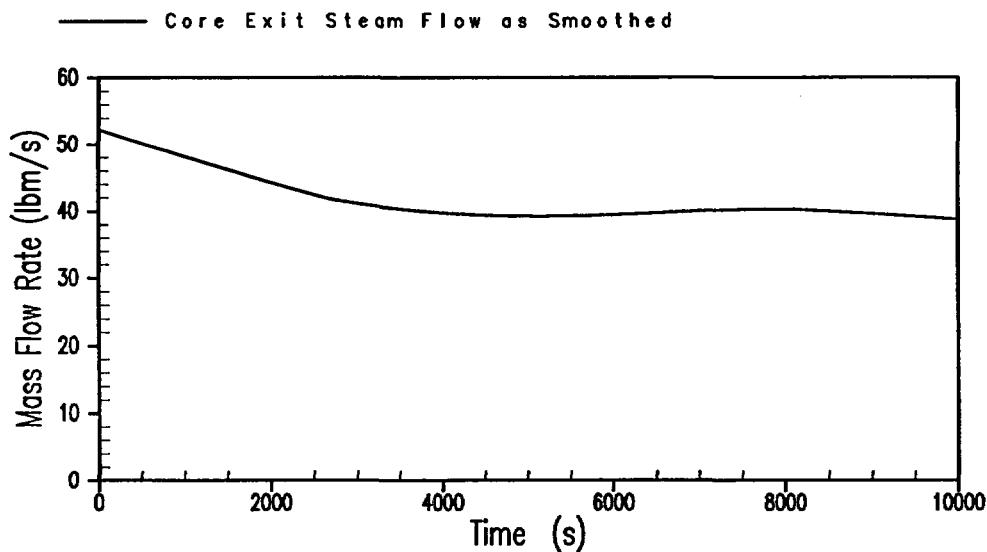


Figure 15.2.7-6 Core Exit Steam Flow

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DEDVI Break LTC Transient Plots

—	MTH00083	24	2	0 VAPOR FRACTION
- - -	MTH00084	24	3	0 VAPOR FRACTION
- - - - -	MTH00085	24	4	0 VAPOR FRACTION

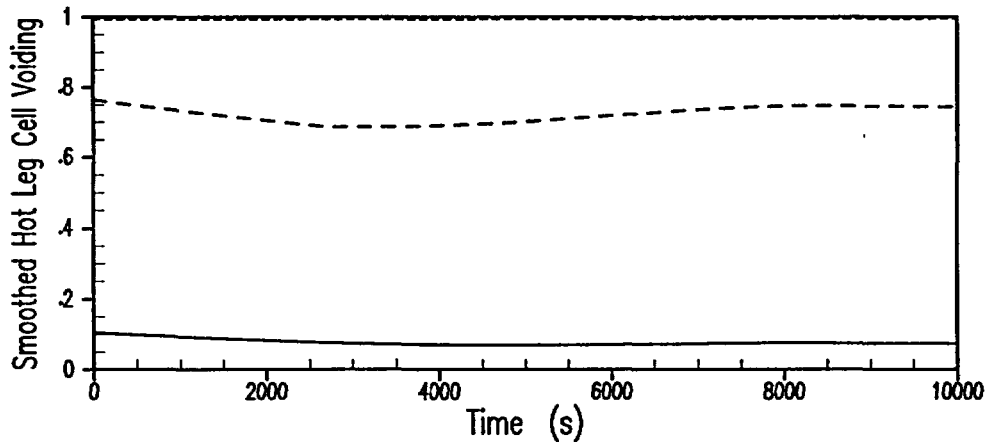


Figure 15.2.7-1-7 Hot Leg Void Fraction

DEDVI Break LTC Transient Plots

—	MTH00098	10	18	0 VAPOR FRACTION
---	----------	----	----	------------------

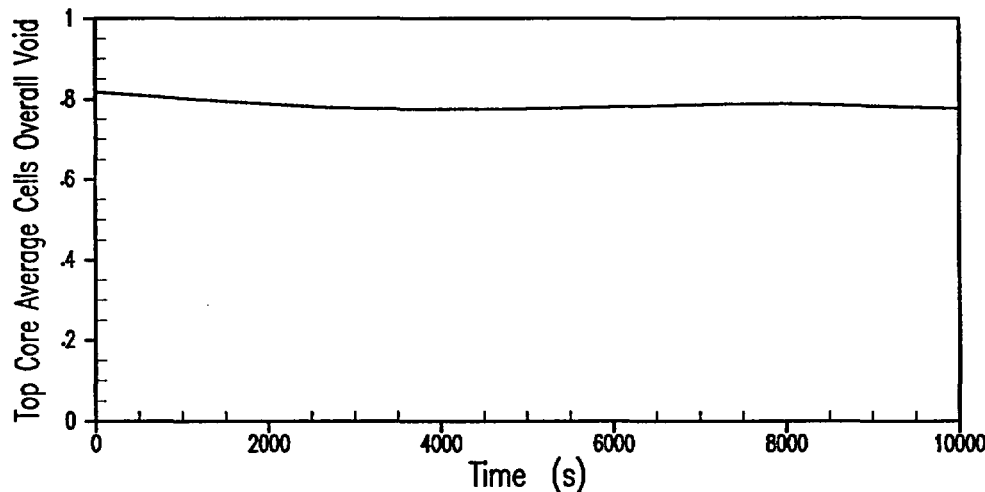


Figure 15.2.7-1-8 Top Core Void Fraction

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DSER Open Item Number: 19.1.10.1-3 Response Revision 1

Original RAI Number(s): 720.039, 720.027, 720.030

Summary of Issue: PRA Input to RTNSS Process

Furthermore, the staff review found that the issue of uncertainties (e.g., those associated with the assumed reliability values for passive system components) had not been addressed. Staff sensitivity studies have shown that the "focused" PRA results (e.g., CDF and LRF) are sensitive to the reliability values used in the PRA for certain passive system components which have significant uncertainties associated with them. The results of such sensitivity studies have shown that when more bounding data are used in the PRA in order to address uncertainties, both probabilistic criteria are met only when credit is taken for some additional non-safety-related "defense-in-depth" systems. Therefore, the need for regulatory oversight of certain SSCs has been determined and is discussed below and in Chapter 22 of this report.

The results of the uncertainty and importance analyses were used to select SSCs for sensitivity studies. These analyses indicated that the following SSCs have the largest impact on PRA results, such as CDF and LRF, used in the criteria for selecting non-safety-related SSCs for regulatory oversight according to the RTNSS process:

- reactor trip components, such as circuit breakers
- ESF actuation components, such as software
- passive system check valves and explosive (squib) valves

A series of sensitivity studies were performed by the staff to investigate the impact of uncertainties in the performance of these SSCs on PRA results, under the assumption of plant operation without credit for one or more non-safety-related "defense-in-depth" systems. These studies provided additional insights about the risk importance of the various "defense-in-depth" systems which were taken into account in selecting non-safety-related systems for "regulatory treatment" according to the RTNSS process (detailed results and insights related to CDF are reported in Section 19.1.3.1.5 of this report while insights related to LRF and CCFP are reported in Section 19.1.3.2 of this report). The most important insights from such sensitivity studies, as they relate to the RTNSS process, are summarized below.

- Availability control of the RT function of DAS provides an efficient means for minimizing the impact of uncertainties in reactor trip components, such as circuit breakers, on PRA results used in the criteria for selecting non-safety-related SSCs for regulatory oversight according to the RTNSS process. Such availability control should include the two M-G set CBs because the RT function of DAS requires the availability (to open) of both these CBs.
- Availability control of the ESF actuation function of DAS provides an efficient means for minimizing the impact of uncertainties associated with ESF actuation components, such as digital I&C system software, on PRA results used in the criteria for selecting non-safety-related SSCs for regulatory oversight according to the RTNSS process.

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- Availability control of the RNS (including its support systems) provides an efficient means for minimizing the impact of uncertainties associated with passive system check valves and explosive (squib) valves on PRA results used in the criteria for selecting non-safety-related SSCs for regulatory oversight according to the RTNSS process.

For AP600, the staff also have determined the following:

- Criterion #1 (i.e., CDF less than $1E-04/y$) is fully satisfied when an unavailability of 0.25 or less is assumed in the PRA for DAS (for both the reactor trip and ESF actuation functions) and for RNS. This requires an "average" yearly availability of at least 75 percent for such systems.
- Criterion #2 (i.e., LRF less than $1E-06/y$) is fully satisfied when an unavailability of 0.1 or less is assumed in the PRA for each of the automatic and manual portions of DAS (for both the reactor trip and ESF actuation functions) and for RNS. This requires an "average" yearly availability of at least 90 percent for such systems or subsystems.

The staff cannot reach similar conclusions for AP1000 at this time. As explained in Section 19.1.10 of this report, additional information is needed which will provide the link between the PRA results and the level of regulatory oversight needed to meet the above mentioned criteria. This is Open Item 19.1.10.1-3.

Westinghouse Original Response:

Westinghouse revised its response to RAI 720.027 in order to address the NRC concerns about the initiating event frequency of large LOCAs. The response to RAI 720.030 was also revised in order to address the NRC concerns about the initiating event frequency of steam generator tube ruptures. These revised responses (rev. 1) were submitted to the NRC on March 25, 2003 in letter DCP/NRC1556. Westinghouse also revised the discussion on uncertainties in the AP1000 RTNSS evaluation (WCAP-15985, rev. 1) to reflect these RAI responses as well as other uncertainties. This revision was included in a revised response to RAI 720.039. This revised response (rev. 2) was submitted to the NRC on April 4, 2003 in letter DCP/NRC1565.

Westinghouse believes that the AP1000 RTNSS evaluation is fully consistent with SECY-94-084. In this SECY, the NRC says that the issue with passive systems is the limited operating experience and the low driving force available which leads to phenomenological uncertainties. In the discussion of the specific RTNSS evaluation process, this SECY says that in the Baseline PRA, uncertainties need to be addressed, including appropriate sensitivity and uncertainty analysis. There is no mention of uncertainty analysis in the subsequent discussion on the Focused PRA.

In the AP1000, as in the AP600, we have performed extensive thermal hydraulic analysis to demonstrate that T/H uncertainty is not risk important for the AP1000. As directed in SECY-94-084, we have used the PRA risk importance ratings and sensitivity studies to evaluate uncertainties in the AP1000 baseline PRA in both initiating event frequencies and in the

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reliability of components. In addition, we have provided a discussion of uncertainties in the PRA as they relate to RTNSS. This discussion is contained in section 2.3 of the RTNSS WCAP-15985. The scope of this discussion was expanded to include information from revised RAI responses (RAI 720.027 rev. 1, RAI 720.030 rev. 1, and 720.039 rev. 2).

The discussion in the revised RTNSS WCAP, concluded that some of these uncertainties are not RTNSS important. In other cases, that conclusion could not be made, so nonsafety features were identified that could compensate for the uncertainties. These features are identified as RTNSS important and appropriate additional regulatory oversight measures have been adopted. These measures include short-term availability controls. The base Focused PRA does not include these features because they are not necessary to allow the AP1000 to meet the CDF and LRF safety goals identified in SECY-94-084. Westinghouse believes that the AP1000 RTNSS evaluation provides a well defined link between the PRA results and the additional regulatory oversight proposed for the AP1000 RTNSS features and is fully consistent with SECY-94-084; it is also consistent with the RTNSS evaluations we performed for AP600.

We do not think that an attempt should be made to quantify uncertainties in the AP1000 Focused PRA. First, it is not necessary or required by SECY-94-084. Second, we don't think that it is possible to accurately quantify these uncertainties. In the baseline PRA, we have performed sensitivity studies on uncertainties (as suggested by SECY-94-084). However these sensitivity studies have a very different objective. The objective of the baseline sensitivity studies is to determine how much the CDF / LRF changes given an arbitrary change in the reliability of a component. It is a much more difficult to quantify the actual uncertainty in the reliability of a component so that it could be shown that the addition of a nonsafety feature compensates for that uncertainty and that the plant still meets the safety goals. We think that it is sufficient to identify nonsafety features that can compensate for these uncertainties.

NRC Follow-On Comment:

In a teleconference held with the NRC, the staff requested that Westinghouse perform an additional sensitivity study to consider the additional uncertainties discussed in DSER Chapter 19 in combination with the focused PRA sensitivity study performed for the AP1000.

Westinghouse Revision 1 Response:

AP1000 PRA Sensitivity case-40

A Study of Effects of Combined Component Failure Probability Uncertainties and Standby System Unavailabilities

At the request of the NRC, an additional sensitivity analysis is made for the plant CDF at internal events at power. This report documents the sensitivity analysis. The sensitivity analysis is made to determine if uncertainties identified for safety component reliabilities are compensated by the additional administrative controls imposed on the non-safety systems.

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The sensitivity analysis is done with the already calculated core damage cutsets for the base case. The analysis is performed in three steps, starting with the CDF cutsets of the base case:

1. First case-38 is generated;
2. Next case-39 is generated;
3. Then case-40 is generated, and modified to case-40p as discussed below.

I. Case-38: Base Case With Higher Safety Component Failure Probabilities

In step 1, the base case basic event values for four sets of components are assigned higher failure probabilities (to approximate the identified uncertainties in their reliabilities) as follows:

1. Sensitivity to explosive valve failure probability:

The failure probabilities of the basic events associated with explosive valves are increased by a factor of 5, as shown in Table 1. This factor of five is consistent with the value discussed in Section 19.1.3.1.5.1 of Draft Safety Evaluation Report of AP1000, stating that this factor of five brings the failure probability in line with the EPRI URD recommended value.

Explosive valves are used in ADS, IRWST injection and containment recirculation functions. The failure contribution associated with these valves is increased by increasing the cause failure probability of basic events associated by these valves by a factor of 5:

Table 1 Increase In Explosive Valve Failure Probability		
Basic Event ID	Base Case Failure Prob. (/d.)	New Failure Prob. (/d.)
ADX-EV-SA	3.00E-05	1.50E-04
ADX-EV-SA2	5.90E-05	2.95E-04
IWX-EV-SA	2.60E-05	1.30E-04
IWX-EV1-SA	5.80E-06	2.90E-05
IWX-EV2-SA	5.80E-06	2.90E-05
IWX-EV4-SA	5.80E-05	2.90E-04

2. Sensitivity to Check Valve Failure Probability

The failure probabilities of the basic events associated with check valves are increased by a factor of 5, as shown in Table 2. This factor of five is consistent with the value discussed in Section 19.1.3.1.5.3.1 of Draft Safety Evaluation Report of AP1000, stating that this factor of five brings the failure probability in line with the EPRI recommended value.

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Table 2 Increase in Check Valve Failure Probability		
Basic Event ID	Base Case Failure Probability (/d.)	New Failure Probability (/d.)
ACACV028GO	1.75E-03	8.75E-03
ACACV029GO	1.75E-03	8.75E-03
ACBCV028GO	1.75E-03	8.75E-03
ACBCV029GO	1.75E-03	8.75E-03
ACX-CV-GO	5.10E-05	2.55E-04
CMA-CV	2.00E-06	1.00E-05
CMB-CV	2.00E-06	1.00E-05
CMX-CV-GO	5.10E-05	2.55E-04
IWACV122AO	1.75E-03	8.75E-03
IWACV124AO	1.75E-03	8.75E-03
IWBCV122AO	1.75E-03	8.75E-03
IWBCV124AO	1.75E-03	8.75E-03
IWX-CV-AO	3.00E-05	1.50E-04
IWX-CV1-AO	5.40E-07	2.70E-06
REACV119GO	1.75E-03	8.75E-03
REBCV119GO	1.75E-03	8.75E-03

3. Sensitivity to Circuit Breaker Failure Probability

Two types of special breakers are distinguished for this sensitivity case:

i) Reactor Trip Breakers

This failure is represented by the CCF basic event RCX-RB-FA with a failure probability of 8.1E-06. This failure probability is increased by a factor of 10 to 8.1E-05.

ii) Reactor Coolant Pump Breakers

This failure is represented by the CCF basic event RPX-CB-GO with a failure probability of 4.2E-04. The failure probability is increased by a factor of 10, to 4.2E-03.

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Table 3 Increase in Reactor Trip and Reactor Coolant Pump Breaker Probabilities

Basic Event ID	Base Case Failure Probability (/d.)	New Failure Probability (/d.)	Basic Event Description
RCX-RB-FA	8.1E-06	8.1E-05	REACTOR TRIP BREAKERS CCF
RPX-CB-GO	4.2E-04	4.2E-03	CCF FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAKERS

4. Sensitivity to Software CCF

The basic events associated with CCF software failure of PMS and PLS are identified from the base case cutsets and their failure probabilities are increased by a factor of 10, as shown in Table 4.

Table 4 Increase in Software CCF Probability

Basic Event ID	Base Case Failure Probability (/d.)	New Failure Probability (/d.)	Basic Event Description
CCX-IN-LOGIC-SW	1.10E-05	1.10E-04	CCF OF ESF INPUT LOGIC SOFTWARE
CCX-INPUT-LOGIC	1.03E-04	1.03E-03	
CCX-PL2MOD5-SW	1.10E-05	1.10E-04	
CCX-PL3MOD1-SW	1.10E-05	1.10E-04	
CCX-PL3MOD5-SW	1.10E-05	1.10E-04	
CCX-PL4MOD1-SW	1.10E-05	1.10E-04	
CCX-PL9MOD1-SW	1.10E-05	1.10E-04	
CCX-PLBMOD1-SW	1.10E-05	1.10E-04	
CCX-PLMMOD4-SW	1.10E-05	1.10E-04	
CCX-PLMOD3-SW	1.10E-05	1.10E-04	
CCX-PLSMOD6-SW	1.10E-05	1.10E-04	
CCX-PMXMOD1-SW	1.10E-05	1.10E-04	CCF OF PMS ESF OUTPUT LOGIC SOFTWARE
CCX-PMXMOD2-SW	1.10E-05	1.10E-04	CCF OF PMS ESF ACTUATION LOGIC SOFTWARE
CCX-PMXMOD4-SW	1.10E-05	1.10E-04	
CCX-SFTW	1.20E-06	1.20E-04	SOFTWARE CCF OF ALL CARDS

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The sensitivity case, thus generated is named as Case-38. The list of affected basic events and their new probabilities are shown in table 5. These probabilities are put into the basecase CVDF cutest file, and the file is requantified. The resulting plant CDF for this case is 1.42E-06. This is a factor of 6 increase with respect to the base case. The dominant CDF cutsets are given in Table 6.

II. Case-39: Focused PRA (No Credit for Standby Systems) With Higher Safety Component Failure Probabilities

Step 2 starts with the result of step 1, namely case-38. On top of this sensitivity, the five standby systems shown below are also assumed to be not available:

1. SFW
2. CVCS
3. Auto DAS
4. N-RHR
5. Diesel Generators.

To simulate this case, the basic events listed in Table 7 are set to failure. In addition to the above, the basic event ALL-IND-FAIL is set to 1.0E-04 /year (a 2 order of magnitude increase in probability). This is consistent with Case-36 and allows reduction of control room indicator reliability due to failure of DAS indicators.

The resulting case is labeled as case-39. The resulting plant CDF for this case is 1.47E-05. This is a factor of 61 increase with respect to the base case and is a factor of 7.0 increase with respect to the focused PRA CDF at power of 2.1E-06. The dominant CDF cutsets are given in Table 8.

III. Case-40: Focused PRA With Higher Safety Component Failure Probabilities and Credit for 90% availability for DAS, DGs, and RNS.

In step 3, case-40 sensitivity is done. This is very similar to case-39, except that 90% availability due to administrative controls on auto DAS, DGs, and RNS is credited. No credit is taken for SWF and CVCS systems.

To set the system reliabilities to 90%, first the system failure cutsets are examined, and a single element cutest that has a component from the system is assigned a failure probability of 0.10. To remove the conservatism, basic events associated with other components for the same system are assigned a failure probability of zero, whenever they are identified. Thus, the remaining basic event with the 0.10 failure probability should be viewed as the "black box" representation of the system in question.

Thus, by inspection, the following basic events are chosen to represent the three systems, and their failure probabilities are set equal to 0.10:

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System	Basic Event	Probability
Auto DAS	DAS	0.10
Diesel Generators	ZOX-PD-ES	0.10
RNS	RN11MOD3	0.10

To create case-40, the starting point is case-38 (not case-39); the SFWS and CVCS systems are failed; and the other three systems are modified as discussed above. The list of basic events thus modified is shown in Table 9.

The resulting case is labeled as case-40. The resulting plant CDF for this case is 8.73E-06. This is a factor of 36 increase with respect to the base case. The dominant CDF cutsets are given in Table 10.

Case-40p:

An examination of these dominant cutsets shows that the first two cutsets are very conservative; the operator action of ADF-MAN01 in these cutsets has a HEP of 0.5, which is actually a conditional probability of failure of CVN-MAN01 which precedes this HEP in the cutsets. However, CVCS is assumed to be unavailable and the basic events associated with it are set equal to failure.

The top two CDF cutsets have the operator action ADF-MAN01 with a failure probability of 0.5. This is a conditional failure probability following the failure of CVN-MAN01 (3.1E-03). If CVN is unavailable, and this preceding action does not fail; then the HEP of ADF-MAN01 is supposed to be 3.1E-03 (per AP1000 PRA). In that case, the modified case-40p CDF becomes 2.42E-06. Table 12 shows the case-40p results, with top two cutsets modified; the remaining cutsets are the same as those of case-40.

Summary of Results

The results of the sensitivity cases are summarized in Table 11 as follows:

Table 11. Summary of Sensitivity Cases

Case Name	# of Basic Events	Number of Cutsets	CDF	CDF Increase Factor
Base Case	599	19374	2.41E-07	1.0
Case-38	599	19374	1.42E-06	5.9
Case-39	390	8888	1.466E-05	61
Case-40	472	12675	8.726E-6	36
Case-40p	472	12675	2.42E-06	10

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These sensitivity analyses show that the administrative controls placed on the standby systems with a 90% availability goal, coupled with the postulated higher failure probabilities for key safety component uncertainties (CVs, EVs, CBs, and software CCF) provide a plant CDF of less than $2.42\text{E-}06$ (case-40p). This is a very favorable CDF, considering the conservatism piled up on the systems and key component failure probabilities, all at once. This CDF is approximately equal to the focused PRA CDF of $2.1\text{E-}06$.

These sensitivity analyses show that the administrative controls placed on the standby nonsafety systems compensate effectively for key safety component uncertainties (CVs, EVs, CBs, and software CCF).

Design Control Document (DCD) Revision:

None

PRA Revision:

None

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Table 5. List of Affected Basic Events and Their New Probabilities

Basic Event ID	New Failure Prob.
ACACV028GO	8.75E-03
ACACV029GO	8.75E-03
ACBCV028GO	8.75E-03
ACBCV029GO	8.75E-03
ACX-CV-GO	2.55E-04
ADX-EV-SA	1.50E-04
ADX-EV-SA2	2.95E-04
CCX-IN-LOGIC-SW	1.10E-04
CCX-INPUT-LOGIC	1.03E-03
CCX-PL2MOD5-SW	1.10E-04
CCX-PL3MOD1-SW	1.10E-04
CCX-PL3MOD5-SW	1.10E-04
CCX-PL4MOD1-SW	1.10E-04
CCX-PL9MOD1-SW	1.10E-04
CCX-PLBMOD1-SW	1.10E-04
CCX-PLMMOD4-SW	1.10E-04
CCX-PLMOD3-SW	1.10E-04
CCX-PLSMOD6-SW	1.10E-04
CCX-PMXMOD1-SW	1.10E-04
CCX-PMXMOD2-SW	1.10E-04
CCX-PMXMOD4-SW	1.10E-04
CCX-SFTW	1.20E-04
CMA-CV	1.00E-05
CMB-CV	1.00E-05
CMX-CV-GO	2.55E-04
IWACV122AO	8.75E-03
IWACV124AO	8.75E-03
IWBCV122AO	8.75E-03
IWBCV124AO	8.75E-03
IWX-CV1-AO	2.70E-06
IWX-CV-AO	1.50E-04
IWX-EV1-SA	2.90E-05
IWX-EV2-SA	2.90E-05
IWX-EV4-SA	2.90E-04
IWX-EV-SA	1.30E-04
RCX-RB-FA	8.10E-05
REACV119GO	8.75E-03
REBCV119GO	8.75E-03
RPX-CB-GO	4.20E-03

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Table 6. Case-38 Dominant CDF Cutsets

File:	case-38.out					
Reduced	Sum of Cutsets:	1.42E-06				
	CUTSET					
NUMBER	PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER	
1	4.73E-07	33.33	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	5.40E-05 8.75E-03	IEV-SPADS CMX-CV-GO	
2	6.25E-08	4.4	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	2.12E-04 2.95E-04	IEV-SI-LB ADX-EV-SA2	
3	5.56E-08	3.92	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF ESF INPUT LOGIC (HARDWARE)	5.40E-05 1.03E-03	IEV-SPADS CCX-INPUT-LOGIC	
4	5.09E-08	3.59	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.12E-04 2.40E-04	IEV-SI-LB IWA-PLUG	
5	4.38E-08	3.09	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 028A FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACACV028GO	
6	4.38E-08	3.09	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACBCV029GO	
7	4.38E-08	3.09	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACBCV028GO	
8	4.38E-08	3.09	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029A FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACACV029GO	

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9	4.38E-08	3.09	LARGE LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA CMX-CV-GO
10	3.18E-08	2.24	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	2.12E-04 1.50E-04	IEV-SI-LB ADX-EV-SA
11	3.18E-08	2.24	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	2.12E-04 1.50E-04	IEV-SI-LB IWX-CV-AO
12	2.76E-08	1.95	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.12E-04 1.30E-04	IEV-SI-LB IWX-EV-SA
13	1.62E-08	1.14	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN CHECK VALVE 124A FAILS TO OPEN	2.12E-04 8.75E-03 8.75E-03	IEV-SI-LB IWACV122AO IWACV124AO
14	1.59E-08	1.12	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	5.40E-05 2.95E-04	IEV-SPADS ADX-EV-SA2
15	1.58E-08	1.11	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COGNITIVE OPERATOR ERROR COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 1.84E-03 8.75E-03 5.06E-01 5.00E-01	IEV-SGTR CIB-MAN00 CMX-CV-GO REC-MANDASC ADN-MAN01C
16	1.38E-08	0.97	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	5.40E-05 2.55E-04	IEV-SPADS ACX-CV-GO
17	1.33E-08	0.94	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS FAILURE TO ALIGN CVCS IN AUX. SPRAY MODE	3.88E-03 3.10E-03	IEV-SGTR CVN-MAN00

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			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01 (OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
18	1.00E-08	0.7	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS	1.00E-08	IEV-RV-RP
19	8.10E-09	0.57	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
20	8.10E-09	0.57	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
21	7.79E-09	0.55	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
22	7.79E-09	0.55	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
23	7.59E-09	0.53	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
24	7.59E-09	0.53	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC

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			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
25	7.02E-09	0.49	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.40E-05 1.30E-04	IEV-SPADS IWX-EV-SA
26	6.69E-09	0.47	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-04 8.75E-03 5.06E-01 3.02E-03	IEV-SLOCA CMX-CV-GO REC-MANDASC ADN-MAN01
27	6.39E-09	0.45	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS FAILURE TO ALIGN CVCS IN AUX. SPRAY MODE OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 3.10E-03 5.00E-01 4.20E-03 5.06E-01 5.00E-01	IEV-SGTR CVN-MAN00 ADF-MAN01 RPX-CB-GO REC-MANDASC ADN-MAN01C
28	6.37E-09	0.45	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	4.36E-04 8.75E-03 5.06E-01 3.30E-03	IEV-MLOCA CMX-CV-GO REC-MANDASC LPM-MAN02
29	6.15E-09	0.43	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	2.12E-04 2.90E-05	IEV-SI-LB IWX-EV1-SA
30	6.00E-09	0.42	SMALL LOCA INITIATING EVENT OCCURS PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	5.00E-04 1.20E-05	IEV-SLOCA REX-FL-GP
31	5.94E-09	0.42	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS

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			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
32	5.94E-09	0.42	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF ESF INPUT LOGIC SOFTWARE	1.10E-04	CCX-IN-LOGIC-SW
33	5.94E-09	0.42	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD2-SW
34	5.83E-09	0.41	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
35	5.52E-09	0.39	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG	1.34E-03	CIB-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
36	5.23E-09	0.37	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
37	5.15E-09	0.36	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
38	5.12E-09	0.36	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
39	4.95E-09	0.35	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR

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			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE FAILURE OF MANUAL DAS ACT.	1.10E-04 1.16E-02	CCX-PMXMOD1-SW REC-MANDAS
40	4.27E-09	0.3	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS CCF OF PMS ESF OUTPUT LOGIC SOFTWARE FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	3.88E-03 1.10E-04 1.00E-02	IEV-SGTR CCX-PMXMOD1-SW MDAS
41	4.13E-09	0.29	SPURIOUS ADS INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN CHECK VALVE 029A FAILS TO OPEN	5.40E-05 8.75E-03 8.75E-03	IEV-SPADS ACBCV028GO ACACV029GO
42	4.13E-09	0.29	SPURIOUS ADS INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN CHECK VALVE 029A FAILS TO OPEN	5.40E-05 8.75E-03 8.75E-03	IEV-SPADS ACBCV029GO ACACV029GO
43	4.13E-09	0.29	SPURIOUS ADS INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN CHECK VALVE 028A FAILS TO OPEN	5.40E-05 8.75E-03 8.75E-03	IEV-SPADS ACBCV029GO ACACV028GO
44	4.13E-09	0.29	SPURIOUS ADS INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN CHECK VALVE 028A FAILS TO OPEN	5.40E-05 8.75E-03 8.75E-03	IEV-SPADS ACBCV028GO ACACV028GO
45	3.64E-09	0.26	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS	5.00E-06 7.27E-04	IEV-LLOCA ACAOR001SP
46	3.64E-09	0.26	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS	5.00E-06 7.27E-04	IEV-LLOCA ACBOR001SP
47	3.35E-09	0.24	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 AOVs TO OPEN	5.40E-05 6.20E-05	IEV-SPADS CCX-AV-LA

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48	3.21E-09	0.23	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-04 4.20E-03 5.06E-01 3.02E-03	IEV-SLOCA RPX-CB-GO REC-MANDASC ADN-MAN01
49	3.06E-09	0.22	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	4.36E-04 4.20E-03 5.06E-01 3.30E-03	IEV-MLOCA RPX-CB-GO REC-MANDASC LPM-MAN02
50	3.01E-09	0.21	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS CCF OF SAFETY PT LT CONTINUOUSLY INTERFACING HIGH PRESSURE COMMON CAUSE FAILURE OF PZR LEVEL SENSORS COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	4.81E-01 5.20E-02 4.78E-04 4.78E-04 5.26E-01	IEV-ATWS ATW-MAN03 CCX-XMTR CCX-XMTR195 ATW-MAN04C
51	2.97E-09	0.21	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)TU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-04 8.75E-03 5.06E-01 1.34E-03	IEV-SLOCA CMX-CV-GO REC-MANDASC LPM-MAN01
52	2.80E-09	0.2	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	4.36E-04 4.20E-03 5.06E-01 3.02E-03	IEV-MLOCA RPX-CB-GO REC-MANDASC ADN-MAN01
53	2.71E-09	0.19	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN	2.12E-04 8.75E-03	IEV-SI-LB IWACV122AO

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			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
54	2.71E-09	0.19	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			CHECK VALVE 124A FAILS TO OPEN	8.75E-03	IWACV124AO
55	2.54E-09	0.18	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
56	2.39E-09	0.17	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
57	2.08E-09	0.15	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.00E-02	REN-MAN04
58	2.08E-09	0.15	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
59	2.08E-09	0.15	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
60	2.08E-09	0.15	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
61	2.08E-09	0.15	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA

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			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5
62	2.07E-09	0.15	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF RTD LEVEL TRANSMITTERS	3.84E-05	CMX-VS-FA
63	1.95E-09	0.14	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-02	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
64	1.86E-09	0.13	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
65	1.86E-09	0.13	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
66	1.81E-09	0.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
67	1.81E-09	0.13	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5

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68	1.81E-09	0.13	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE MECHANICAL FAILURE OF RNS MOV V055	4.36E-04 2.95E-04 1.41E-02	IEV-MLOCA ADX-EV-SA2 RN55MOD1
69	1.81E-09	0.13	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE HARDWARE FAILURE OF ISOLATION MOV 011	4.36E-04 2.95E-04 1.41E-02	IEV-MLOCA ADX-EV-SA2 RN11MOD3
70	1.68E-09	0.12	TRANSIENT WITH MFW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS UNAVAILABILITY GOAL FOR DAS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.40E+00 1.20E-05 1.00E-02 1.00E-02	IEV-TRANS CCX-SFTW DAS MDAS
71	1.62E-09	0.11	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN RELAY FAILS TO OPERATE	2.12E-04 8.75E-03 8.76E-04	IEV-SI-LB IWACV122AO IWDRS125AFA
72	1.62E-09	0.11	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 124A FAILS TO OPEN RELAY FAILS TO OPERATE	2.12E-04 8.75E-03 8.76E-04	IEV-SI-LB IWACV124AO IWBR123AFA
73	1.58E-09	0.11	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS UNAVAILABILITY GOAL FOR DAS COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	4.81E-01 1.20E-05 5.20E-02 1.00E-02 5.26E-01	IEV-ATWS CCX-SFTW ATW-MAN03 DAS ATW-MAN04C
74	1.49E-09	0.11	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	2.12E-04 4.20E-03 5.06E-01	IEV-SI-LB RPX-CB-GO REC-MANDASC

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			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
75	1.48E-09	0.1	LARGE LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	5.00E-06 2.95E-04	IEV-LLOCA ADX-EV-SA2
76	1.48E-09	0.1	SMALL LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	5.00E-04 2.95E-04 1.00E-02	IEV-SLOCA ADX-EV-SA2 CLP- UNAVAILABLE
77	1.42E-09	0.1	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-04 4.20E-03 5.06E-01 1.34E-03	IEV-SLOCA RPX-CB-GO REC-MANDASC LPM-MAN01
78	1.36E-09	0.1	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	2.12E-04 4.20E-03 5.06E-01 3.02E-03	IEV-SI-LB RPX-CB-GO REC-MANDASC ADN-MAN01
79	1.35E-09	0.1	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 028A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV028GO
80	1.35E-09	0.1	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 029A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV029GO
81	1.29E-09	0.09	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	4.36E-04 2.95E-04	IEV-MLOCA ADX-EV-SA2

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			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
82	1.28E-09	0.09	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
83	1.23E-09	0.09	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
84	1.12E-09	0.08	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
85	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
86	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5
87	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
88	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
89	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4

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			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
90	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
91	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
92	1.06E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
93	1.01E-09	0.07	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL	1.00E-02	REN-MAN04
			FAILURE		
94	9.73E-10	0.07	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
95	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
96	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5

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97	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE HARDWARE FAILURE OF ISOLATION MOV 011	4.36E-04 1.50E-04 1.41E-02	IEV-MLOCA ADX-EV-SA RN11MOD3
98	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE MECHANICAL FAILURE OF RNS MOV V055	4.36E-04 1.50E-04 1.41E-02	IEV-MLOCA ADX-EV-SA RN55MOD1
99	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS MECHANICAL FAILURE OF RNS MOV V055 CCF OF 4 GRAVITY INJECTION CVs	4.36E-04 1.41E-02 1.50E-04	IEV-MLOCA RN55MOD1 IWX-CV-AO
100	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS HARDWARE FAILURE OF ISOLATION MOV 011 CCF OF 4 GRAVITY INJECTION CVs	4.36E-04 1.41E-02 1.50E-04	IEV-MLOCA RN11MOD3 IWX-CV-AO
101	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC CCF OF 4 GRAVITY INJECTION CVs	4.36E-04 1.41E-02 1.50E-04	IEV-MLOCA RN22MOD4 IWX-CV-AO
102	9.22E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC CCF OF 4 GRAVITY INJECTION CVs	4.36E-04 1.41E-02 1.50E-04	IEV-MLOCA RN23MOD5 IWX-CV-AO
103	9.17E-10	0.06	SMALL LOCA INITIATING EVENT OCCURS HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.00E-04 1.41E-02 1.30E-04	IEV-SLOCA RN23MOD5 IWX-EV-SA
104	9.17E-10	0.06	SMALL LOCA INITIATING EVENT OCCURS HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	5.00E-04 1.41E-02	IEV-SLOCA RN22MOD4

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			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
105	9.17E-10	0.06	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
106	9.17E-10	0.06	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
107	8.63E-10	0.06	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
108	8.26E-10	0.06	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			TURBINE IMPULSE CHAMBER PRESSURE TRANSMITTER 002 FAILURE	5.23E-03	MSHTP002RI
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
109	8.26E-10	0.06	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			TURBINE IMPULSE CHAMBER PRESSURE TRANSMITTER 001 FAILURE	5.23E-03	MSHTP001RI
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
110	7.99E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5

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			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
111	7.99E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
112	7.99E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
113	7.99E-10	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
114	7.87E-10	0.06	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
115	7.50E-10	0.05	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
116	7.50E-10	0.05	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO

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117	7.50E-10	0.05	LARGE LOCA INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	5.00E-06 1.50E-04	IEV-LLOCA IWX-CV-AO
118	7.50E-10	0.05	LARGE LOCA INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	5.00E-06 1.50E-04	IEV-LLOCA ADX-EV-SA
119	7.50E-10	0.05	MEDIUM LOCA INITIATING EVENT OCCURS COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA CCF OF ESF INPUT LOGIC (HARDWARE)	4.36E-04 5.06E-01 3.30E-03 1.03E-03	IEV-MLOCA REC-MANDASC LPM-MAN02 CCX-INPUT-LOGIC
120	7.47E-10	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS MECHANICAL FAILURE OF AOV V084 AND CV V085 TO OPEN OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.88E-03 2.88E-02 5.00E-01 8.75E-03 5.06E-01 3.02E-03	IEV-SGTR CVMOD05 ADF-MAN01 CMX-CV-GO REC-MANDASC ADN-MAN01
121	7.44E-10	0.05	RCS LEAK INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	6.20E-03 1.20E-05 1.00E-02	IEV-RCSLK CCX-SFTW MDAS
122	7.23E-10	0.05	SMALL LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE CCF OF STOP CHECK VALVES V015A/B TO OPEN	5.00E-04 2.95E-04 4.90E-03	IEV-SLOCA ADX-EV-SA2 RNX-KV1-GO
123	7.03E-10	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS MECHANICAL FAILURE OF AOV V081 FAILS TO CLOSE OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	3.88E-03 2.71E-02 5.00E-01 8.75E-03	IEV-SGTR CVMOD07 ADF-MAN01 CMX-CV-GO

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			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
124	7.03E-10	0.05	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
125	6.95E-10	0.05	ATWS PRECURSOR WITH MFW AVAILA. INITIATING EVENT OCCURS	1.17E+00	IEV-ATW-T
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-03	ATW-MAN05
			CCF OF SAFETY PT LT CONTINUOSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			COMMON CAUSE FAILURE OF PZR LEVEL SENSORS	4.78E-04	CCX-XMTR195
			COND. PROB. OF ATW-MAN06 (OPER. FAILS TO TRIP REACTOR VIA D	5.00E-01	ATW-MAN06C
126	6.86E-10	0.05	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
127	6.86E-10	0.05	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COMMON CAUSE FAILURE OF ALL CI AOVs TO CLOSE	7.70E-04	CIX-AV-LA
128	6.57E-10	0.05	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
129	6.54E-10	0.05	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA

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			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.50E-04 1.00E-02	ADX-EV-SA CLP- UNAVAILABLE
130	6.54E-10	0.05	MEDIUM LOCA INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS CCF OF 4 GRAVITY INJECTION CVs	4.36E-04 1.00E-02 1.50E-04	IEV-MLOCA CLP- UNAVAILABLE IWX-CV-AO
131	6.53E-10	0.05	CMT LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	9.31E-05 4.20E-03 5.06E-01 3.30E-03	IEV-CMTLB RPX-CB-GO REC-MANDASC LPM-MAN02
132	6.50E-10	0.05	SMALL LOCA INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.00E-04 1.00E-02 1.30E-04	IEV-SLOCA CLP- UNAVAILABLE IWX-EV-SA
133	6.50E-10	0.05	LARGE LOCA INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.00E-06 1.30E-04	IEV-LLOCA IWX-EV-SA
134	6.48E-10	0.05	SPURIOUS ADS INITIATING EVENT OCCURS PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	5.40E-05 1.20E-05	IEV-SPADS REX-FL-GP
135	6.48E-10	0.05	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF STRAINERS IN IRWST TANK	5.40E-05 1.20E-05	IEV-SPADS IWX-FL-GP
136	6.48E-10	0.05	SPURIOUS ADS INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS	5.40E-05 1.20E-05	IEV-SPADS CCX-SFTW

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137	6.47E-10	0.05	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK FLOW TUNING ORIFICE PLUGS	2.12E-04 4.20E-03 7.27E-04	IEV-SI-LB RPX-CB-GO ACAOR001SP
138	6.38E-10	0.04	SMALL LOCA INITIATING EVENT OCCURS FAILURE OF MANUAL DAS ACT. CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	5.00E-04 1.16E-02 1.10E-04	IEV-SLOCA REC-MANDAS CCX-PMXMOD1-SW
139	6.30E-10	0.04	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.36E-04 2.95E-04 4.90E-03	IEV-MLOCA ADX-EV-SA2 RNX-KV1-GO
140	6.02E-10	0.04	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	4.50E-03 1.00E-02 8.75E-03 5.06E-01 3.02E-03	IEV-POWEX OTH-PRSOV CMX-CV-GO REC-MANDASC ADN-MAN01
141	5.98E-10	0.04	CMT LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	9.31E-05 4.20E-03 5.06E-01 3.02E-03	IEV-CMTLB RPX-CB-GO REC-MANDASC ADN-MAN01
142	5.72E-10	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF GRAVITY INJECTION CVs IN 1/1 LINES TO OPEN	2.12E-04 2.70E-06	IEV-SI-LB IWX-CV1-AO
143	5.67E-10	0.04	MEDIUM LOCA INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	4.36E-04 1.00E-02 1.30E-04	IEV-MLOCA CLP- UNAVAILABLE IWX-EV-SA

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144	5.57E-10	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 124A FAILS TO OPEN BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	2.12E-04 8.75E-03 3.00E-04	IEV-SI-LB IWACV124AO IDBBSDD1TM
145	5.57E-10	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 124A FAILS TO OPEN BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	2.12E-04 8.75E-03 3.00E-04	IEV-SI-LB IWACV124AO IDBBSDS1TM
146	5.57E-10	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	2.12E-04 8.75E-03 3.00E-04	IEV-SI-LB IWACV122AO IDBBSDS1TM
147	5.57E-10	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN BUS UNAVAILABLE DUE TO TEST OR CORRECTIVE MAINTENANCE	2.12E-04 8.75E-03 3.00E-04	IEV-SI-LB IWACV122AO IDBBSDD1TM
148	5.56E-10	0.04	MEDIUM LOCA INITIATING EVENT OCCURS FAILURE OF MANUAL DAS ACT. CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	4.36E-04 1.16E-02 1.10E-04	IEV-MLOCA REC-MANDAS CCX-PMXMOD1-SW
149	5.50E-10	0.04	SMALL LOCA INITIATING EVENT OCCURS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	5.00E-04 1.00E-02 1.10E-04	IEV-SLOCA MDAS CCX-PMXMOD1-SW
150	5.50E-10	0.04	LARGE LOCA INITIATING EVENT OCCURS CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	5.00E-06 1.10E-04	IEV-LLOCA CCX-PMXMOD2-SW
151	5.50E-10	0.04	LARGE LOCA INITIATING EVENT OCCURS CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	5.00E-06 1.10E-04	IEV-LLOCA CCX-PMXMOD1-SW

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152	5.50E-10	0.04	LARGE LOCA INITIATING EVENT OCCURS CCF OF ESF INPUT LOGIC SOFTWARE	5.00E-06 1.10E-04	IEV-LLOCA CCX-IN-LOGIC-SW
153	5.40E-10	0.04	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	3.88E-03 1.20E-05 1.16E-02	IEV-SGTR CCX-SFTW REC-MANDAS
154	5.40E-10	0.04	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	4.50E-03 1.00E-02 1.20E-05	IEV-POWEX OTH-PRSOV REX-FL-GP
155	5.27E-10	0.04	LOSS OF CCW/SW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS EDS3 EA 1 DISTR. PNL FAILURE OR T&M	1.44E-01 1.20E-05 3.05E-04	IEV-LCCW CCX-SFTW ED3MOD07
156	5.25E-10	0.04	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS CONTROL ROD MG SETS FAIL TO TRIP SOFTWARE CCF OF ALL CARDS OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	4.81E-01 1.75E-03 1.20E-05 5.20E-02	IEV-ATWS OTH-MGSET CCX-SFTW ATW-MAN03
157	4.80E-10	0.03	MEDIUM LOCA INITIATING EVENT OCCURS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	4.36E-04 1.00E-02 1.10E-04	IEV-MLOCA MDAS CCX-PMXMOD1-SW
158	4.67E-10	0.03	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	4.36E-04 4.20E-03 2.55E-04	IEV-MLOCA RPX-CB-GO ACX-CV-GO
159	4.66E-10	0.03	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS UNAVAILABILITY GOAL FOR DAS	3.35E-01 1.20E-05 1.00E-02	IEV-LMFW CCX-SFTW DAS

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			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
160	4.66E-10	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
161	4.65E-10	0.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
162	4.52E-10	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
163	4.45E-10	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL		
			FAILURE	1.00E-02	REN-MAN04
164	4.28E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	RHN-MAN01
165	4.26E-10	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CCF OF PRESSURE TRANSMITTERS FOLLOWING ACCIDENT (CCX-XMTR1)	4.78E-04	CCX-XMTR1
166	4.10E-10	0.03	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
167	4.02E-10	0.03	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW

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			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-02	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
168	3.98E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
169	3.98E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
170	3.98E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
171	3.88E-10	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
172	3.87E-10	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V023 / CB FTC / RELAY FTC	1.41E-02	RN23MOD5
173	3.87E-10	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILS TO OPEN MOV V022 / CB FTC / RELAY FTC	1.41E-02	RN22MOD4
174	3.87E-10	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2

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			HARDWARE FAILURE OF ISOLATION MOV 011	1.41E-02	RN11MOD3
175	3.87E-10	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			MECHANICAL FAILURE OF RNS MOV V055	1.41E-02	RN55MOD1
176	3.79E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF VALVES ON DVI LINE A (V 015A & 017	5.07E-02	RNAMOD09
			HARDWARE FAILURE OF VALVES ON DVI LINE B (V 015B & 017	5.07E-02	RNBMOD10
177	3.73E-10	0.03	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			OPERATOR FAILS TO ALIGN AND ACTUATE THE RNS	2.90E-03	RHN-MAN01
178	3.68E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
179	3.67E-10	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
180	3.65E-10	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING		
			MLOCA	3.30E-03	LPM-MAN02
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
181	3.59E-10	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			MECHANICAL FAILURE OF AOV V084 AND CV V085 TO OPEN	2.88E-02	CVMOD05

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			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
182	3.49E-10	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
183	3.47E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
184	3.47E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
185	3.47E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
186	3.44E-10	0.02	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
187	3.44E-10	0.02	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO

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188	3.44E-10	0.02	SPURIOUS ADS INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN FLOW TUNING ORIFICE PLUGS	5.40E-05 8.75E-03 7.27E-04	IEV-SPADS ACBCV028GO ACAOR001SP
189	3.44E-10	0.02	SPURIOUS ADS INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 029A FAILS TO OPEN	5.40E-05 7.27E-04 8.75E-03	IEV-SPADS ACBOR001SP ACACV029GO
190	3.37E-10	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS MECHANICAL FAILURE OF AOV V081 FAILS TO CLOSE OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.88E-03 2.71E-02 5.00E-01 4.20E-03 5.06E-01 3.02E-03	IEV-SGTR CVMOD07 ADF-MAN01 RPX-CB-GO REC-MANDASC ADN-MAN01
191	3.34E-10	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS CCF OF EPO BOARDS IN PMS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	3.88E-03 8.62E-06 1.00E-02	IEV-SGTR CCX-EP-SAM MDAS
192	3.34E-10	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS CCF OF ESF INPUT LOGIC (HARDWARE)	2.12E-04 5.06E-01 3.02E-03 1.03E-03	IEV-SI-LB REC-MANDASC ADN-MAN01 CCX-INPUT-LOGIC
193	3.31E-10	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS MECHANICAL FAILURE OF AOV V084 AND CV V085 TO OPEN OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.) OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	3.88E-03 2.88E-02 5.00E-01 8.75E-03 5.06E-01 1.34E-03	IEV-SGTR CVMOD05 ADF-MAN01 CMX-CV-GO REC-MANDASC LPM-MAN01

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194	3.31E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF VALVES ON DVI LINE A (V 015A & 017	5.07E-02	RNAMOD09
			HARDWARE FAILURE OF VALVES ON DVI LINE B (V 015B & 017	5.07E-02	RNBMOD10
195	3.20E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
196	3.20E-10	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
197	3.18E-10	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF STOP CHECK VALVES V015A/B TO OPEN	4.90E-03	RNX-KV1-GO
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
198	3.16E-10	0.02	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
199	3.12E-10	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C

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200	3.12E-10	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			MECHANICAL FAILURE OF AOV V081 FAILS TO CLOSE	2.71E-02	CVMOD07
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS ACTU.)	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
Total % =			94.9		

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Table 7. Basic Events Revised in Case-39

; SENDATA 1 1
; 09/26/03, 11:10:04

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ALL-IND-FAIL 1.0E-04
CLP-UNAVAILABLE R
CVBPM01BTM R
CVMOD01 R
CVMOD02 R
CVMOD03 R
CVMOD04 R
CVMOD05 R
CVMOD07 R
CVN-MAN00 R
CVN-MAN02 R
CVN-MAN03 R
CVNMV090GC R
CVNMV091GC R
CVX-MV-GC2 R
CVX-PM-ER R
DAS R
FWACV012GO R
FWBCV012GO R
FWMOD013A R
FWMOD013B R
FWMOD03A R
FWMOD03B R
FWX-CV2-GO R
FWX-MV2-GO R
FWX-PM2-ER R
FWX-PM2-FS R
RHN-MAN01 R
RN11MOD3 R
RN22MOD4 R
RN23MOD5 R
RN55MOD1 R
RNAMOD06 R
RNAMOD09 R
RNBMOD07 R
RNBMOD10 R
RNNCV013GO R
RNNCV056GO R
RNX-CV-GO R
RNX-KV-GO R
RNX-KV1-GO R
RNX-PM-ER R
RNX-PM-FS R

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SGX-AV-FA R
SWN-MAN03 R
ZANMOD01 R
ZANTR-2AHF R
ZO1DG001TM R
ZO1MOD01 R
ZO1MOD03 R
ZO1MOD04 R
ZO2DG002TM R
ZO2MOD01 R
ZO2MOD04 R
ZOX-BL-ES R
ZOX-DG-DR R
ZOX-DG-DS R
ZOX-PD-ER R
ZOX-PD-ES R
CV3EPCPASA R
CV3EPCPBSA R
CVAEP084SA R
CVBEP081SA R
FWA-CV-EO R
RNAEP01ASA R
RNAEP01BSA R
RNAEP022SA R
RNBEP011SA R
RNDEP023SA R
SGX-CV-GO R
SGX-MV-RP R

Note: R means the basic event probability is set equal to 1 and the basic event id is "Removed" (it does not show up in the cutsets) from the cutsets.

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Table 8. Case-39 Dominant CDF Cutsets

File: case-39.wlk

Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	4.29E-06	29.26	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
2	2.06E-06	14.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
3	1.83E-06	12.48	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
4	9.30E-07	6.34	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
5	9.30E-07	6.34	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
6	8.06E-07	5.5	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
7	4.73E-07	3.23	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS

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Table 8. Case-39 Dominant CDF Cutsets

File: case-39.wlk

Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
8	1.95E-07	1.33	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
9	1.68E-07	1.15	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
10	1.58E-07	1.08	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
11	1.48E-07	1.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
12	1.29E-07	0.88	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
13	1.07E-07	0.73	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-

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Table 8. Case-39 Dominant CDF Cutsets

File: case-39.wlk

Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
					PMXMOD1-SW
14	9.24E-08	0.63	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW
15	7.50E-08	0.51	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
16	7.50E-08	0.51	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
17	7.44E-08	0.51	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
18	7.44E-08	0.51	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
19	6.54E-08	0.45	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
20	6.54E-08	0.45	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
21	6.50E-08	0.44	SMALL LOCA INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.00E-04 1.30E-04	IEV-SLOCA IWX-EV-SA
22	6.25E-08	0.43	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	2.12E-04 2.95E-04	IEV-SI-LB ADX-EV-SA2
23	5.67E-08	0.39	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	4.36E-04 1.30E-04	IEV-MLOCA IWX-EV-SA
24	5.56E-08	0.38	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF ESF INPUT LOGIC (HARDWARE)	5.40E-05 1.03E-03	IEV-SPADS CCX-INPUT-LOGIC
25	5.09E-08	0.35	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.12E-04 2.40E-04	IEV-SI-LB IWA-PLUG
26	4.66E-08	0.32	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	3.35E-01 1.20E-05 1.16E-02	IEV-LMFW CCX-SFTW REC-MANDAS
27	4.38E-08	0.3	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACBCV029GO
28	4.38E-08	0.3	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
29	4.38E-08	0.3	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
30	4.38E-08	0.3	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
31	4.38E-08	0.3	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
32	4.35E-08	0.3	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
33	4.35E-08	0.3	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA .
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
34	4.07E-08	0.28	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C

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Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
35	4.02E-08	0.27	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	3.35E-01 1.20E-05 1.00E-02	IEV-LMFW CCX-SFTW MDAS
36	3.18E-08	0.22	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	2.12E-04 1.50E-04	IEV-SI-LB IWX-CV-AO
37	3.18E-08	0.22	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	2.12E-04 1.50E-04	IEV-SI-LB ADX-EV-SA
38	3.04E-08	0.21	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 AOVs TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 5.00E-01 6.20E-05 5.06E-01 5.00E-01	IEV-SGTR ADF-MAN01 CCX-AV-LA REC-MANDASC ADN-MAN01C
39	2.96E-08	0.2	RCS LEAK INITIATING EVENT OCCURS CCF OF TANK LEVEL TRANSMITTERS OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	6.20E-03 4.78E-04 1.00E-02	IEV-RCSLK IWX-XMTR REN-MAN04
40	2.76E-08	0.19	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	2.12E-04 1.30E-04	IEV-SI-LB IWX-EV-SA
41	2.75E-08	0.19	CMT LINE BREAK INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	9.31E-05 2.95E-04	IEV-CMTLB ADX-EV-SA2

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
42	2.67E-08	0.18	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	1.92E-01 1.20E-05 1.16E-02	IEV-LMFW1 CCX-SFTW REC-MANDAS
43	2.59E-08	0.18	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.88E-03 5.00E-01 8.75E-03 5.06E-01 3.02E-03	IEV-SGTR ADF-MAN01 CMX-CV-GO REC-MANDASC ADN-MAN01
44	2.49E-08	0.17	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.88E-03 4.20E-03 5.06E-01 3.02E-03	IEV-SGTR RPX-CB-GO REC-MANDASC ADN-MAN01
45	2.35E-08	0.16	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	5.00E-04 4.70E-05	IEV-SLOCA CCX-BY-PN
46	2.30E-08	0.16	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.92E-01 1.20E-05 1.00E-02	IEV-LMFW1 CCX-SFTW MDAS
47	2.05E-08	0.14	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.36E-04 4.70E-05	IEV-MLOCA CCX-BY-PN

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
48	2.00E-08	0.14	LOSS OF CCW/SW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	1.44E-01 1.20E-05 1.16E-02	IEV-LCCW CCX-SFTW REC-MANDAS
49	1.73E-08	0.12	LOSS OF CCW/SW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.44E-01 1.20E-05 1.00E-02	IEV-LCCW CCX-SFTW MDAS
50	1.62E-08	0.11	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN CHECK VALVE 124A FAILS TO OPEN	2.12E-04 8.75E-03 8.75E-03	IEV-SI-LB IWACV122AO IWACV124AO
51	1.59E-08	0.11	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	5.40E-05 2.95E-04	IEV-SPADS ADX-EV-SA2
52	1.58E-08	0.11	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COGNITIVE OPERATOR ERROR COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 1.84E-03 8.75E-03 5.06E-01 5.00E-01	IEV-SGTR CIB-MAN00 CMX-CV-GO REC-MANDASC ADN-MAN01C
53	1.56E-08	0.11	LOSS OF CONDENSER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	1.12E-01 1.20E-05 1.16E-02	IEV-LCOND CCX-SFTW REC-MANDAS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
54	1.40E-08	0.1	CMT LINE BREAK INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	9.31E-05 1.50E-04	IEV-CMTLB ADX-EV-SA
55	1.40E-08	0.1	CMT LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	9.31E-05 1.50E-04	IEV-CMTLB IWV-CV-AO
56	1.38E-08	0.09	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	5.40E-05 2.55E-04	IEV-SPADS ACX-CV-GO
57	1.34E-08	0.09	LOSS OF CONDENSER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.12E-01 1.20E-05 1.00E-02	IEV-LCOND CCX-SFTW MDAS
58	1.33E-08	0.09	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE CCF OF 2 SQUIB VALVES TO OPERATE	4.50E-03 1.00E-02 2.95E-04	IEV-POWEX OTH-PRSOV ADX-EV-SA2
59	1.21E-08	0.08	CMT LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	9.31E-05 1.30E-04	IEV-CMTLB IWV-EV-SA
60	1.17E-08	0.08	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES SOFTWARE CCF OF ALL CARDS FAILURE OF MANUAL DAS ACT.	1.20E-01 7.00E-01 1.20E-05 1.16E-02	IEV-LOSP OTH-R05 CCX-SFTW REC-MANDAS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
61	1.15E-08	0.08	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
62	1.10E-08	0.08	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
63	1.04E-08	0.07	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
64	1.04E-08	0.07	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
65	1.01E-08	0.07	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
66	1.00E-08	0.07	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS	1.00E-08	IEV-RV-RP
67	9.96E-09	0.07	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	2.12E-04 4.70E-05	IEV-SI-LB CCX-BY-PN
68	9.48E-09	0.06	ATWS PRECURSOR WITH MFW AVAILA. INITIATING EVENT OCCURS REACTOR TRIP BREAKERS CCF INDICATION FAILURE	1.17E+00 8.10E-05 1.00E-04	IEV-ATW-T RCX-RB-FA ALL-IND-FAIL
69	8.40E-09	0.06	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES FAILURE OF MANUAL DAS ACT. CCF OF EPO BOARDS IN PMS	1.20E-01 7.00E-01 1.16E-02 8.62E-06	IEV-LOSP OTH-R05 REC-MANDAS CCX-EP-SAM
70	8.10E-09	0.06	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	5.40E-05 1.50E-04	IEV-SPADS IWX-CV-AO
71	8.10E-09	0.06	SPURIOUS ADS INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	5.40E-05 1.50E-04	IEV-SPADS ADX-EV-SA
72	7.91E-09	0.05	RCS LEAK INITIATING EVENT OCCURS FAILURE OF MANUAL DAS ACT. CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	6.20E-03 1.16E-02 1.10E-04	IEV-RCSLK REC-MANDAS CCX- PMXMOD1-SW

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
73	7.79E-09	0.05	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
74	7.79E-09	0.05	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
75	7.59E-09	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
76	7.59E-09	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
77	7.24E-09	0.05	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM

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78	7.02E-09	0.05	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	5.40E-05 1.30E-04	IEV-SPADS IWX-EV-SA
79	6.94E-09	0.05	CONSEQUENTIAL SGTR OCCURS LOSS OF CONDENSER INITIATING EVENT OCCURS ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV) CCF OF 2 SQUIB VALVES TO OPERATE	1.00E-02 1.12E-01 2.10E-02 2.95E-04	OTH-SGTR IEV-LCOND OTH-SLSOV1 ADX-EV-SA2
80	6.82E-09	0.05	RCS LEAK INITIATING EVENT OCCURS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	6.20E-03 1.00E-02 1.10E-04	IEV-RCSLK MDAS CCX- PMXMOD1-SW
81	6.75E-09	0.05	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	4.50E-03 1.00E-02 1.50E-04	IEV-POWEX OTH-PRSOV ADX-EV-SA
82	6.75E-09	0.05	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE CCF OF 4 GRAVITY INJECTION CVs	4.50E-03 1.00E-02 1.50E-04	IEV-POWEX OTH-PRSOV IWX-CV-AO
83	6.69E-09	0.05	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-04 8.75E-03 5.06E-01 3.02E-03	IEV-SLOCA CMX-CV-GO REC-MANDASC ADN-MAN01

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Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
84	6.37E-09	0.04	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	4.36E-04 8.75E-03 5.06E-01 3.30E-03	IEV-MLOCA CMX-CV-GO REC-MANDASC LPM-MAN02
85	6.32E-09	0.04	TRANSIENT WITH MFW INITIATING EVENT OCCURS FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	1.40E+00 9.60E-05 4.70E-05	IEV-TRANS PXX-AV-LA1 CCX-BY-PN
86	6.32E-09	0.04	TRANSIENT WITH MFW INITIATING EVENT OCCURS FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	1.40E+00 9.60E-05 4.70E-05	IEV-TRANS PXX-AV-LA CCX-BY-PN
87	6.18E-09	0.04	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS FAILURE TO RECLOSE OF SG PORV & 1 SG SV ON RUPTURED S CCF OF 2 SQUIB VALVES TO OPERATE	3.88E-03 5.40E-03 2.95E-04	IEV-SGTR OTH-SLSOV3 ADX-EV-SA2
88	6.15E-09	0.04	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	2.12E-04 2.90E-05	IEV-SI-LB IWX-EV1-SA
89	6.00E-09	0.04	SMALL LOCA INITIATING EVENT OCCURS CCF OF STRAINERS IN IRWST TANK	5.00E-04 1.20E-05	IEV-SLOCA IWX-FL-GP
90	6.00E-09	0.04	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
91	5.97E-09	0.04	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
92	5.97E-09	0.04	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
93	5.94E-09	0.04	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD2-SW
94	5.94E-09	0.04	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF ESF INPUT LOGIC SOFTWARE	1.10E-04	CCX-IN-LOGIC- SW
95	5.94E-09	0.04	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW
96	5.85E-09	0.04	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA

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97	5.83E-09	0.04	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	4.36E-04 8.75E-03 5.06E-01 3.02E-03	IEV-MLOCA CMX-CV-GO REC-MANDASC ADN-MAN01
98	5.52E-09	0.04	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	3.88E-03 1.34E-03 4.20E-03 5.06E-01 5.00E-01	IEV-SGTR CIB-MAN01 RPX-CB-GO REC-MANDASC LPM-MAN01C
99	5.23E-09	0.04	MEDIUM LOCA INITIATING EVENT OCCURS CCF OF STRAINERS IN IRWST TANK	4.36E-04 1.20E-05	IEV-MLOCA IWV-FL-GP
100	5.23E-09	0.04	MEDIUM LOCA INITIATING EVENT OCCURS PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	4.36E-04 1.20E-05	IEV-MLOCA REX-FL-GP
101	5.20E-09	0.04	CONSEQUENTIAL SGTR OCCURS LOSS OF OFFSITE POWER INITIATING EVENT OCCURS FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV) CCF OF 2 SQUIB VALVES TO OPERATE	1.00E-02 1.20E-01 7.00E-01 2.10E-02 2.95E-04	OTH-SGTR IEV-LOSP OTH-R05 OTH-SLSOV1 ADX-EV-SA2
102	5.15E-09	0.04	LARGE LOCA INITIATING EVENT OCCURS CCF OF ESF INPUT LOGIC (HARDWARE)	5.00E-06 1.03E-03	IEV-LLOCA CCX-INPUT-

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
					LOGIC
103	5.12E-09	0.03	TRANSIENT WITH MFW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS EDS3 EA 1 DISTR. PNL FAILURE OR T&M	1.40E+00 1.20E-05 3.05E-04	IEV-TRANS CCX-SFTW ED3MOD07
104	4.95E-09	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS CCF OF PMS ESF OUTPUT LOGIC SOFTWARE FAILURE OF MANUAL DAS ACT.	3.88E-03 1.10E-04 1.16E-02	IEV-SGTR CCX- PMXMOD1-SW REC-MANDAS
105	4.86E-09	0.03	ATWS PRECURSOR WITH SI SIGNAL INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	1.48E-02 1.20E-05 5.20E-02 5.26E-01	IEV-ATW-S CCX-SFTW ATW-MAN03 ATW-MAN04C
106	4.48E-09	0.03	LOSS OF CCW/SW INITIATING EVENT OCCURS FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.44E-01 9.60E-05 3.24E-04	IEV-LCCW PXX-AV-LA ADX-MV3-GO
107	4.48E-09	0.03	LOSS OF CCW/SW INITIATING EVENT OCCURS FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.44E-01 9.60E-05 3.24E-04	IEV-LCCW PXX-AV-LA1 ADX-MV3-GO
108	4.38E-09	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
109	4.33E-09	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
110	4.27E-09	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
111	4.16E-09	0.03	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
112	4.13E-09	0.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
113	4.13E-09	0.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
114	4.13E-09	0.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
115	4.13E-09	0.03	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
116	4.05E-09	0.03	PRZ SV FAILURE FOR LOSS OF MFW ATWS, NO UET	2.00E-03	OTH-PRES
			ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			REACTOR TRIP BREAKERS CCF	8.10E-05	RCX-RB-FA
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-02	ATW-MAN04
117	3.90E-09	0.03	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			REACTOR TRIP BREAKERS CCF	8.10E-05	RCX-RB-FA
			INDICATION FAILURE	1.00E-04	ALL-IND-FAIL
118	3.64E-09	0.02	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP
119	3.64E-09	0.02	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACAOR001SP
120	3.57E-09	0.02	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS	1.21E-03	IEV-SLB-V
			CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
121	3.53E-09	0.02	CONSEQUENTIAL SGTR OCCURS LOSS OF CONDENSER INITIATING EVENT OCCURS ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV) DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.00E-02 1.12E-01 2.10E-02 1.50E-04	OTH-SGTR IEV-LCOND OTH-SLSOV1 ADX-EV-SA
122	3.53E-09	0.02	CONSEQUENTIAL SGTR OCCURS LOSS OF CONDENSER INITIATING EVENT OCCURS ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV) CCF OF 4 GRAVITY INJECTION CVs	1.00E-02 1.12E-01 2.10E-02 1.50E-04	OTH-SGTR IEV-LCOND OTH-SLSOV1 IWX-CV-AO
123	3.48E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.12E-01 9.60E-05 3.24E-04	IEV-LCOND PXX-AV-LA ADX-MV3-GO
124	3.48E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.12E-01 9.60E-05 3.24E-04	IEV-LCOND PXX-AV-LA1 ADX-MV3-GO
125	3.40E-09	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS INDICATION FAILURE COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	3.88E-03 1.00E-04 8.75E-03	IEV-SGTR ALL-IND-FAIL CMX-CV-GO
126	3.35E-09	0.02	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 AOVs TO OPEN	5.40E-05 6.20E-05	IEV-SPADS CCX-AV-LA

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127	3.21E-09	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
128	3.06E-09	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
129	3.06E-09	0.02	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
130	3.01E-09	0.02	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			CCF OF SAFETY PT LT CONTINUOSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			COMMON CAUSE FAILURE OF PZR LEVEL SENSORS	4.78E-04	CCX-XMTR195
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
131	3.00E-09	0.02	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
132	3.00E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW
133	2.97E-09	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
134	2.82E-09	0.02	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW
135	2.80E-09	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
136	2.71E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CHECK VALVE 124A FAILS TO OPEN	8.75E-03	IWACV124AO
137	2.71E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	8.75E-03	IWACV122AO
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
138	2.65E-09	0.02	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
139	2.65E-09	0.02	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
140	2.59E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW
141	2.54E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB

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			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
142	2.52E-09	0.02	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOV5	3.24E-04	ADX-MV3-GO
143	2.51E-09	0.02	LOSS OF RSC FLOW INITIATING EVENT OCCURS	1.80E-02	IEV-LRCS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
144	2.40E-09	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
145	2.39E-09	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
146	2.29E-09	0.02	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA

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Reduced Sum = 1.47E-05

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
147	2.17E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOV5	3.24E-04	ADX-MV3-GO
148	2.16E-09	0.01	LOSS OF RSC FLOW INITIATING EVENT OCCURS	1.80E-02	IEV-LRCS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
149	2.11E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
150	2.09E-09	0.01	INADEQUATE PRS RELIEF FOR LOSS OF MFW ATWS, WITH UET	2.00E-03	OTH-PRESU
			ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			REACTOR TRIP BREAKERS CCF	8.10E-05	RCX-RB-FA
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA DAS	5.20E-02	ATW-MAN04
			COND. PROB. OF ATW-MAN01 (OPER. FAILS TO STEP-IN CONTROL ROD	5.17E-01	ATW-MAN01C
151	2.08E-09	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
152	2.08E-09	0.01	PRZ SV FAILURE FOR LOSS OF MFW ATWS, NO UET	2.00E-03	OTH-PRES

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			PMS REACTOR TRIP SYSTEM HARDWARE CCF	7.89E-05	CCX-PMS-HARDWARE
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
153	2.07E-09	0.01	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF RTD LEVEL TRANSMITTERS	3.84E-05	CMX-VS-FA
154	1.86E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
155	1.86E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
156	1.85E-09	0.01	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			ANY SECOND. SIDE RELIEF VALVE FAILS TO RECLOSE (1 SV + PORV)	1.10E-02	OTH-SLSOV

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
157	1.82E-09	0.01	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS	1.21E-03	IEV-SLB-V
			CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
158	1.82E-09	0.01	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS	1.21E-03	IEV-SLB-V
			CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
159	1.63E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			INDICATION FAILURE	1.00E-04	ALL-IND-FAIL
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
160	1.62E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 124A FAILS TO OPEN	8.75E-03	IWACV124AO
			RELAY FAILS TO OPERATE	8.76E-04	IWBRS123AFA
161	1.62E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	8.75E-03	IWACV122AO
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
162	1.61E-09	0.01	PASSIVE RHR TUBE RUPTURE INITIATING EVENT OCCURS	1.34E-04	IEV-PRSTR
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
163	1.57E-09	0.01	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS CONSEQUENTIAL SGTR OCCURS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.21E-03 1.00E-02 1.30E-04	IEV-SLB-V OTH-SGTR IWX-EV-SA
164	1.57E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS FAILURE TO RECLOSE OF SG PORV & 1 SG SV ON RUPTURED S CCF OF 4 GRAVITY INJECTION CVs	3.88E-03 5.00E-01 5.40E-03 1.50E-04	IEV-SGTR ADF-MAN01 OTH-SLSOV3 IWX-CV-AO
165	1.57E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS FAILURE TO RECLOSE OF SG PORV & 1 SG SV ON RUPTURED S DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.88E-03 5.00E-01 5.40E-03 1.50E-04	IEV-SGTR ADF-MAN01 OTH-SLSOV3 ADX-EV-SA
166	1.54E-09	0.01	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS FAILURE OF MANUAL DAS ACT. CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.21E-03 1.16E-02 1.10E-04	IEV-SLB-V REC-MANDAS CCX- PMXMOD1-SW
167	1.53E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG CCF OF 2 SQUIB VALVES TO OPERATE	3.88E-03 1.34E-03 2.95E-04	IEV-SGTR CIB-MAN01 ADX-EV-SA2
168	1.49E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	2.12E-04 4.20E-03	IEV-SI-LB RPX-CB-GO

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	5.06E-01 3.30E-03	REC-MANDASC LPM-MAN02
169	1.48E-09	0.01	RCS LEAK INITIATING EVENT OCCURS MAIN GEN. BKR ES 01 FAILS TO OPEN [# COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	6.20E-03 5.08E-03 4.70E-05	IEV-RCSLK ECOMOD01 CCX-BY-PN
170	1.48E-09	0.01	LARGE LOCA INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	5.00E-06 2.95E-04	IEV-LLOCA ADX-EV-SA2
171	1.42E-09	0.01	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-04 4.20E-03 5.06E-01 1.34E-03	IEV-SLOCA RPX-CB-GO REC-MANDASC LPM-MAN01
172	1.36E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS FAILURE TO RECLOSE OF SG PORV & 1 SG SV ON RUPTURED S CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	3.88E-03 5.00E-01 5.40E-03 1.30E-04	IEV-SGTR ADF-MAN01 OTH-SLSOV3 IWV-EV-SA
173	1.36E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	2.12E-04 4.20E-03 5.06E-01 3.02E-03	IEV-SI-LB RPX-CB-GO REC-MANDASC ADN-MAN01

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
174	1.35E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 029A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV029GO
175	1.35E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 028A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV028GO
176	1.33E-09	0.01	MAIN STEAM LINE STUCK-OPEN SV INITIATING EVENT OCCURS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.21E-03 1.00E-02 1.10E-04	IEV-SLB-V MDAS CCX- PMXMOD1-SW
177	1.28E-09	0.01	LARGE LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	5.00E-06 2.55E-04	IEV-LLOCA ACX-CV-GO
178	1.25E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS AOV MSIV V040B FAILS TO CLOSE CCF OF 2 SQUIB VALVES TO OPERATE	3.88E-03 1.09E-03 2.95E-04	IEV-SGTR SGBAV040LA ADX-EV-SA2
179	1.23E-09	0.01	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.35E-01 1.20E-05 3.05E-04	IEV-LMFW CCX-SFTW ED3MOD07
180	1.21E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
181	1.21E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
182	1.21E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
183	1.21E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
184	1.16E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
185	1.16E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS

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			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
186	1.12E-09	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
187	1.12E-09	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
188	1.08E-09	0.01	LOSS OF COMPRESSED AIR INITIATING EVENT OCCURS	3.48E-02	IEV-LCAS
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
189	1.08E-09	0.01	LOSS OF COMPRESSED AIR INITIATING EVENT OCCURS	3.48E-02	IEV-LCAS
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
190	1.07E-09	0.01	INADEQUATE PRS RELIEF FOR LOSS OF MFW ATWS, WITH UET	2.00E-03	OTH-PRESU
			ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			PMS REACTOR TRIP SYSTEM HARDWARE CCF	7.89E-05	CCX-PMS-HARDWARE
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
			COND. PROB. OF ATW-MAN01 (OPER. FAILS TO STEP-IN CONTROL ROD)	5.17E-01	ATW-MAN01C

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
191	1.07E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COGNITIVE OPERATOR ERROR DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	3.88E-03 1.84E-03 1.50E-04	IEV-SGTR CIB-MAN00 ADX-EV-SA
192	1.07E-09	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COGNITIVE OPERATOR ERROR CCF OF 4 GRAVITY INJECTION CVs	3.88E-03 1.84E-03 1.50E-04	IEV-SGTR CIB-MAN00 IWX-CV-AO
193	1.05E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC CCF OF ESF INPUT LOGIC (HARDWARE) OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	1.40E+00 4.78E-04 5.06E-01 1.03E-03 3.02E-03	IEV-TRANS CCX-TRNSM REC-MANDASC CCX-INPUT- LOGIC ADN-MAN01
194	1.05E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.20E-01 7.00E-01 9.60E-05 1.30E-04	IEV-LOSP OTH-R05 PXX-AV-LA1 IWX-EV-SA
195	1.05E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.20E-01 7.00E-01 9.60E-05 1.30E-04	IEV-LOSP OTH-R05 PXX-AV-LA IWX-EV-SA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
196	1.03E-09	0.01	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF COMPRESSED AIR INITIATING EVENT OCCURS	3.48E-02	IEV-LCAS
			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (1 SV)	1.00E-02	OTH-SLSOV2
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
197	1.01E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
198	1.01E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
199	1.00E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
200	1.00E-09	0.01	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			CCF NON-SAFETY TRANSMITTERS INTERFACING SYSTEM PRESSU	4.78E-04	CCX-TRNSM
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
Total % = 99.14					

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Table 9. Basic Events Revised in Case-40

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CVMOD01 R
CVMOD02 R
CVMOD03 R
CVMOD04 R
CVMOD05 R
CVMOD07 R
CVN-MAN00 R
CVN-MAN02 R
CVN-MAN03 R
CVNMV090GC R
CVNMV091GC R
CVX-MV-GC2 R
CVX-PM-ER R
DAS 0.1
FWACV012GO R
FWBCV012GO R
FWMOD013A R
FWMOD013B R
FWMOD03A R
FWMOD03B R
FWX-CV2-GO R
FWX-MV2-GO R
FWX-PM2-ER R
FWX-PM2-FS R
RHN-MAN01 0.0
RN11MOD3 0.1
RN22MOD4 0.0
RN23MOD5 0.0
RN55MOD1 0.0
RNAMOD06 0.0
RNAMOD09 0.0
RNBMOD07 0.0
RNBMOD10 0.0
RNNCV013GO 0.0
RNNCV056GO 0.0
RNX-CV-GO 0.0
RNX-KV-GO 0.0
RNX-KV1-GO 0.0
RNX-PM-ER 0.0
RNX-PM-FS 0.0
ZANMOD01 0.0
ZANTR-2AHF 0.0
ZO1DG001TM 0.0
ZO1MOD01 0.0

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ZO1MOD03 0.0
ZO1MOD04 0.0
ZO2DG002TM 0.0
ZO2MOD01 0.0
ZO2MOD04 0.0
ZOX-BL-ES 0.0
ZOX-DG-DR 0.0
ZOX-DG-DS 0.0
ZOX-PD-ER 0.0
ZOX-PD-ES 0.1
CV3EPCPASA R
CV3EPCPBSA R
CVAEP084SA R
CVBEP081SA R
FWA-CV-EO R
RNAEP01ASA 0.0
RNAEP01BSA 0.0
RNAEP022SA 0.0
RNBEP011SA 0.0
RNDEP023SA 0.0
SGX-CV-GO R
SGX-MV-RP R

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
1	4.29E-06	49.16	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
2	2.06E-06	23.61	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
3	4.73E-07	5.42	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
4	1.83E-07	2.1	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
5	9.30E-08	1.07	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
6	9.30E-08	1.07	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wik
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
7	8.06E-08	0.92	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
8	7.44E-08	0.85	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
9	6.25E-08	0.72	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
10	5.56E-08	0.64	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
11	5.09E-08	0.58	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			IWRST DISCHARGE LINE "A" STRAINER PLUGGED	2.40E-04	IWA-PLUG
12	4.38E-08	0.5	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
13	4.38E-08	0.5	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
14	4.38E-08	0.5	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029B FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACBCV029GO
15	4.38E-08	0.5	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 028B FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACBCV028GO
16	4.38E-08	0.5	LARGE LOCA INITIATING EVENT OCCURS CHECK VALVE 029A FAILS TO OPEN	5.00E-06 8.75E-03	IEV-LLOCA ACACV029GO
17	4.07E-08	0.47	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 5.00E-01 4.20E-03 1.00E-02 5.00E-01	IEV-SGTR ADF-MAN01 RPX-CB-GO MDAS ADN-MAN01C
18	3.18E-08	0.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF 4 GRAVITY INJECTION CVs	2.12E-04 1.50E-04	IEV-SI-LB IWX-CV-AO
19	3.18E-08	0.36	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	2.12E-04 1.50E-04	IEV-SI-LB ADX-EV-SA
20	3.04E-08	0.35	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS COMMON CAUSE FAILURE OF 4 AOVs TO OPEN	3.88E-03 5.00E-01 6.20E-05	IEV-SGTR ADF-MAN01 CCX-AV-LA

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
21	2.96E-08	0.34	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
22	2.76E-08	0.32	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
23	2.59E-08	0.3	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
24	2.49E-08	0.29	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
25	1.95E-08	0.22	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
26	1.83E-08	0.21	RCS LEAK INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	6.20E-03 2.95E-04 1.00E-02	IEV-RCSLK ADX-EV-SA2 CLP-UNAVAILABLE
27	1.68E-08	0.19	TRANSIENT WITH MFW INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS UNAVAILABILITY GOAL FOR DAS FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.40E+00 1.20E-05 1.00E-01 1.00E-02	IEV-TRANS CCX-SFTW DAS MDAS
28	1.62E-08	0.19	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CHECK VALVE 122A FAILS TO OPEN CHECK VALVE 124A FAILS TO OPEN	2.12E-04 8.75E-03 8.75E-03	IEV-SI-LB IWACV122AO IWACV124AO
29	1.59E-08	0.18	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF 2 SQUIB VALVES TO OPERATE	5.40E-05 2.95E-04	IEV-SPADS ADX-EV-SA2
30	1.58E-08	0.18	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS COGNITIVE OPERATOR ERROR COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	3.88E-03 1.84E-03 8.75E-03 5.06E-01 5.00E-01	IEV-SGTR CIB-MAN00 CMX-CV-GO REC-MANDASC ADN-MAN01C
31	1.58E-08	0.18	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
32	1.48E-08	0.17	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
33	1.38E-08	0.16	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
34	1.29E-08	0.15	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
35	1.15E-08	0.13	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
36	1.10E-08	0.13	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
37	1.04E-08	0.12	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
38	1.04E-08	0.12	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
39	1.00E-08	0.11	REACTOR VESSEL RUPTURE INITIATING EVENT OCCURS	1.00E-08	IEV-RV-RP
40	9.30E-09	0.11	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
41	9.30E-09	0.11	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
42	8.10E-09	0.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
43	8.10E-09	0.09	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
44	8.06E-09	0.09	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
45	7.91E-09	0.09	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
46	7.79E-09	0.09	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
47	7.79E-09	0.09	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
48	7.59E-09	0.09	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
49	7.59E-09	0.09	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
50	7.50E-09	0.09	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
51	7.50E-09	0.09	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
52	7.44E-09	0.09	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
53	7.02E-09	0.08	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
54	6.82E-09	0.08	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX- PMXMOD1-SW

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
55	6.69E-09	0.08	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
56	6.54E-09	0.07	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
57	6.54E-09	0.07	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
58	6.50E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
59	6.37E-09	0.07	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
60	6.15E-09	0.07	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF 2 GRAVITY INJECTION SQUIB VALVES IN 1/1 LINES TO OPEN	2.90E-05	IWX-EV1-SA

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
61	6.00E-09	0.07	SMALL LOCA INITIATING EVENT OCCURS PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	5.00E-04 1.20E-05	IEV-SLOCA REX-FL-GP
62	5.94E-09	0.07	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF ESF INPUT LOGIC SOFTWARE	5.40E-05 1.10E-04	IEV-SPADS CCX-IN-LOGIC-SW
63	5.94E-09	0.07	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	5.40E-05 1.10E-04	IEV-SPADS CCX- PMXMOD1-SW
64	5.94E-09	0.07	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF PMS ESF ACTUATION LOGIC SOFTWARE	5.40E-05 1.10E-04	IEV-SPADS CCX- PMXMOD2-SW
65	5.83E-09	0.07	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	4.36E-04 8.75E-03 5.06E-01 3.02E-03	IEV-MLOCA CMX-CV-GO REC-MANDASC ADN-MAN01
66	5.67E-09	0.06	MEDIUM LOCA INITIATING EVENT OCCURS HARDWARE FAILURE OF ISOLATION MOV 011 CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	4.36E-04 1.00E-01 1.30E-04	IEV-MLOCA RN11MOD3 IWV-EV-SA
67	5.52E-09	0.06	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			OPERATOR ERROR TO CLOSE VALVES ON RUPTURED SG	1.34E-03	CIB-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			LPM-MAN01C	5.00E-01	LPM-MAN01C
68	5.23E-09	0.06	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
69	5.15E-09	0.06	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
70	5.12E-09	0.06	TRANSIENT WITH MFW INITIATING EVENT OCCURS	1.40E+00	IEV-TRANS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
71	4.95E-09	0.06	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
72	4.94E-09	0.06	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
73	4.94E-09	0.06	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
74	4.94E-09	0.06	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
75	4.66E-09	0.05	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
76	4.33E-09	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
77	4.27E-09	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
78	4.16E-09	0.05	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
79	4.13E-09	0.05	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
80	4.13E-09	0.05	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
81	4.13E-09	0.05	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
82	4.13E-09	0.05	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
83	4.02E-09	0.05	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
84	3.64E-09	0.04	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			FLOW TUNING ORIFICE PLUGS	7.27E-04	ACBOR001SP

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
85	3.64E-09	0.04	LARGE LOCA INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS	5.00E-06 7.27E-04	IEV-LLOCA ACAOR001SP
86	3.48E-09	0.04	LOSS OF CONDENSER INITIATING EVENT OCCURS FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.12E-01 9.60E-05 3.24E-04	IEV-LCOND PXX-AV-LA ADX-MV3-GO
87	3.48E-09	0.04	LOSS OF CONDENSER INITIATING EVENT OCCURS PXX-AV-LA1 CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	1.12E-01 9.60E-05 3.24E-04	IEV-LCOND PXX-AV-LA1 ADX-MV3-GO
88	3.35E-09	0.04	SPURIOUS ADS INITIATING EVENT OCCURS COMMON CAUSE FAILURE OF 4 AOVs TO OPEN	5.40E-05 6.20E-05	IEV-SPADS CCX-AV-LA
89	3.21E-09	0.04	SMALL LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-04 4.20E-03 5.06E-01 3.02E-03	IEV-SLOCA RPX-CB-GO REC-MANDASC ADN-MAN01
90	3.06E-09	0.04	MEDIUM LOCA INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	4.36E-04 4.20E-03 5.06E-01 3.30E-03	IEV-MLOCA RPX-CB-GO REC-MANDASC LPM-MAN02
91	3.01E-09	0.03	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			CCF OF SAFETY PT LT CONTINUOUSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			COMMON CAUSE FAILURE OF PZR LEVEL SENSORS	4.78E-04	CCX-XMTR195
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
92	2.97E-09	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	1.34E-03	LPM-MAN01
93	2.82E-09	0.03	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	1.10E-04	CCX-PMXMOD1-SW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
94	2.80E-09	0.03	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
95	2.75E-09	0.03	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3

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Table 10. Case-40 Dominant CDF Cutsets

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
96	2.71E-09	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	8.75E-03	IWACV122AO
			HARDWARE FAILURE OF VALVE 125A	1.46E-03	IRWMOD06
97	2.71E-09	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			HARDWARE FAILURE OF VALVE 123A	1.46E-03	IRWMOD05
			CHECK VALVE 124A FAILS TO OPEN	8.75E-03	IWACV124AO
98	2.67E-09	0.03	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
99	2.54E-09	0.03	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
100	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
101	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
102	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
103	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
104	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
105	2.51E-09	0.03	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
106	2.39E-09	0.03	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
107	2.30E-09	0.03	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
108	2.18E-09	0.02	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS122TM
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
109	2.18E-09	0.02	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
110	2.18E-09	0.02	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
111	2.08E-09	0.02	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
112	2.07E-09	0.02	SPURIOUS ADS INITIATING EVENT OCCURS	5.40E-05	IEV-SPADS
			CCF OF RTD LEVEL TRANSMITTERS	3.84E-05	CMX-VS-FA
113	2.00E-09	0.02	LOSS OF CCW/SW INITIATING EVENT OCCURS	1.44E-01	IEV-LCCW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
114	1.86E-09	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
115	1.86E-09	0.02	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			COGNITIVE OPERATOR ERROR	1.84E-03	CIB-MAN00
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.00E-01	LPM-MAN01C
116	1.73E-09	0.02	LOSS OF CCW/SW INITIATING EVENT OCCURS	1.44E-01	IEV-LCCW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
117	1.62E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 122A FAILS TO OPEN	8.75E-03	IWACV122AO
			RELAY FAILS TO OPERATE	8.76E-04	IWDRS125AFA
118	1.62E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CHECK VALVE 124A FAILS TO OPEN	8.75E-03	IWACV124AO

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			RELAY FAILS TO OPERATE	8.76E-04	IWBR123AFA
119	1.61E-09	0.02	PASSIVE RHR TUBE RUPTURE INITIATING EVENT OCCURS	1.34E-04	IEV-PRSTR
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
120	1.56E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
121	1.49E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
122	1.48E-09	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING		CLP-
			OPERATIONS	1.00E-02	UNAVAILABLE
123	1.48E-09	0.02	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
124	1.42E-09	0.02	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO

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Table 10. Case-40 Dominant CDF Cutsets

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Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING SLOCA	5.06E-01 1.34E-03	REC-MANDASC LPM-MAN01
125	1.40E-09	0.02	CMT LINE BREAK INITIATING EVENT OCCURS DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE HARDWARE FAILURE OF ISOLATION MOV 011	9.31E-05 1.50E-04 1.00E-01	IEV-CMTLB ADX-EV-SA RN11MOD3
126	1.40E-09	0.02	CMT LINE BREAK INITIATING EVENT OCCURS HARDWARE FAILURE OF ISOLATION MOV 011 CCF OF 4 GRAVITY INJECTION CVs	9.31E-05 1.00E-01 1.50E-04	IEV-CMTLB RN11MOD3 IWX-CV-AO
127	1.36E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	2.12E-04 4.20E-03 5.06E-01 3.02E-03	IEV-SI-LB RPX-CB-GO REC-MANDASC ADN-MAN01
128	1.35E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 029A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV029GO
129	1.35E-09	0.02	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS FLOW TUNING ORIFICE PLUGS CHECK VALVE 028A FAILS TO OPEN	2.12E-04 7.27E-04 8.75E-03	IEV-SI-LB CMA-PLUG ACACV028GO
130	1.34E-09	0.02	LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
131	1.33E-09	0.02	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
132	1.29E-09	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP-UNAVAILABLE
133	1.28E-09	0.01	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
134	1.23E-09	0.01	LOSS OF MAIN FEEDWATER INITIATING EVENT OCCURS	3.35E-01	IEV-LMFW
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
135	1.21E-09	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA

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136	1.18E-09	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			HARDWARE FAILURE OF SQUIB VALVE 118A	1.46E-03	IRWMOD09
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
137	1.18E-09	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			HARDWARE FAILURE OF SQUIB VALVE 118B	1.46E-03	IRWMOD11
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
138	1.17E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
139	1.12E-09	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	1.20E-05	REX-FL-GP
140	1.08E-09	0.01	LOSS OF COMPRESSED AIR INITIATING EVENT OCCURS	3.48E-02	IEV-LCAS
			FAILURE OF IRWST GUTTER DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA1
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO
141	1.08E-09	0.01	LOSS OF COMPRESSED AIR INITIATING EVENT OCCURS	3.48E-02	IEV-LCAS
			FAILURE OF PRHR DUE TO COMMON CAUSE OF AOVs	9.60E-05	PXX-AV-LA
			CCF OF 4 COMBINATIONS OF 3 STAGES #2 AND #3 MOVs	3.24E-04	ADX-MV3-GO

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142	1.01E-09	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			CCF OF TANK LEVEL TRANSMITTERS	4.78E-04	IWX-XMTR
			OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILUR	1.00E-02	REN-MAN04
143	1.01E-09	0.01	LOSS OF OFFSITE POWER INITIATING EVENT OCCURS	1.20E-01	IEV-LOSP
			FAILURE TO RECOVER OFFSITE AC POWER IN 30 MINUTES	7.00E-01	OTH-R05
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			UNAVAILABILITY GOAL FOR DAS	1.00E-01	DAS
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
144	9.73E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COMMON CAUSE FAILURE OF 2 ACCUMULATOR CHECK VALVES	2.55E-04	ACX-CV-GO
145	9.29E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			CCF TO START OF ENGINE-DRIVEN FUEL PUMPS	1.00E-01	ZOX-PD-ES
			MAIN GEN. BKR ES 01 FAILS TO OPEN (#	5.08E-03	ECOMOD01
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
146	8.63E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS
147	8.26E-10	0.01	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			TURBINE IMPULSE CHAMBER PRESSURE TRANSMITTER 002 FAILURE	5.23E-03	MSHTP002RI
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
148	8.26E-10	0.01	ATWS PRECURSOR WITH NO MFW INITIATING EVENT OCCURS	4.81E-01	IEV-ATWS
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-02	ATW-MAN03
			TURBINE IMPULSE CHAMBER PRESSURE TRANSMITTER 001 FAILURE	5.23E-03	MSHTP001RI
			COND. PROB. OF ATW-MAN04 (OPER. FAILS TO TRIP REACTOR)	5.26E-01	ATW-MAN04C
149	7.87E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
150	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS012TM
151	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC1BS121TM
152	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK

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			UNAVAILABILITY OF BUS ECS ES 1 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC1BS001TM
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
153	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS221TM
154	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			UNAVAILABILITY OF BUS ECS ES 2 DUE TO UNSCHEDUL MAINTENANCE	2.70E-03	EC2BS002TM
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
155	7.87E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			COMMON CAUSE FAILURE OF THE BATTERIES IDSA-DB-1A/1B	4.70E-05	CCX-BY-PN
			BUS UNAVAILABLE DUE TO UNSCHEDULED MAINTENANCE	2.70E-03	EC2BS022TM
156	7.50E-10	0.01	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
157	7.50E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	1.00E-02	CLP- UNAVAILABLE
158	7.50E-10	0.01	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA

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NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
159	7.50E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	5.00E-04	IEV-SLOCA CLP- UNAVAILABLE
			CCF OF 4 GRAVITY INJECTION CVs	1.00E-02	
				1.50E-04	IWX-CV-AO
160	7.50E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	4.36E-04	IEV-MLOCA
				5.06E-01	REC-MANDASC
				3.30E-03	LPM-MAN02 CCX-INPUT- LOGIC
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	
161	7.44E-10	0.01	RCS LEAK INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS	6.20E-03	IEV-RCSLK
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.20E-05	CCX-SFTW
				1.00E-02	MDAS
162	7.44E-10	0.01	RCS LEAK INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS	6.20E-03	IEV-RCSLK CLP- UNAVAILABLE
			CCF OF STRAINERS IN IRWST TANK	1.00E-02	
				1.20E-05	IWX-FL-GP
163	7.06E-10	0.01	RCS LEAK INITIATING EVENT OCCURS RELAY FAILS TO OPERATE	6.20E-03	IEV-RCSLK
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	8.76E-04	IWBRS118AFA
				1.30E-04	IWX-EV-SA

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164	7.06E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			RELAY FAILS TO OPERATE	8.76E-04	IWARS118BFA
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
165	7.03E-10	0.01	LOSS OF MFW TO ONE SG INITIATING EVENT OCCURS	1.92E-01	IEV-LMFW1
			SOFTWARE CCF OF ALL CARDS	1.20E-05	CCX-SFTW
			EDS3 EA 1 DISTR. PNL FAILURE OR T&M	3.05E-04	ED3MOD07
166	6.97E-10	0.01	ATWS PRECURSOR WITH MFW AVAILA. INITIATING EVENT OCCURS	1.17E+00	IEV-ATW-T
			CONTROL ROD MG SETS FAIL TO TRIP	1.75E-03	OTH-MGSET
			REACTOR TRIP BREAKERS CCF	8.10E-05	RCX-RB-FA
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
167	6.96E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			3/4 STAGE 2 & 3 LINES FAIL DUE TO CCF OF MOVs TO OPEN	7.48E-04	ADX-MV-GO
168	6.95E-10	0.01	ATWS PRECURSOR WITH MFW AVAILA. INITIATING EVENT OCCURS	1.17E+00	IEV-ATW-T
			OPERATOR FAILS TO MANUALLY TRIP REACTOR VIA PMS	5.20E-03	ATW-MAN05
			CCF OF SAFETY PT LT CONTINUOUSLY INTERFACING HIGH PRESSURE	4.78E-04	CCX-XMTR
			COMMON CAUSE FAILURE OF PZR LEVEL SENSORS	4.78E-04	CCX-XMTR195
			COND. PROB. OF ATW-MAN06 (OPER. FAILS TO TRIP REACTOR VIA D	5.00E-01	ATW-MAN06C
169	6.94E-10	0.01	CONSEQUENTIAL SGTR OCCURS	1.00E-02	OTH-SGTR
			LOSS OF CONDENSER INITIATING EVENT OCCURS	1.12E-01	IEV-LCOND

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			ANY SECOND. SIDE RELIEF VALVE FAILS TO CLOSE (2 SV + PORV)	2.10E-02	OTH-SLSOV1
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
170	6.86E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
			CCF OF ESF INPUT LOGIC (HARDWARE)	1.03E-03	CCX-INPUT-LOGIC
171	6.86E-10	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS	2.12E-04	IEV-SI-LB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COMMON CAUSE FAILURE OF ALL CI AOVs TO CLOSE	7.70E-04	CIX-AV-LA
172	6.75E-10	0.01	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
173	6.75E-10	0.01	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
174	6.57E-10	0.01	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX

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			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
175	6.54E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			DUE TO CCF OF 4TH STAGE ADS SQUIB VALVES TO OPERATE	1.50E-04	ADX-EV-SA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING		CLP-
			OPERATIONS	1.00E-02	UNAVAILABLE
176	6.54E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS	4.36E-04	IEV-MLOCA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING		CLP-
			OPERATIONS	1.00E-02	UNAVAILABLE
			CCF OF 4 GRAVITY INJECTION CVs	1.50E-04	IWX-CV-AO
177	6.53E-10	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO RECOG. THE NEED FOR RCS DEPRESS. DURING MLOCA	3.30E-03	LPM-MAN02
178	6.50E-10	0.01	LARGE LOCA INITIATING EVENT OCCURS	5.00E-06	IEV-LLOCA
			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
179	6.50E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING		CLP-
			OPERATIONS	1.00E-02	UNAVAILABLE

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			CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	1.30E-04	IWX-EV-SA
180	6.48E-10	0.01	SPURIOUS ADS INITIATING EVENT OCCURS SOFTWARE CCF OF ALL CARDS	5.40E-05 1.20E-05	IEV-SPADS CCX-SFTW
181	6.48E-10	0.01	SPURIOUS ADS INITIATING EVENT OCCURS PLUGGING OF BOTH RECIRC LINES DUE TO CCF OF SUMP SCREENS	5.40E-05 1.20E-05	IEV-SPADS REX-FL-GP
182	6.48E-10	0.01	SPURIOUS ADS INITIATING EVENT OCCURS CCF OF STRAINERS IN IRWST TANK	5.40E-05 1.20E-05	IEV-SPADS IWX-FL-GP
183	6.47E-10	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK FLOW TUNING ORIFICE PLUGS	2.12E-04 4.20E-03 7.27E-04	IEV-SI-LB RPX-CB-GO ACAOR001SP
184	6.41E-10	0.01	PASSIVE RHR TUBE RUPTURE INITIATING EVENT OCCURS CCF OF TANK LEVEL TRANSMITTERS OPER. FAILS TO ACT. SUMP RECIRC GIVEN IRW LEVEL SIGNAL FAILURE	1.34E-04 4.78E-04 1.00E-02	IEV-PRSTR IWX-XMTR REN-MAN04
185	6.38E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS FAILURE OF MANUAL DAS ACT. CCF OF PMS ESF OUTPUT LOGIC SOFTWARE	5.00E-04 1.16E-02 1.10E-04	IEV-SLOCA REC-MANDAS CCX- PMXMOD1-SW
186	6.24E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
187	6.24E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
188	6.24E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 029B FAILS TO OPEN	8.75E-03	ACBCV029GO
			CHECK VALVE 028A FAILS TO OPEN	8.75E-03	ACACV028GO
189	6.24E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO
			CHECK VALVE 028B FAILS TO OPEN	8.75E-03	ACBCV028GO
			CHECK VALVE 029A FAILS TO OPEN	8.75E-03	ACACV029GO
190	6.20E-10	0.01	RCS LEAK INITIATING EVENT OCCURS	6.20E-03	IEV-RCSLK
			FAILURE OF MANUAL DAS ACT.	1.16E-02	REC-MANDAS

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Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			CCF OF EPO BOARDS IN PMS	8.62E-06	CCX-EP-SAM
191	6.18E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			FAILURE TO RECLOSE OF SG PORV & 1 SG SV ON RUPTURED S	5.40E-03	OTH-SLSOV3
			CCF OF 2 SQUIB VALVES TO OPERATE	2.95E-04	ADX-EV-SA2
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
192	6.02E-10	0.01	CORE POWER EXCURSION INITIATING EVENT OCCURS	4.50E-03	IEV-POWEX
			EITHER PRZR SV FAILS TO RECLOSE	1.00E-02	OTH-PRSOV
			COMMON CAUSE FAILURE OF 4 CHECK VALVES TO OPEN	8.75E-03	CMX-CV-GO
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC	5.06E-01	REC-MANDASC
			OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	3.02E-03	ADN-MAN01
193	6.01E-10	0.01	STEAM GENERATOR TUBE RUPTURE INITIATING EVENT OCCURS	3.88E-03	IEV-SGTR
			OPERATOR FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.00E-01	ADF-MAN01
			COMMON CAUSE FAILURE OF 4 AOVs TO OPEN	6.20E-05	CCX-AV-LA
			FAILURE OF MANUAL DAS REACTOR TRIP HARDWARE	1.00E-02	MDAS
			COND. PROB. OF ADN-MAN01(OPER. FAILS TO ACT. ADS)	5.00E-01	ADN-MAN01C
194	6.00E-10	0.01	SMALL LOCA INITIATING EVENT OCCURS	5.00E-04	IEV-SLOCA
			HARDWARE FAILURE OF ISOLATION MOV 011	1.00E-01	RN11MOD3
			CCF OF STRAINERS IN IRWST TANK	1.20E-05	IWX-FL-GP
195	5.98E-10	0.01	CMT LINE BREAK INITIATING EVENT OCCURS	9.31E-05	IEV-CMTLB
			COMMON CAUSE FAILURE TO OPEN OF 4.16 KVAC CIRCUIT BREAK	4.20E-03	RPX-CB-GO

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Table 10. Case-40 Dominant CDF Cutsets

File: case-40.wlk
Reduce 8.73E-06

NUMBER	CUTSET PROB	PERCENT	BASIC EVENT NAME	EVENT PROB.	IDENTIFIER
			COND. PROB. OF REC-MANDAS (FAILURE OF MANUAL DAS AC OPER. FAILS TO FULFIL MANUAL ACTUATION OF ADS	5.06E-01 3.02E-03	REC-MANDASC ADN-MAN01
196	5.85E-10	0.01	CORE POWER EXCURSION INITIATING EVENT OCCURS EITHER PRZR SV FAILS TO RECLOSE HARDWARE FAILURE OF ISOLATION MOV 011 CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	4.50E-03 1.00E-02 1.00E-01 1.30E-04	IEV-POWEX OTH-PRSOV RN11MOD3 IWX-EV-SA
197	5.80E-10	0.01	RCS LEAK INITIATING EVENT OCCURS FIXED COMPONENTS FAILURE CCF OF 2 SQUIB VALVES TO OPERATE	6.20E-03 3.17E-04 2.95E-04	IEV-RCSLK ED1MOD11 ADX-EV-SA2
198	5.80E-10	0.01	RCS LEAK INITIATING EVENT OCCURS FIXED COMPONENTS FAILURE CCF OF 2 SQUIB VALVES TO OPERATE	6.20E-03 3.17E-04 2.95E-04	IEV-RCSLK ED1MOD113 ADX-EV-SA2
199	5.72E-10	0.01	SAFETY INJECTION LINE BREAK INITIATING EVENT OCCURS CCF OF GRAVITY INJECTION CVs IN 1/1 LINES TO OPEN	2.12E-04 2.70E-06	IEV-SI-LB IWX-CV1-AO
200	5.67E-10	0.01	MEDIUM LOCA INITIATING EVENT OCCURS CASK LOADING PIT UNAVAILABLE DUE TO FUEL UNLOADING OPERATIONS CCF OF 4 GRAVITY INJECTION & 2 RECIRCULATION SQUIB VALVES	4.36E-04 1.00E-02 1.30E-04	IEV-MLOCA CLP- UNAVAILABLE IWX-EV-SA
Total % =		98.97			

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DSER Open Item Number: 19.4-1 Response Revision 1

Original RAI Number(s): 720.060

Summary of Issue:

In a revised RAI response dated March 31, 2003, the applicant provided an updated evaluation addressing these concerns. The staff has not completed its evaluation of SAMDAs for AP1000. Therefore, this is Open Item 19.4-1.

Westinghouse Response:

Westinghouse believes that the response to RAI 720.060 revision 1 dated March 31, 2003 provides a revised SAMDA evaluation that complies with NRC concerns.

NRC Follow-on Comment:

In a teleconference held with Westinghouse, the NRC staff asked that Westinghouse provide an explanation of why a redesign of the accumulators or 4th stage ADS valves was adopted as part of the SAMDA evaluation.

Westinghouse Response:

As acknowledged by the NRC in the teleconference, the very low AP1000 risk profile is such that the perfect SAMDA (i.e. one that totally eliminates offsite consequences) would have to cost less than \$33,000 to meet the risk worth necessary to be considered. The following addresses the two items that were raised in the teleconference by the NRC.

Larger accumulators

Increasing the size of the accumulators would result in a significant increase in cost that would be greater than the cost threshold established by the perfect SAMDA evaluation in our earlier response. In order to have any benefit in the PRA, the accumulators would have to be increased in size sufficiently to change the Large LOCA success criteria from 2 of 2 accumulators to 1 of 2 accumulators. Westinghouse estimates that the accumulator tanks would have to be increased in size from 2000ft³ to 4000 ft³, and the hardware costs associated with this change would be significant. Such a size increase would also likely result in a change to the design of the DVI piping subsystem. The design of this piping system was established in the AP600 design certification, and the design does not change significantly for AP1000. Recently Westinghouse completed the leak-before break analysis of the DVI piping, and any change in the DVI piping would result in significant piping reanalysis of the DVI piping. Westinghouse estimates the redesign costs associated with the changes in hardware and piping re-design to be significantly greater than the cost threshold established for the perfect SAMDA discussed in our earlier SAMDA evaluation. Therefore this design change was not incorporated.

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Larger 4th stage ADS valves

Increasing the 4th stage ADS valves in size would result in a significant increase in cost associated with redesigning the AP1000 loop piping and 4th stage piping configuration. The AP1000 ADS valves were already increased in size compared to the AP600 valves more than the ratio of the power uprate of the AP1000. In order to have any benefit in the PRA, the 4th stage ADS valves would have to be increased in size sufficiently to change the LOCA success criteria from 3 of 4 valves to 2 of 4 valves. To accommodate such a change, Westinghouse estimates that the 4th stage ADS valves would have to increase in size from 14-inch to 18-inch valves and associated piping. In addition, the common 4th stage inlet piping that connects to the hot leg would have to increase in size from 18-inch to at least 20-inch. This would require a significant redesign of the squib valve, and would also result in re-design of the ADS-4 piping which in-turn would impact the design of the reactor coolant loop piping. Finally, such a redesign would require Westinghouse to perform additional confirmatory testing of the passive core cooling system to verify that the behavior of the passive safety systems was not adversely impacted. Westinghouse estimates the cost of this change to be significantly larger than the cost threshold of the perfect SAMDA established in our earlier response. Therefore, this design change was not incorporated.

Design Control Document (DCD) Revision:

None

PRA Revision:

None