Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

June 25, 2014

10 CFR 50.4

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – PROBABILISTIC RISK ASSESSMENT (PRA) SUMMARY REPORT - INFORMATION PREVIOUSLY COMMITTED TO PROVIDE (TAC NO. ME3334)

References:

1. TVA letter dated February 9, 2010, Watts Bar Nuclear Plant (WBN) Unit 2 – Probabilistic Risk Assessment Individual Plant Examination Summary Report"

2. TVA letter dated June 8, 2010, "Watts Bar Nuclear Plant (WBN) Unit 2 – Request for Additional Information Regarding Individual Plant Examination (TAC No. ME3334)"

The purpose of this letter is to provide information previously committed to in References 1 and 2 above. In Reference 1, TVA committed to confirming that the Unit 2 PRA model matches the as-built, as-operated plant. Enclosure 1 provides TVA Calculation MDN-000-999-2008-0151, R1, "WBN Probabilistic Risk Assessment – Summary Document," which satisfies this commitment. It should be noted that the calculation provided in Enclosure 1 contains icon links to other documents. These other documents are available, if needed, for NRC review at TVA's corporate offices.

Regarding the second commitment, in Reference 2, TVA committed to provide information regarding how the model and the peer review process addresses the items in the Regulatory Guide 1.200, Revision 2 tables related to internal events including internal flooding for which the NRC endorsed position included "Qualifications," that required response. Enclosure 2 provides the information required to satisfy this commitment.

There are no new commitments contained in this letter. If you have any questions, please contact me at (423) 365-2004.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 25th day of June, 2014.

Respectfully,

Gordon P. Arent
Director, Licensing
Watts Bar

Enclosures:

1. WBN Probabilistic Risk Assessment – Summary Document
2. Information Related to how the Model and the Peer Review Process Addressed the Items in the Regulatory Guide 1.200 Revision 2 Tables

cc (Enclosures):

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ENCLOSURE 1
Tennessee Valley Authority
Watts Bar Nuclear Plant, Unit 2
Docket No. 50-391

WBN Probabilistic Risk Assessment – Summary Document

NPG CALCULATION COVERSHEET / CTS UPDATE

REV 0 EDMS/RIMS NO.	CTS TYPE:	EDMS TYPE:	EDMS ACCESSION NO (N/A for REV. 0)
T71 101118 811	Calculation	CALCULATIONS (NUCLEAR)	T71 140212 814

Calc Title:

WBN Probabilistic Risk Assessment - Summary Document

	ORG	PLANT	BRANCH	NUMBER	CUR REV	NEW REV
CALC ID	NUC	WBN	MEB	MDN-000-999-2008-0151	000	001

CTS UPDATE ONLY ☐ (Verifier and Approval Signatures Not Required)

NO CTS CHANGES ☒ (For calc revision, CTS has been reviewed and no CTS changes required)

UNIT (check one)	SYSTEMS	UNIDS
0 ☒, 1 ☐, 2 ☐, 3 ☐	999	N/A

DCN.EDC.N/A	APPLICABLE DESIGN DOCUMENT(S)	CLASSIFICATION
N/A	N/A	D

QUALITY RELATED?	SAFETY RELATED? (If yes, QR = yes)	UNVERIFIED ASSUMPTION	SPECIAL REQUIREMENTS AND/OR LIMITING CONDITIONS?	DESIGN OUTPUT ATTACHMENT?	SAR/TS and/or ISFSI SAR/CoC AFFECTED
Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

CALCULATION NUMBER REQUESTOR	PREPARING DISCIPLINE	VERIFICATION METHOD	NEW METHOD OF ANALYSIS
Name: N/A Phone:	MEB	N/A	☐ Yes ☒ No

PREPARER (PRINT NAME AND SIGN)	DATE	CHECKER (PRINT NAME AND SIGN)	DATE
Jonathan D. Gore [signature]	2/6/14	Bradley W. Dolan [signature]	2/7/14

VERIFIER (PRINT NAME AND SIGN)	DATE	APPROVAL (PRINT NAME AND SIGN)	DATE
N/A		Ching Guey [signature]	2/7/14

STATEMENT OF PROBLEM/ABSTRACT

Abstract:

This calculation documents a summary of the WBN PRA.

MICROFICHE/EFICHE Yes ☐ No ☒ FICHE NUMBER(S)

NPG CALCULATION COVERSHEET / CTS UPDATE

CALC ID	ORG	PLANT	BRANCH	NUMBER	REV
	NUC	WBN	MEB	MDN-000-999-2008-0151	001

BUILDING	ROOM	ELEVATION	COORD/AZIM	FIRM
CATEGORIES				

KEYWORDS (A-add, D-delete)

ACTION (A/D)	KEYWORD	A/D	KEYWORD

CROSS-REFERENCES (A-add, D-delete)

ACTION (A/D)	XREF CODE	XREF PLANT	XREF TYPE	XREF NUMBER	XREF REV

CTS ONLY UPDATES:

Following are required only when making keyword/cross reference CTS updates and page 1 of form NEDP-2-1 is not included:

PREPARER (PRINT NAME AND SIGN)	DATE	CHECKER (PRINT NAME AND SIGN)	DATE
PREPARER PHONE NO.	EDMS ACCESSION NO.		

NPG CALCULATION RECORD OF REVISION	
Calculation Identifier: MDN-000-999-2008-0151	
Title	WBN Probabilistic Risk Assessment - Summary Document
Revision No.	DESCRIPTION OF REVISION
000	Initial Issue The Safety Analysis Report (SAR) has been reviewed by /s/ Carla A. Borrelli (11/16/10) and this revision of the calculation does not affect the SAR. The Tech Specs have been reviewed and have been determined to not be affected. Total Number of Pages = 383
001	Summary Notebook updated to reflect the update model information. The Safety Analysis Report (SAR) has been reviewed by [signature] 2/6/14 and this revision of the calculation does not affect the SAR. The Tech Specs have been reviewed and have been determined to not be affected. Total Number of Pages = 295

NPG CALCULATION TABLE OF CONTENTS		
Calculation Identifier: MDN-000-999-2008-0151	Revision: 001	

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Figures

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SECTION	TITLE	PAGE

NPG COMPUTER INPUT FILE STORAGE INFORMATION SHEET

Document MDN-000-999-2008-0151	Rev. 001	Plant: WBN	

Subject:

Probabilistic Risk Assessment - Summary Document

☐ Electronic storage of the input files for this calculation is not required. Comments:

☒ Input files for this calculation have been stored electronically and sufficient identifying information is provided below for each input file. (Any retrieved file requires re-verification of its contents before use.)

Electronic files are stored in Filekeeper.

File Name: WBN_Summary_Files_Rev.1.zip

Document Identifier: 323197

☐ Microfiche/eFiche

1.0 Purpose

This calculation documents the summary of the results Watts Bar Nuclear Plant (WBN) Units 1 and 2 PRA model.

As part of the conversion of the WBN PRA from a RISKMAN platform to a CAFTA platform, the analyses supporting the PRA were completely redone. All documentation for the Internal Events (ASME/ANS RA-Sa–2009 Part 2, Reference 1) and Internal Flooding (ASME/ANS RA-Sa–2009 Part 3, Reference 1) PRA has been upgraded to meet the requirements of Regulatory Guide 1.200 Rev. 2 (Reference 2). The WBN PRA now meets at least category 2 of the requirements of the ASME/ANS Standard and Regulatory Guide 1.200, R2, with respect to internal events. However, fire and external events such as seismic events, high winds, and external floods are not evaluated in the WBN model.

The original R0 CAFTA model has been updated to revision 1. This revision of the Summary Notebook documents the changes which were made.

2.0 References and Acronyms

2.1 References

1. ASME/ANS RA-Sa-2009, Addenda to ASME/ANS RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications.
2. Regulatory Guide 1.200, An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities, Rev 2.
3. NEI 05-04, Process for Performing Internal Events PRA Peer Reviews using the ASME/ANS PRA Standard, Rev. 2.
4. EPRI-TR-1021086, Pipe Rupture Frequencies for Internal Flooding PRAs, Revision 2, November 2010
5. SPP-9.11, NPG Standard Programs and Processes, Probabilistic Risk Assessment (PRA) Program, Rev. 0.
6. NEDP-2, NPG Department Procedure, Design Calculation Process Control, Rev. 14.
7. NEDP-26, NPG Department Procedure, Probabilistic Risk Assessment (PRA), Rev. 2.

8. NUREG/CR-6928, U.S. Nuclear Regulatory Commission, Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants, February 2007.

9. NUREG/CR-5497, Common-Cause Failure Parameter Estimations, October 1998.

10. Not used.

11. Regulatory Guide 1.174, “An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions On Plant-Specific Changes To The Licensing Basis” November 2002.

12. Regulatory Guide 1.177, An Approach for Plant-Specific, Risk-Informed Decision-making: Technical Specifications, August 1998.

13. LTR-RAM-II-09-084, RG 1.200 PRA Peer Review Against the ASME/ANS PRA Standard Requirements for the Watts Bar Nuclear Power Plant Probabilistic Risk Assessment, (B45 100125 001).

14. WCAP-16141, Rev 0, RCP Seal Leakage PRA Model Implementation Guidelines for Westinghouse PWRs.

15. CN-NUC-WBN-MEB-MDN-000-001-2008-0122, WBN Probabilistic Risk Assessment – Main Steam System, R1

16. CN-NUC-WBN-MEB-MDN-000-002-2008-0123, WBN Probabilistic Risk Assessment – Condensate and Feedwater System, R1

17. CN-NUC-WBN-MEB-MDN-000-003-2008-0124, WBN Probabilistic Risk Assessment – Auxiliary Feedwater System, R4

18. CN-NUC-WBN-MEB-MDN-000-003-2008-0125, WBN Probabilistic Risk Assessment – Steam Generator Isolation System, R0

19. CN-NUC-WBN-MEB-MDN-000-032-2008-0126, WBN Probabilistic Risk Assessment – Plant Compressed Air System, R1

20. CN-NUC-WBN-MEB-MDN-000-062-2008-0127, WBN Probabilistic Risk Assessment – Chemical and Volume Control System, R3

21. CN-NUC-WBN-MEB-MDN-000-062-2008-0128, WBN Probabilistic Risk Assessment – RCP Seal Injection and Thermal Barrier Cooling, R0

22. CN-NUC-WBN-MEB-MDN-000-063-2008-0129, WBN Probabilistic Risk Assessment – Safety Injection System, R0

23. CN-NUC-WBN-MEB-MDN-000-067-2008-0130, WBN Probabilistic Risk Assessment – Essential Raw Cooling Water System, R5

24. CN-NUC-WBN-MEB-MDN-000-068-2008-0131, WBN Probabilistic Risk Assessment – Pressurizer Power-Operated Relief Valves and Safety Valves System, R0

25. CN-NUC-WBN-MEB-MDN-000-070-2008-0132, WBN Probabilistic Risk Assessment – Component Cooling System, R2

26. CN-NUC-WBN-MEB-MDN-000-072-2008-0133, WBN Probabilistic Risk Assessment – Containment Spray System, R0

27. CN-NUC-WBN-MEB-MDN-000-074-2008-0134, WBN Probabilistic Risk Assessment – Residual Heat Removal System, R2

28. CN-NUC-WBN-MEB-MDN-000-099-2008-0135, WBN Probabilistic Risk Assessment – Reactor Protection System, R0

29. CN-NUC-WBN-MEB-MDN-000-099-2008-0136, WBN Probabilistic Risk Assessment – Engineered Safety Features Actuation System, R0

30. CN-NUC-WBN-MEB-MDN-000-999-2008-0137, WBN Probabilistic Risk Assessment – Electric Power System, R3

31. CN-NUC-WBN-MEB-MDN-000-999-2008-0138, WBN Probabilistic Risk Assessment – LOOP Non-Recovery Probabilities, R1

32. CN-NUC-WBN-MEB-MDN-000-999-2008-0139, WBN Probabilistic Risk Assessment – Containment System, R0

33. CN-NUC-WBN-MEB-MDN-000-999-2008-0140, WBN Probabilistic Risk Assessment – Initiating Events Analysis, R2

34. CN-NUC-WBN-MEB-MDN-000-999-2008-0141, WBN Probabilistic Risk Assessment – Accident Sequence Analysis, R1

35. CN-NUC-WBN-MEB-MDN-000-999-2008-0142, WBN Probabilistic Risk Assessment – Success Criteria, R3

36. CN-NUC-WBN-MEB-MDN-000-999-2008-0143, WBN Probabilistic Risk Assessment – Systems Analysis Summary, R1

37. CN-NUC-WBN-MEB-MDN-000-999-2008-0144, WBN Probabilistic Risk Assessment – Human Reliability Analysis, R3

38. CN-NUC-WBN-MEB-MDN-000-999-2008-0145, WBN Probabilistic Risk Assessment – Data Analysis, R4
39. CN-NUC-WBN-MEB-MDN-000-999-2008-0146, WBN Probabilistic Risk Assessment – Internal Flooding Analysis, R2
40. CN-NUC-WBN-MEB-MDN-000-999-2008-0148, WBN Probabilistic Risk Assessment – Level 2 (LERF) Analysis, R3
41. CN-NUC-WBN-MEB-MDN-000-999-2008-0149, WBN Probabilistic Risk Assessment – Loss of Offsite Power Frequency Analysis, R0
42. CN-NUC-WBN-MEB-MDN-000-999-2008-0150, WBN Probabilistic Risk Assessment – Interfacing Systems LOCA Analysis, R0
43. CN-NUC-WBN-MEB-MDN-000-999-2008-0153, WBN Probabilistic Risk Assessment – Thermal Hydraulics Analysis, Level I, R1
44. CN-NUC-WBN-MEB-MDN-000-999-2008-0147, WBN Probabilistic Risk Assessment – Quantification, R4
45. CN-NUC-WBN-MEB-MDN-000-999-2009-0162, WBN Probabilistic Risk Assessment – Sensitivity and Uncertainty, R2

2.2 Acronyms

The following acronyms are used in this document:

AC	–	Alternating Current
ANS	–	American Nuclear Society
ASME	–	American Society of Mechanical Engineers
ATWS	–	Anticipated Transient Without SCRAM
CAFTA	–	Computer Aided Fault Tree Analysis System
CCF	–	Common Cause Failure
CCF	–	Common Cause Failure
CCS	–	Component Cooling System
CCW	–	Condenser Circulating Water
CDF	–	Core Damage Frequency
CET	–	Containment Event Tree
CPNPP	–	Comanche Peak Nuclear Power Plant

DC	–	Direct Current
EDG	–	Emergency Diesel Generator
EPRI	–	Electric Power Research Institute
ERCW	–	Essential Raw Cooling Water
F&O	–	Fact and Observation
FMEA	–	Failure Modes and Effects Analysis
F-V	–	Fussell - Vesely
GTRAN	–	General Transient
HEP	–	Human Error Probability
HFE	–	Human Failure Event
HPFP	–	High Pressure Fire Protection
HRA	–	Human Reliability Analysis
IF	–	Internal Flooding
ISLOCA	–	Interfacing Systems LOCA
LERF	–	Large Early Release Frequency
LLOCA	–	Large LOCA
LOCA	–	Loss of Coolant Accident
LOOP	–	Loss of Offsite Power
MAAP	–	Modular Accident Analysis Program
MGL	–	Multiple Greek Letter
MLOCA	–	Medium LOCA
MOR	–	Model of Record
NEI	–	Nuclear Energy Institute
PRA	–	Probabilistic Risk Assessment
RAW	–	Risk Achievement Worth
RCP	–	Reactor Coolant Pump
RCW	–	Raw Cooling Water
SGTR	–	Steam Generator Tube Rupture
SLOCA	–	Small LOCA
SLOCAV	–	Very Small LOCA
SR	–	Supporting Requirement

SSBI	–	Secondary Side Break Inside Containment
SSBO	–	Secondary Side Break Outside Containment
SSC	–	Structure, System, or Component
T&M	–	Test and Maintenance
TLPCA	–	Total Loss of Plant Compressed Air
TVA	–	Tennessee Valley Authority
WBN	–	Watts Bar Nuclear

3.0 Design Input

All inputs to this calculation are listed in section 2.1. The documentation requirements for the PRA are provided in Section 3.6 of NEDP-26 (Reference 7). Table 10 provides a listing and description of WBN PRA model files. Attachment B of this calculation documents the Model of Record (MOR).

4.0 Assumptions

Assumptions used in the development and quantification of the WBN PRA are listed in the PRA model documentation (References 15 through 45).

The dual unit model was updated based on the as-built, as-operated configuration of the plant as of April 30, 2013. Significant modifications to Unit 2 intended for completion prior to unit startup were also included. It was assumed that no new significant modifications will be developed for unit 2 prior to startup.

5.0 Special Requirements/Limiting Conditions

None

6.0 Computations and Analyses

The following sections provide a summary of the changes that were made to the PRA since the last revision and a summary of the results of the PRA quantification.

6.1 Model Development

6.1.1 Initiating Events

The initiating event analysis has been updated to include current industry generic data, recent plant events and multi-unit initiators. The scope of this analysis included: 1) a review of all initiators in the RISKMAN model to ensure applicability, 2) resolution of previously identified problems, 3) a review of common initiators that could result in challenging both units, 4) the Bayesian updating of the initiating event frequency distributions, 5) the development of support system initiating event fault trees, and 6) the development of an updated Initiating Event Notebook (Reference 33) and a Loss of Offsite Power (LOOP) Frequency Notebook (Reference 41). Flooding initiating events are identified in the Internal Flooding Analysis Notebook (Reference 39). Interfacing LOCA initiating events are identified in the ISLOCA Frequency Notebook (Reference 42).

6.1.1.1 New Initiators

Table 1 provides a listing of all initiators in the 2-unit WBN PRA CAFTA model. Where applicable, the equivalent RISKMAN initiator identifier is also given in Table 1. No RISKMAN identifiers are listed for the new initiators that have no RISKMAN model equivalent. Note that the RISKMAN R4 model did not address unit 2. Internal flooding initiators were expanded from 6 to 133. Interfacing System LOCA initiators were expanded from 2 to 24. One new transient initiator, Total Loss of Plant Compressed Air (TLPCA), was added.

No new initiators were identified for the Revision 1 CAFTA model.

6.1.1.2 Initiators Removed from the Model

No Initiators were removed from the model.

6.1.1.3 Updates to Support System Initiating Event Fault Trees

Support system initiating event fault trees were built for the following initiating events:

- Partial Loss of ERCW
- Total Loss of ERCW
- Loss of Train A CCS
- Total Loss of CCS
- Loss of 4 125V DC busses
- Loss of 8 120V AC busses

The support system initiator fault trees are described in detail in their system notebooks (References 23, 25, and 30). Models for the unit 2 AC and DC busses are new to the CAFTA R0 analysis.

The following model changes were made for Revision 001:

- AFW 1-51 (trip and throttle) valves added. Note that this could be considered to be subsumed in the TDAFWP but the valve was modeled separately at the request of the station Maintenance Rule / MSPI coordinator, to facilitate data tracking and risk monitoring. Use of generic TDAFWP failure data as an input to the data evaluation may be slightly conservative as a result.
- RHR 74-12 and -24 (minimum flow) valves added
- Data updated

- Logic for vital inverters and battery chargers enhanced (see Electric Power Notebook for details)
- DG ERCW supply valves changed from locked open to closed, required to open for DG success
- ERCW model enhancements (See ERCW notebook for details).
- CCS model enhancements (See CCS Notebook for details)
- Minor changes to HRA preinitiators (See HRA Notebook for details)
- Revised HRA dependency approach to retain individual HEPs in cutsets
- Added N2 supply to AFW LCVs and PCVs

6.1.1.4 Updates to IE Frequencies from Generic and Plant Specific Data

The generic initiating event frequencies used in the WBN PRA have been updated as described in Section 6.3.2 of the Initiating Events Notebook (Reference 33). The plant specific data used for the update is given in Table 2. The prior and posterior initiating event frequencies are provided in Table 3. Bayesian updating was not used to calculate the frequencies for flooding initiators or ISLOCA initiators.

6.1.1.5 Comparison of IE Frequencies

A comparison of initiating event frequencies between the Riskman R4 model and the CAFTA R0 model is provided in Table 4.

6.1.2 Accident Sequences Analysis

The level 1 accident sequence analysis models, chronologically (to the extent practical), the different possible progressions of events (i.e., accident sequences) that can occur from the start of the initiating event to either successful mitigation or core damage. The accident sequences account for the systems that are used (and available) and operator actions performed to mitigate the initiator based on the defined success criteria and plant operating procedures (e.g., plant emergency and abnormal operating instructions) and training. The availability of a system includes consideration of the functional, phenomenological, and operational dependencies and interfaces between the various systems and operator actions during the course of the accident progression. A set of plant damage states were defined to account for important conditions that may affect containment response and possible offsite releases after a severe accident event. These plant damage states, listed in Table 5, provide the interface between the Level 1 PRA models and the Level 2 PRA model. Licensed operators were interviewed as part of this process to ensure reasonable scenarios and corresponding conditions were modeled.

The accident sequences analysis was revised for the WBN PRA conversion from RISKMAN to CAFTA. The initiating events were grouped into classes that could be evaluated collectively. For each functional group of initiating events, an event tree model was developed that defines the possible plant responses, mitigating system functions, and operator actions that determine the event sequence progression.

A total of 10 event trees were developed for the WBN PRA:

- LLOCA - Large LOCA
- MLOCA – Medium LOCA
- SLOCA – Small LOCA
- SLOCAV – Very Small LOCA
- SSBI – Secondary Side Break Inside Containment
- SSBO – Secondary Side Break Outside Containment
- GTRAN – General transient
- SGTR – Steam Generator Tube Rupture
- ATWS – Anticipated Transient Without SCRAM
- ISLOCA – Interfacing Systems LOCA

These event trees are shown in Figures 1 through 10, respectively. Linking between the initiating events and the event trees is provided in Table 6.

Accident sequence models did not change in CAFTA model revision 1.

6.1.3 Success Criteria

The success criteria analysis was revised for the WBN PRA conversion from RISKMAN to CAFTA. Success criteria analysis determines the minimum requirements for each function (and ultimately the systems used to perform the functions) used to prevent core damage (or to mitigate a release) given an initiating event. The requirements defining the success criteria are based on acceptable engineering analyses that represent the design and operation of WBN. Functional success criteria are dependent on the initiator and the conditions created by the initiator. The computer codes used for developing the success criteria are validated and verified for both technical integrity and suitability to assess plant conditions for the reactor pressure, temperature, and flow range of interest, and the phenomena of interest. Calculations are performed by personnel who are qualified to perform the types of analyses of interest and are well trained in the use of the codes.

The objectives of the success criteria element are to define the plant-specific measures of success and failure that support the other technical elements of the PRA in such a way that overall success criteria are defined. Success criteria are defined for critical safety functions, supporting systems, structures, and components (SSCs) and operator actions necessary to support accident sequence development.

During risk model development, existing safety analyses were reviewed, and selected thermal hydraulic analyses were performed to establish realistic success criteria for the mitigating systems and operator actions that are modeled in the PRA. In some cases, conservative success criteria may be used to simplify the models or their supporting analyses when the degree of conservatism does not have an important impact on the overall PRA results.

The success criteria are documented in detail in the Success Criteria notebook (Reference 35). Tables 7 through 16 provide a summary of the success criteria for each of the event trees. Tables 17 through 22 provide a comparison of success criteria between WBN PRA and the Comanche Peak Nuclear Power Plant (CPNPP) PRA.

6.1.3.1 Summary of Success Criteria Changes

Based on a review of the documentation for the RISKMAN model, there were no significant changes in the success criteria previously used for the WBN PRA. No changes to success criteria were made for CAFTA model revision 1.

6.1.3.2 MAAP Analyses

All thermal hydraulics calculations used as the basis for the success criteria were updated (or re-run) and documented in the Thermal Hydraulics Notebook (Reference 34). Table 23 provides a listing of MAAP runs. The sensitivity of core damage timing with respect to the size of RCP seal leakage is shown in Table 24. Table 25 provides the conditional probability of various size RCP seal leaks, taken from WCAP 16141 (Reference 14). Table 26 and Table 27 provide the sensitivity of timing to high pressure and low pressure recirculation for a variety of conditions and LOCA sizes.

In addition, MAAP runs were executed to determine the sequence timing for the Human Reliability Analysis (HRA). A summary of these results is provided in Table 28.

6.1.4 Systems Analysis

All systems that are required for accident mitigation and those systems supporting accident mitigating systems have been re-analyzed as part of the conversion from RISKMAN to CAFTA. Each system notebook is documented in a separate calculation, References 15 through 32, as listed in Table 29. The analysis for the Raw Cooling Water (RCW) System is documented in an appendix to the ERCW System notebook (Reference 23), and the analysis for the Condenser Circulating Water (CCW) System and Condenser Vacuum System is documented in an appendix to the Condensate and Feedwater System Notebook (Reference 16); these are new system analyses. There are two calculations pertinent to Electric Power, the system analysis (Reference 30), and the Electric Power Recovery Notebook (Reference 31). The System Summary Notebook, (Reference 36) provides information common to the system analyses, such as model naming conventions, notebook format and content requirements and generic system assumptions.

6.1.4.1 Walkdowns

Each system modeled in the PRA was walked down by a group of PRA analysts to evaluate

- Component location and operational status;
- Environmental considerations such as heat sources, ventilation, and steam/humidity sources;
- Considerations for manual operation; and
- Physical characteristics of the room/area.

The walkdowns are documented in Appendix A of the individual system notebooks.

6.1.4.2 System Engineer Review and Interviews

Each system notebook was reviewed by the responsible system engineer(s). Subsequently, the PRA analysts interviewed the system engineers. The purpose of the interview is as follows:

- Ensure system modeling in the PRA is consistent with the as-built, as-operated plant (SY-A4)
- Ensure potential initiating events have not been overlooked (IE-A6)
- Ensure system operating experience is properly considered and documented in the PRA (IE, DA)

The interviews are documented in Attachment A of each system notebook.

6.1.4.3 Design Changes Impacting PRA

The new CAFTA model included system engineer review and operator interviews to ensure that it was developed to reflect the as-built, as-operated plant. Future revisions of this document will included a discussion of design changes that require changes to the model.

The following model changes were made for Revision 001:

- AFW 1-51 (trip and throttle) valves added. Note that this could be considered to be subsumed in the TDAFWP but the valve was modeled separately at the request of the station Maintenance Rule / MSPI coordinator, to facilitate data tracking and risk monitoring. Use of generic TDAFWP failure data as an input to the data evaluation may be slightly conservative as a result.
- RHR 74-12 and -24 (minimum flow) valves added
- DG ERCW supply valves changed from locked open to closed, required to open for DG success
- Revised HRA dependency approach to retain individual HEPs in cutsets

6.1.5 Data Analysis

The objectives of the data analysis are to provide estimates of the parameters used to determine the probabilities of the basic events representing equipment failures and unavailabilities modeled in the PRA. Such parameters include the following:

- Failure rates
- Unavailability due to test and maintenance
- Common Cause Failure (CCF) Multiple Greek Letter (MGL) parameters.

The data analysis is documented in the Data Analysis Notebook (Reference 39).

6.1.5.1 Unreliability Data

The unreliability (or failure rate) data are based on generic industry data that has undergone Bayesian updating with plant specific data. Plant specific data for the period 1/1/2003 to 4/30/2013 was evaluated and used as input to the Bayesian analysis. A screening process was implemented to determine whether the generic, updated, or plant specific data should be used for the analysis. Table 30 provides a listing of failure data for which plant specific failure data was collected. Table 31 provides a comparison of failure data between the RISKMAN R4 model and the CAFTA R0 model. For Revision 1 of the CAFTA model, data was updated through 4/30/2011. Revision 1 represents an incremental change from Revision 0, therefore comparison tables between revisions are not required.

6.1.5.2 Unavailability Data

The unavailability data is based on plant-specific data collected in support of the Maintenance Rule or derived from other plant records, generic industry data, or estimates from plant personnel such as system engineers or operations staff. Plant specific data is the preferred method for determining unavailability since it represents historical equipment unavailability. Plant maintenance unavailability data is based on the same time period as the failure data, 1/1/2003 to 4/30/2013. Generic industry data from NUREG/CR-6928 (Reference 8) was used for components for which no plant specific data was available. If no plant specific or generic industry data were available, estimates from plant personnel such as system engineers or operations staff were used. Table 32 provides a listing of unavailability data for which plant specific data was collected. Table 33 provides a comparison of unavailability parameters between the RISKMAN R4 model and the CAFTA R0 model. Revision 1 of the CAFTA model represents an incremental change from Revision 0, therefore comparison tables between these revisions are not required.

6.1.5.3 Common Cause Data

Components of similar manufacture and functions are subject to CCF. Common cause failure can result in failure of a system when identical, non-diverse, and active components are used to provide redundancy. Failure of two or more components in a common cause group can occur if they are of the same design, perform the same function, share the same installation and maintenance procedures, and are located in the same location or environment.

In the conversion of the WBN PRA from a RISKMAN model to a CAFTA model, the Multiple Greek Letter (MGL) methodology, described in NUREG/CR-5485, was retained. MGL factors were assigned to each CCF group and CAFTA automatically calculated the probability of the CCF basic events using equations based on the group size and the number of failed components. In a few instances, such as for system models to determine initiating event frequencies, specific basic events were inserted into the fault tree model to capture CCF probabilities.

The CCF probabilities for the WBN PRA were conservatively calculated assuming that all testing is performed on a non-staggered testing. The MGL factors were converted from alpha values provided in WCAP-16672-P via formulas provided in NUREG/CR-5485. This is a different data source than used for the RISKMAN R4 model. In addition, no Bayesian updating of MGL factors was performed. Table 34 provides a list of CCF groups and associated MGL factors. Table 35 provides a comparison of MGL factors between the CAFTA R0 model and the RISKMAN R4 model.

The common cause analysis is documented in the Data Analysis Notebook (Reference 38).

6.1.6 Human Reliability Analysis

The purpose of the HRA is to identify human interactions that play a role in the accident sequences, and to provide an estimate of the probabilities for failure events corresponding to those interactions. This analysis includes pre-initiators and post initiators. The HRA for the WBN PRA was revised and is documented in Reference 37. Table 36 provides a list of the pre-initiator Human Failure Events (HFEs) and associated probabilities. Table 37 provides a list of the post-initiator HFEs. Table 38 provides a list of the post-initiator HFEs associated with recovery from flooding events. Table 39 provides a summary comparison of Human Error Probabilities (HEPs) between the CAFTA R0 model and the RISKMAN R4 model. Revision 1 of the CAFTA model represents an incremental change from Revision 0, therefore comparison tables between these revisions are not required.

6.1.7 Internal Flooding

The internal flooding (IF) analysis for the WBN PRA was updated based on the new flood frequencies provided in EPRI-TR-1021086 (Reference 4), and is documented in the Internal Flooding Analysis Notebook, Reference 39. That calculation documents the development and application of the internal flooding analysis consistent with the guidance provided in the ASME PRA Standard RA-Sa-2009 (Reference 1).The scope of the flooding events covered includes all floods originating within the plant boundary. It does not include floods resulting from external events (e.g., weather, offsite events such as upstream dam rupture, etc.).

The IF-PRA methodology is organized into two major phases, as shown in Figure 11. In the first phase of IF-PRA, Qualitative Analysis, the information that is needed for the IF-PRA is collected and the initial qualitative analysis tasks are performed. There are four key tasks that are completed in this phase; (Task 1) identification of flood areas and SSCs, (Task 2) identification of flood sources, (Task 3) performance of a plant walkdown, and (Task 4) completion of a qualitative screening evaluation of plant locations.

In the second phase of IF-PRA, plant locations which have not been screened out are addressed in six separate tasks that comprise the quantitative evaluation phase of IF-PRA. These tasks are organized around the key steps in defining flood scenarios and quantifying their impacts in the PRA model in terms of their contributions to CDF and

LERF. These steps include (Task 5) the definition of flood scenarios in terms of (Task 6) flood initiating events, (Task 7) the consequences of the flood on SSCs, (Task 8) human actions to mitigate the consequences of the flood and to control the plant, and (Task 9) the interfacing of the flood scenario with the PRA event tree/fault tree logic. Once the scenarios have been properly characterized, this phase also addresses (Task 10) the quantification of the flood initiating event frequency, CDF, and LERF.

Table 40 provides a summary of flooding sources. Table 41 and Figure 12 provide a sample propagation calculation. Tables 42 through 46 provide the results of the qualitative screening assessment. Table 47 provides a description and frequency of the internal flooding initiators. Table 48 provides a description of the effects of the flooding initiators. Table 49 provides a summary of the HEPs that were modified to accommodate the flooding analysis. Figures 13 through 16 provide a summary of the CDF and LERF results of the flooding analysis.

6.1.7.1 Walkdowns

Several plant walkdowns were performed to assess the plant for partitioning into flood zones, characterize the flood sources in each zone, examine the flow propagation paths between flood areas, and determine the susceptibility of PRA equipment to flood and spray effects. Table 50 provides a sample walkdown data sheet.

6.1.7.2 Raw Water Piping in the Auxiliary Building

Pipe failure frequencies calculated for risk significant raw water piping in the Auxiliary Building are based on leak-before-break methodology. It is assumed that WBN will implement a monitoring program for risk significant raw water piping in the Auxiliary Building similar to that employed at SQN.

6.1.8 Large Early Release Frequency Analysis

The Level 2 Analysis was revised as part of the conversion from a RISKMAN model to a CAFTA model, and is documented in Reference 40.

The Level 2 Analysis describes the process used to identify core damage sequences that could lead to large early fission product releases to the environment and therefore contribute to the WBN Large Early Release Frequency (LERF).

The LERF sequences are identified through the development of a containment event tree (CET). The Level 2 Analysis documents the development of the CET and the process used to quantify LERF using the CET; results of the LERF quantification are contained in the PRA Quantification Notebook (Reference 44). Table 23 provides a listing of MAAP runs.

The CET is shown in Figure 17. The structure of the CET has been formulated to include the following features for the assessment of LERF:

- to properly represent the time sequence of events and to divide the CET into major time periods;

- to incorporate all important system, human and phenomenological occurrences including possible recovery;
- to maintain a simplified representation;
- to preserve the nature of the challenge throughout the analysis;
- to explicitly recognize the effect of postulated containment failure modes;
- to allow the identification of recovery and repair actions that can terminate or mitigate the progression of a severe accident; and
- to categorize the end-states of the resulting sequences into groups that can be assessed for their affect on public safety. This grouping has been simplified to meet Reg. Guide 1.174 requirements.

The CET end-states are as follows:

- INTACT – an intact containment with no release to the environment
- BLERF – Large early release via bypass of the containment
- ILERF – Large early release via failure of isolation of the containment
- LLERF – Large early release during low pressure sequences
- HLERF – Large early release during high pressure sequences
- LATE – late release
- BSERF – Small early release via bypass of the containment
- ISERF – Small early release via failure of isolation of containment
- SERF – Small early release via recovery of AC power
- PI-SGTR – Pressure induced steam generator tube rupture
- TI-SGTR – Temperature induced steam generator tube rupture.

The Level 2 analysis interfaces with the Level 1 accident sequence analysis through the appropriate definition of a set of plant damage states. These states are the endpoints of the sequences in the Level 1 portion of the event trees and the initiating events for the CET.

6.1.9 Quantification

The WBN PRA CAFTA model was quantified after the conversion from a RISKMAN model. The Quantification is documented in Reference 44.

The input files used for the quantification are listed in Table 51 and are stored as zip files in Filekeeper. Refer to the computer storage information sheet of Reference 44 for file names and Filekeeper identification numbers.

6.1.10 Maintenance & Update/Configuration Control (MU)

The TVA process for controlling updates to the PRA is documented in TVA procedures SPP-9.11, "The Probabilistic Risk Assessment Program" and NEDP-26, "Probabilistic Risk Assessment".

SPP-9.11 (Reference 5) covers the management of PRA applications, periodic updates, and interdepartmental PRA documentation. This procedure provides definitions for PRA model update, PRA model application, and PRA evaluation. This procedure also defines responsibilities of other departments such as operations and system engineering for review of the PRA.

NEDP-26 (Reference 7) describes the process used by the PRA staff to perform applications, model updates and PRA model maintenance and review. The terms PRA upgrade and maintenance are defined in the ASME standard (Reference 1). The procedure requires that updates be completed at least once every other fuel cycle (for the lead unit at multiunit sites) or sooner if estimated cumulative impact of plant configuration changes exceeds +/- 10% of CDF or LERF. Changes in PRA inputs or discovery of new information are evaluated to determine whether such information warrants PRA update. Items exceeding the above threshold are tracked in the Corrective Action Program. Changes that do not meet the threshold for immediate update are tracked in the PRA Model Open Items Database. PRA updates follow the guidelines established by the ASME Standard for a minimum of a Category II assessment.

NEDP-26 also defines the requirements for PRA documentation of the model of record (MOR) and PRA applications. The MOR is composed of the 1) PRA computer model and supporting documentation, 2) MAAP model and supporting documentation, and 3) other Supporting Computer Evaluation Tools (e.g., UNCERT, EPRI HRA Calculator, etc). The purpose of the PRA MOR is to provide a prescriptive method for quality, configuration, and documentation control. PRA applications and evaluations are referenced to a MOR and therefore the pedigree of PRA applications and evaluations is traceable and verifiable. NEDP-26 also specifies the requirements for independent review and periodic self assessments of the model.

After September 2008 all PRA notebooks modified will be converted to desirable calculations. The NEDP-2 (Reference 6) calculation process requires calculations to be prepared and independently checked and approved.

6.1.11 Software

The software packages used in the WBN PRA quantification are listed in Table 52.

6.1.12 Resolution of F&Os from Peer Review of the RISKMAN R4 Model

The RISKMAN model R4 underwent a peer review by the Westinghouse (WOG) and received a total of 80 Facts and Observations (F&Os). The F&Os and current status are provided in Appendix A.

6.1.13 Resolution of F&Os from Peer Review of the CAFTA R0 model

The WBN Units 1 and 2 Internal Events PRA peer review was performed in November, 2009 at the TVA offices in Chattanooga, TN, using the process described in NEI 05-04 (Reference 3), the ASME PRA Standard (Reference 1), and Regulatory Guide 1.200 (Reference 2). A team of independent PRA experts from nuclear utility groups and PRA consulting organizations carried out these peer review certifications.

The purpose of the peer review is to provide a method for establishing the technical adequacy of a PRA for the spectrum of potential risk-informed plant licensing applications for which the PRA may be used. The 2009 WBN PRA Peer Review provided a full-scope review of the technical elements of the internal events, at-power PRA, including internal flooding. The PRA was not reviewed for fires, external flooding, seismic, high winds, or other external events.

This intensive peer review involved over two person-months of engineering effort by the review team and provides a comprehensive assessment of the strengths and limitations of each element of the PRA model. The review team determined that the WBN PRA meets, at capability category II or greater, 258 of a total of 326 supporting requirements (SRs), with 9 SRs determined to be not applicable. Table 53 provides a summary of the assessment results. A total of 112 F&Os were generated, consisting of 50 findings and 62 suggestions. All finding-level F&Os were addressed to at least the requirements of capability category II; see related notebooks for details (i.e. For flooding F&Os, see the flooding notebook. For system F&Os, see the appropriate system notebook).

6.1.14 Major Changes from Riskman R4 model to the CAFTA R0 model

The WBN Unit 1 PRA R4 (operating via Riskman software) underwent substantial revision including a change to the CAFTA software suite. The revised model is referred to as the CAFTA R0 model. Major differences are listed below.

- Inclusion of unverified Unit 2 model
- Upgraded to address requirements of ASME/ANS RA-Sa-2009
- Processed to comply with requirements of TVA procedure NEDP-2 (engineering calculations)
- Upgraded flooding analysis approach
- Expansion of flooding initiating events from 6 to 133
- Expansion of ISLOCA initiating events from 2 to 24
- Addition of TLPCA initiating event
- Expanded CCF coverage

6.2 Results

6.2.1 Core Damage Frequency

Table 54 summarizes the CDF and LERF for each unit and the number of cutsets saved for each quantification. Table 55 provides a listing of the dominant accident sequences. Table 56 provides the distribution of core damage sequences across the frequency range. Figure 18 provides a comparison of WBN CDF with that of other Westinghouse plants. A listing of the top 100 cutsets is provided in Table 57 and Table 58 for unit 1 and unit 2, respectively.

6.2.1.1 Total CDF with Uncertainty Analysis

The CDF uncertainty analysis was performed using the UNCERT computer program. Plots showing the uncertainty distributions are provided in Figure 19 and Figure 20.

6.2.1.2 Initiator Contribution to CDF

The initiator contribution to CDF for each unit is shown graphically in

Figure 21 and Figure 22 and in tabular form in Table 59 and Table 61. Table 60 provides a comparison of initiator contributions to unit 1 CDF between the CAFTA R0 and RISKMAN R4 models.

6.2.1.3 System Importance to CDF

The importance of systems to CDF was calculated using the SYSIMP computer code. Table 62 provides the systems with a Fussell - Vesely (F-V) importance greater than 0.5% for Unit 1 CDF, sorted on F-V importance. Table 63 provides the systems with a Risk Achievement Worth greater than 2 for Unit 1 CDF, sorted on Risk Achievement Worth (RAW). Table 64 provides the systems with a F-V importance greater than 0.5% for Unit 2 CDF, sorted on F-V importance. Table 65 provides the systems with a RAW greater than 2 for Unit 2 CDF, sorted on RAW.

6.2.1.4 Component Importance to CDF

The importance of components to CDF was calculated using the SYSIMP computer code. Table 66 provides the components with a F-V importance greater than 0.5% for Unit 1 CDF, sorted on F-V importance. Table 67 provides the components with a RAW greater than 2 for Unit 1 CDF, sorted on RAW. Table 68 provides the components with a F-V importance greater than 0.5% for Unit 2 CDF, sorted on F-V importance. Table 69 provides the components with a RAW greater than 2 for Unit 2 CDF, sorted on RAW. Appendix C contains an Excel spreadsheet with a complete listing of component importance measures.

6.2.1.5 Operator Action Importance to CDF

The importance of operator actions to CDF was calculated using CAFTA and the CDF cutset files. Those operator actions with a F-V greater than 0.5% are listed in Table 70 and Table 72, for unit 1 and 2, respectively. Those operator actions with a RAW value greater than 2 are listed in Table 71 and Table 73, for unit 1 and 2, respectively.

6.2.1.6 Basic Event Importance to CDF

The importance of basic events to CDF was calculated using CAFTA and the CDF cutset files. Those basic events with a F-V greater than 0.5% are listed in Table 74 and Table 76, for unit 1 and 2, respectively. Those basic events with a RAW value greater than 2 are listed in Table 75 and Table 77, for unit 1 and 2, respectively. Appendix C contains an Excel spreadsheet with a complete listing of basic event importance measures.

6.2.1.7 Test and Maintenance Importance to CDF

The importance of Test and Maintenance (T&M) events to CDF was calculated using CAFTA and the CDF cutset files. T&M events with a F-V greater than 0.5% are listed in Table 78 and Table 80, for unit 1 and 2, respectively. T&M with a RAW value greater than 2 are listed in Table 79 and Table 81, for unit 1 and 2, respectively.

6.2.2 Large Early Release Frequency

Table 54 summarizes the CDF and LERF for each unit and the number of cutsets saved for each quantification. Table 82 provides a listing of the dominant accident sequences. Table 83 provides the distribution of large early release sequences across the frequency range. Figure 23 provides a comparison of WBN LERF with that of other Westinghouse plants. Figure 24 provides a comparison of WBN LERF with that of other Westinghouse plants with ice condenser containments. A listing of the top 100 cutsets is provided in Table 84 and Table 85 for unit 1 and unit 2, respectively.

6.2.2.1 Total LERF Uncertainty Analysis

The LERF uncertainty analysis was performed using the UNCERT computer program. Plots showing the uncertainty distributions are provided in Figure 25 and Figure 26.

6.2.2.2 Phenomena Contribution to LERF

The phenomena contribution to LERF for each unit is shown graphically in Figure 27 and Figure 28 and in tabular form in Table 86 and Table 87.

6.2.2.3 PDS Contribution to LERF

The PDS contribution to LERF for each unit is shown graphically in Figure 29 and Figure 30 and in tabular form in Table 88 and Table 90. Table 89 provides the mapping between the PDSs of the level 1 analysis and the Bins of the level 2 analysis.

6.2.2.4 Initiator Contribution to LERF

The initiator contribution to LERF for each unit is shown graphically in Figure 31 and Figure 32 and in tabular form in Table 91 and Table 93. Table 92 provides a comparison of initiator contributions to LERF between the CAFTA R0 and RISKMAN R4 models. Revision 1 of the CAFTA model represents an incremental change from Revision 0, therefore comparison tables between these revisions are not required.

6.2.2.5 System Importance to LERF

Table 94 provides the systems with a F-V importance greater than 0.5% for unit 1 LERF, sorted on F-V importance. Table 95 provides the systems with a RAW greater than 2 for unit 1 LERF, sorted on RAW. Table 96 provides the systems with a F-V importance greater than 0.5% for unit 2 LERF, sorted on F-V importance. Table 97 provides the systems with a RAW greater than 2 for unit 2 LERF, sorted on RAW.

6.2.2.6 Component Importance to LERF

Table 98 provides the components with a F-V importance greater than 0.5% for unit 1 LERF, sorted on F-V importance. Table 99 provides the components with a RAW greater than 2 for unit 1 LERF, sorted on RAW. Table 100 provides the components with a F-V importance greater than 0.5% for unit 2 LERF, sorted on F-V importance.

Table 101 provides the components with a RAW greater than 2 for Unit 2 LERF, sorted on RAW.

6.2.2.7 Operator Action Importance to LERF

Those operator actions with a F-V greater than 0.5% are listed in Table 102 and Table 104, for unit 1 and 2, respectively. Those operator actions with a RAW value greater than 2 are listed in Table 103 and Table 105, for unit 1 and 2, respectively.

6.2.2.8 Basic Event Importance to LERF

Those basic events with a F-V greater than 0.5% are listed in Table 106 and Table 108, for unit 1 and 2, respectively. Those basic events with a RAW value greater than 2 are listed in Table 107 and Table 109, for unit 1 and 2, respectively.

6.2.2.9 Test and Maintenance Importance to LERF

Test and maintenance events with a F-V greater than 0.5% are listed in Table 110 and Table 112, for unit 1 and 2, respectively. Test and maintenance events with a RAW value greater than 2 are listed in Table 111 and Table 113, for unit 1 and 2, respectively.

7.0 Supporting Graphics

7.1 Tables

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%0FLAFW1	Flood: Unit 1 AFW line break in general areas (and 737.0-A3)
%0FLAFW1692A6	Flood: AFW line break in room 692.0-A6
%0FLAFW1692A7	Flood: AFW line break in room 692.0-A7
%0FLAFW2	Flood: Unit 1 AFW line break in general areas (and 737.0-A12)
%0FLAFW2692A25	Flood: AFW line break in room 692.0-A25
%0FLAFW2692A26	Flood: AFW line break in room 692.0-A26
%0FLAFW713A19	Flood: AFW line break in room 713.0-A19
%0FLAFW713A6	Flood: AFW line break in room 713.0-A6
%0FLAFW737A5	Flood: AFW line break in room 737.0-A5
%0FLAFW737A9	Flood: AFW line break in room 737.0-A9
%0FLCRDM1F	Flood event: HPFP or RCW line break in room 782.0-A1
%0FLCRDM2F	Flood event: HPFP or RCW line break in room 782.0-A3
%0FLCVCS1692A10	Flood event induced by CVCS break in room 692.0-A10.
%0FLCVCS1692A9	Flood event induced by CVCS break in room 692.0-A9.
%0FLCVCS1713A0	Flood event induced by CVCS break in area 713.0-A0 (Unit 1)
%0FLCVCS1713A6	Flood event induced by CVCS break in room 713.0-A6.
%0FLCVCS1757A10	Flood event induced by CVCS break in area 757.0-A10
%0FLCVCS1PITS	Flood event induced by Unit 1 CVCS break in sealed pits.
%0FLCVCS2692A22	Flood event induced by CVCS break in room 692.0-A22.
%0FLCVCS2692A23	Flood event induced by CVCS break in room 692.0-A23.
%0FLCVCS2713A0	Flood event induced by CVCS break in area 713.0-A0 (Unit 2)
%0FLCVCS2713A19	Flood event induced by CVCS break in room 713.0-A19.
%0FLCVCS2PITS	Flood event induced by Unit 2 CVCS break in sealed pits.
%0FLDWS713A19	Flood event induced by DWS line break in room 713.0-A19
%0FLDWS713A6	Flood event induced by DWS line break in room 713.0-A6
%0FLDWSAB	Flood event induced by DWS in the common areas of the Auxiliary Building (multip
%0FLERCW1AESFRCF	Flood event induced by unisolated ERCW break associated with ESF room cooling tr
%0FLERCW1AESFRCMF	Major flood event induced by unisolated ERCW break associated with ESF room cool
%0FLERCW1BESFRCF	Flood event induced by unisolated ERCW break associated with ESF room cooling tr
%0FLERCW1BESFRCMF	Major flood event induced by unisolated ERCW break associated with ESF room cool

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%0FLERCW2AESFRCF	Flood event induced by unisolated ERCW break associated with ESF room cooling tr
%0FLERCW2AESFRCMF	Major flood event induced by unisolated ERCW break associated with ESF room cool
%0FLERCW2BESFRCF	Flood event induced by unisolated ERCW break associated with ESF room cooling tr
%0FLERCW2BESFRCMF	Major flood event induced by unisolated ERCW break associated with ESF room cool
%0FLERCW692A25	Flood: ERCW break - supply header 2A in room 692.0-A25.
%0FLERCW692A26F	Flood event induced by ERCW line break: discharge header B (AFW TD pump room)
%0FLERCW692A26MF	Major flood event induced by ERCW line break: discharge header B (AFW TD pump ro
%0FLERCW692A6F	Flood event induced by ERCW line break: discharge header A (AFW TD pump room)
%0FLERCW692A6MF	Major flood event induced by ERCW line break: discharge header A (AFW TD pump ro
%0FLERCW692A7	Flood: ERCW break - supply header 1B in room 692.0-A7.
%0FLERCW713A19	Flood: ERCW break - supply header 2A in room 713.0-A19.
%0FLERCW713A28	Flood: ERCW break - supply header 1B in room 713.0-A28.
%0FLERCW713A29	Flood: ERCW break - supply header 2A in room 713.0-A29.
%0FLERCW713A6	Flood: ERCW break - supply header 1B in room 713.0-A6.
%0FLERCW737A5	Flood: ERCW break - supply header 1B in room 737.0-A5.
%0FLERCW737A9	Flood: ERCW break - supply header 2A in room 737.0-A9.
%0FLERCWAB676F-1A	Flood event induced by unisolated ERCW break at elevation 676' of Auxiliary Buil
%0FLERCWAB676F-1B	Flood event induced by unisolated ERCW break at elevation 676' of Auxiliary Buil
%0FLERCWAB676F-2A	Flood event induced by unisolated ERCW break at elevation 676' of Auxiliary Buil
%0FLERCWAB676F-2B	Flood event induced by unisolated ERCW break at elevation 676' of Auxiliary Buil
%0FLERCWAB676MF-1A	Major flood event induced by unisolated ERCW break in room 676.0-A1 (ESF room co
%0FLERCWAB676MF-1B	Major flood event induced by unisolated ERCW break in room 676.0-A1 (ESF room co
%0FLERCWAB676MF-2A	Major flood event induced by unisolated ERCW break in room 676.0-A1 (ESF room co
%0FLERCWAB676MF-2B	Major flood event induced by unisolated ERCW break in room 676.0-A1 (ESF room co

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%0FLERCWCB	Flood event induced by ERCW line break in Control Building.
%0FLERCWDISAF	Flood event induced by ERCW line break: discharge header A
%0FLERCWDISAMF	Major flood event induced by ERCW line break: discharge header A
%0FLERCWDISBF	Flood event induced by ERCW line break: discharge header B
%0FLERCWDISBMF	Major flood event induced by ERCW line break: discharge header B
%0FLERCWIPSA	Flood event in ERCW Strainer room A
%0FLERCWIPSB	Flood event in ERCW Strainer room B
%0FLHELB01A	HELB: CVCS line break in 713.0-A28
%0FLHELB01B	HELB: CVCS line break in 713.0-A29
%0FLHELB02A	HELB: CVCS line break in 737.0-A7
%0FLHELB02B	HELB: CVCS line break in 737.0-A8
%0FLHPFP692A25F	Flood event induced by a HPFP line break in room 692.0-A25
%0FLHPFP692A7F	Flood event induced by a HPFP line break in room 692.0-A7
%0FLHPFP737A5F	Flood event induced by HPFP line break in room 737.0-A5
%0FLHPFP737A9F	Flood event induced by HPFP line break in room 737.0-A9
%0FLHPFPAB713A1921F	Flood event induced by HPFP line break in room 713.0-A19 or 713.0-A21
%0FLHPFPAB713A68F	Flood event induced by HPFP line break in room 713.0-A6 or 713.0-A8
%0FLHPFPAB757A2	Flood event induced by break of HPFP line in room 757.0-A2
%0FLHPFPAB757A21	Flood event induced by break of HPFP line in room 757.0-A21
%0FLHPFPAB757A24	Flood event induced by break of HPFP line in room 757.0-A24
%0FLHPFPAB757A5	Flood event induced by break of HPFP line in room 757.0-A5
%0FLHPFPAB772A10	Flood event induced by break of HPFP line in room 772.0-A10
%0FLHPFPAB772A7	Flood event induced by break of HPFP line in room 772.0-A7
%0FLHPFPABF	Flood event induced by HPFP in the common areas of the Auxiliary Building (multi
%0FLHPFPCB	Flood event induced by a HPFP line break in the Control Building
%0FLHPFPIPS	Flood event induced by a HPFP or RCW line break in room 711.0-E1
%0FLRCW737A5F	Flood event induced by rupture of RCW lines in room 737.0-A5
%0FLRCW737A5MF	Major flood event induced by rupture of RCW lines in room 737.0-A5
%0FLRCW737A9F	Flood event induced by rupture of RCW lines in room 737.0-A9
%0FLRCW757A17	Flood event induced by rupture of RCW line in room 757.0-A17
%0FLRCW757A9	Flood event induced by rupture of RCW line in room 757.0-A9
%0FLRCW772A8	Flood event induced by rupture of RCW line in room 772.0-A8
%0FLRCW772A9	Flood event induced by rupture of RCW line in room 772.0-A9
%0FLRCWABF	Flood event induced by RCW in the common areas of the Auxiliary

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
	Building (multip
%0FLRCWABMF	Major flood event induced by RCW in the common areas of the Auxiliary Building (
%0FLRWST1692A7	Flood event induced by break in the lines from RWST 1 in room 692.0-A7
%0FLRWST1692A8	Flood event induced by break in the lines from RWST 1 in rooms 692.0-A8 or 713.0
%0FLRWST1713A28	Flood: break in the lines from RWST 1 in room 713.0-A28
%0FLRWST1713HX	Flood: rupture of the lines from RWST1 in any of the Unit 1 HX rooms at elevatio
%0FLRWST1AB676	Flood: Unisolated line break from RWST 1 - elevation 676' of Auxiliary Building
%0FLRWST1AB692A1	Flood event induced by rupture of RWST 1 header in room 692.0-A1
%0FLRWST1SIS	Flood: SIS line break in any of the Unit 1 SIS pump room.
%0FLRWST2692A24	Flood event induced by break in the lines from RWST 2 in rooms 692.0-A24 or 713.
%0FLRWST2692A25	Flood event induced by break in the lines from RWST 2 in room 692.0-A25
%0FLRWST2713A29	Flood: break in the lines from RWST 2 in room 713.0-A29
%0FLRWST2713HX	Flood: rupture of the lines from RWST2 in any of the Unit 2 HX rooms at elevatio
%0FLRWST2AB676	Flood: unisolated line break from RWST 2 - elevation 676' of Auxiliary Building
%0FLRWST2AB692A1	Flood event induced by rupture of RWST 2 header in room 692.0-A1
%0FLRWST2SIS	Flood: SIS line break in any of the Unit 2 SIS pump room.
%0FLTBCST1MF	Major flood in the Turbine Building involving line break from CST1.
%0FLTBCST2MF	Major flood in the Turbine Building involving line break from CST2.
%0FLTBMF	Major flood in the Turbine Building
%0FLTBSPRAY1-A-D	Spray event on 6.9kV board 1D and 2A
%0FLTBSPRAY3	Spray event on common board 205 B
%0FLTBSPRAY4	Spray event on air compressor D and sequencer
%0FLTBSPRAY5	Spray event on dryers
%0LOSP-GR	Loss of Offsite Power (Grid Related)
%0LOSP-PC	Loss of Offsite Power (Plant Centered)
%0LOSP-WI	Loss of Offsite Power (Weather Induced)
%0TLERCW	Total Loss of ERCW
%0TLPCA	Total Loss of Plant Compressed Air

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%1CCS	Total Loss of Component Cooling System Unit 1
%1CCS1A	Loss of Component Cooling System Train 1A
%1CPEX	Core Power Excursion
%1EX	EXCESSIVE LOCA (VESSEL RUPTURE)
%1EXMFW	Excessive Main Feedwater
%1FLCCS	Flood event induced by CCS line break (Train A)
%1FLCCS1AB692A7	Flood: CCS line break in room 692.0-A7
%1FLCCS713A28	Flood: unisolated break in CCS line in room 713.0-A28
%1FLCCS737A5	Flood: CCS line break in room 737.0-A5
%1FLCCS757A13	Flood event induced by CCS line break in room 757.0-A13 (Surge tank A).
%1FLHELBAFW	HELB scenario induced by MSS supply to AFW line break. Unit 1
%1FLRTIE	Contribution to reactor trip initiating event frequency due to pipe breaks – Uni
%1FLTBSPRAY1-A-B	Spray event on Unit 1 6.9kV boards A and B
%1FLTBSPRAY1-B-C	Spray event on Unit 1 6.9kV boards B and C
%1FLTBSPRAY1-C-D	Spray event on Unit 1 6.9kV boards C and D
%1FLTBSPRAY2A	Spray event on U1 board 203A (480V TB)
%1FLTBSPRAY2B	Spray event on U1 board 203B (480V TB)
%1FLTBSPRAY6	Spray event on distribution board WBN-0-DPL -239-0001
%1IMSIV	Inadvertent Closure of all MSIVs
%1ISI	Inadvertent Safety Injection
%1ISL-IERWSTRHR	ISLOCA RWST PIPING INITIATOR FLAG
%1ISL-IEX107	ISLOCA RHR Supply Line Initiator Flag
%1ISL-IEX15	ISL - LETDOWN LINE INITIATOR FLAG
%1ISL-IEX17	ISLOCA RHR HOT LEG INITIATOR FLAG
%1ISL-IEX20A	ISLOCA RHR COLD LEG INJECTION B Initiator Flag
%1ISL-IEX20B	ISLOCA RHR COLD LEG INJECTION A Initiator Flag
%1ISL-IEX21	ISLOCA SI HOT LEG B INITIATOR FLAG
%1ISL-IEX32	ISLOCA SI HOT LEG A INITIATOR FLAG
%1ISL-IEX33	ISLOCA SI COLD LEG INJECTION Initiator Flag
%1ISL-RHRPMPSEAL	ISLOCA RHR PUMP SEAL INITIATOR FLAG
%1ISL-SIPMPSEALA	ISLOCA SI PUMP SEAL A Initiator Flag
%1ISL-SIPMPSEALB	ISLOCA SI PUMP SEAL B Initiator Flag
%1LDAAC	Loss of 120V AC Vital Instrument Board I
%1LDBAC	Loss of 120V AC Vital Instrument Board II
%1LDCAC	Loss of 120V AC Vital Instrument Board III
%1LDDAC	Loss of 120V AC Vital Instrument Board IV

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%1LLOCA-CL1	LLOCA ON COLD LEG 1
%1LLOCA-CL2	LLOCA ON COLD LEG 2
%1LLOCA-CL3	LLOCA ON COLD LEG 3
%1LLOCA-CL4	LLOCA ON COLD LEG 4
%1LOCV	Loss of Condenser Vacuum
%1LRCP	Loss of Primary Flow
%1LVBB1	Loss of Battery Board 1
%1LVBB2	Loss of Battery Board 2
%1MLOCA-CL1	MLOCA ON COLD LEG 1
%1MLOCA-CL2	MLOCA ON COLD LEG 2
%1MLOCA-CL3	MLOCA ON COLD LEG 3
%1MLOCA-CL4	MLOCA ON COLD LEG 4
%1MSIV	Inadvertent Closure of 1 MSIV
%1MSVO	Steam Generator PORV Fails Open
%1PLERCW	Partial Loss of ERCW UNIT 1
%1PLMFW	Partial Loss of Main Feedwater
%1RTIE	Reactor Trip
%1SGTRSG1	RUPTURED STEAM GENERATOR IS SG1
%1SGTRSG2	RUPTURED STEAM GENERATOR IS SG2
%1SGTRSG3	RUPTURED STEAM GENERATOR IS SG3
%1SGTRSG4	RUPTURED STEAM GENERATOR IS SG4
%1SLOCA-CL1	SLOCA ON COLD LEG 1
%1SLOCA-CL2	SLOCA ON COLD LEG 2
%1SLOCA-CL3	SLOCA ON COLD LEG 3
%1SLOCA-CL4	SLOCA ON COLD LEG 4
%1SLOCAL	Small LOCA Stuck Open Safety Relief Valve
%1SLOCAV	VERY SMALL LOCA INITIATING EVENT
%1SSBI-1	SG1 IS THE FAULTED SG
%1SSBI-2	SG2 IS THE FAULTED SG
%1SSBI-3	SG3 IS THE FAULTED SG
%1SSBI-4	SG4 IS THE FAULTED SG
%1SSBO-1	SECONDARY BREAK OUTSIDE CONTAINMENT SG 1
%1SSBO-2	SECONDARY BREAK OUTSIDE CONTAINMENT SG 2
%1SSBO-3	SECONDARY BREAK OUTSIDE CONTAINMENT SG 3
%1SSBO-4	SECONDARY BREAK OUTSIDE CONTAINMENT SG 4
%1TLMFW	Total Loss of Main Feedwater
%1TTIE	Turbine Trip

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%2CCS	Total Loss of Component Cooling System Unit 2
%2CCS2A	Loss of Component Cooling System Train 2A
%2CPEX	Core Power Excursion
%2EX	EXCESSIVE LOCA (VESSEL RUPTURE)
%2EXMFW	Excessive Main Feedwater
%2FLCCS	Flood event induced by CCS line break (Train B)
%2FLCCS2AB692A25	Flood event induced by CCS line break in room 692.0-A15
%2FLCCS713A29	Flood: unisolated break in CCS line in room 713.0-A29
%2FLCCS737A9	Flood: CCS line break in room 737.0-A9
%2FLCCS757A13	Flood event induced by CCS line break in room 757.0-A13 (Surge tank B).
%2FLHELBAFW	HELB scenario induced by MSS supply to AFW line break. Unit 2
%2FLRTIE	Contribution to reactor trip initiating event frequency due to pipe breaks – Uni
%2FLTBSPRAY1-A-B	Spray event on Unit 2 6.9kV boards A and B
%2FLTBSPRAY1-B-C	Spray event on Unit 2 6.9kV boards B and C
%2FLTBSPRAY1-C-D	Spray event on Unit 2 6.9kV boards C and D
%2FLTBSPRAY2B	Spray event on U2 board 203B (480V TB)
%2IMSIV	Inadvertent Closure of all MSIVs
%2ISI	Inadvertent Safety Injection
%2ISL-IERWSTRHR	ISLOCA RWST PIPING INITIATOR FLAG
%2ISL-IEX107	ISLOCA RHR Supply Line Initiator Flag
%2ISL-IEX15	ISL - LETDOWN LINE INITIATOR FLAG
%2ISL-IEX17	ISLOCA RHR HOT LEG INITIATOR FLAG
%2ISL-IEX20A	ISLOCA RHR COLD LEG INJECTION B Initiator Flag
%2ISL-IEX20B	ISLOCA RHR COLD LEG INJECTION A Initiator Flag
%2ISL-IEX21	ISLOCA SI HOT LEG B INITIATOR FLAG
%2ISL-IEX32	ISLOCA SI HOT LEG A INITIATOR FLAG
%2ISL-IEX33	ISLOCA SI COLD LEG INJECTION Initiator Flag
%2ISL-RHRPMPSEAL	ISLOCA RHR PUMP SEAL INITIATOR FLAG
%2ISL-SIPMPSEALA	ISLOCA SI PUMP SEAL A Initiator Flag
%2ISL-SIPMPSEALB	ISLOCA SI PUMP SEAL B Initiator Flag
%2LDAAC	Loss of 120V AC Vital Instrument Board I
%2LDBAC	Loss of 120V AC Vital Instrument Board II
%2LDCAC	Loss of 120V AC Vital Instrument Board III
%2LDDAC	Loss of 120V AC Vital Instrument Board IV
%2LLOCA-CL1	LLOCA ON COLD LEG 1
%2LLOCA-CL2	LLOCA ON COLD LEG 2

Table 1 - Initiating Events

CAFTA IDENTIFIER	DESCRIPTION
%2LLOCA-CL3	LLOCA ON COLD LEG 3
%2LLOCA-CL4	LLOCA ON COLD LEG 4
%2LOCV	Loss of Condenser Vacuum
%2LRCP	Loss of Primary Flow
%2LVBB3	Loss of Battery Board 3
%2LVBB4	Loss of Battery Board 4
%2MLOCA-CL1	MLOCA ON COLD LEG 1
%2MLOCA-CL2	MLOCA ON COLD LEG 2
%2MLOCA-CL3	MLOCA ON COLD LEG 3
%2MLOCA-CL4	MLOCA ON COLD LEG 4
%2MSIV	Inadvertent Closure of 1 MSIV
%2MSVO	Steam Generator PORV Fails Open
%2PLERCW	Partial Loss of ERCW UNIT 1
%2PLMFW	Partial Loss of Main Feedwater
%2RTIE	Reactor Trip
%2SGTRSG1	RUPTURED STEAM GENERATOR IS SG1
%2SGTRSG2	RUPTURED STEAM GENERATOR IS SG2
%2SGTRSG3	RUPTURED STEAM GENERATOR IS SG3
%2SGTRSG4	RUPTURED STEAM GENERATOR IS SG4
%2SLOCA-CL1	SLOCA ON COLD LEG 1
%2SLOCA-CL2	SLOCA ON COLD LEG 2
%2SLOCA-CL3	SLOCA ON COLD LEG 3
%2SLOCA-CL4	SLOCA ON COLD LEG 4
%2SLOCAL	Small LOCA Stuck Open Safety Relief Valve
%2SLOCAV	VERY SMALL LOCA INITIATING EVENT
%2SSBI-1	SG1 IS THE FAULTED SG
%2SSBI-2	SG2 IS THE FAULTED SG
%2SSBI-3	SG3 IS THE FAULTED SG
%2SSBI-4	SG4 IS THE FAULTED SG
%2SSBO-1	SECONDARY BREAK OUTSIDE CONTAINMENT SG 1
%2SSBO-2	SECONDARY BREAK OUTSIDE CONTAINMENT SG 2
%2SSBO-3	SECONDARY BREAK OUTSIDE CONTAINMENT SG 3
%2SSBO-4	SECONDARY BREAK OUTSIDE CONTAINMENT SG 4
%2TLMFW	Total Loss of Main Feedwater
%2TTIE	Turbine Trip

References: CAFTA R1 Database, IE Notebook

Table 2 - Summary of WBN Initiating Event Evidence January 1, 2003 to April 30, 2011

Initiator	WBN-1	
	LER	**Events**
Reactor Trip (RTIE)	LER 390-2004-02	1
	LER 390-2004-01	1
	LER 390-2008-002	1
	LER 390-2010-03	1
Total		4
Turbine Trip (TTIE)	LER 390-2006-04	1
	LER 390-2006-05	1
	LER 390-2003-03	1
	LER 390-2003-01	1
	LER 390-2008-004	1
	LER 390-2010-01	1
Total		6
Total Loss of Main Feedwater (TLMFW)	LER 390-2010-02	1
Total		1
Total of all IEs		**11**
	Exposure Time	7.5 year
Reference 33, Table 5-3		

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%0LOSP-GR	Loss of Offsite Power (Grid Related)	LOSP-GR	1.01E-02	--	--	--	--	--
%0LOSP-PC	Loss of Offsite Power (Plant Centered)	LOSP-PC	8.12E-03	--	--	--	--	--
%0LOSP-WI	Loss of Offsite Power (Weather Induced)	LOSP-WI	2.03E-03	--	--	--	--	--
%0TLERCW	Total Loss of ERCW	--	--	--	--	6.78E-06	--	--
%0TLPCA	Total Loss of Plant Compressed Air	TLPCA	9.81E-03	Lognormal	8.4	--	--	--
%1CCS	Total Loss of Component Cooling System Unit 1	--	--	--	--	2.49E-04	--	--
%1CCS1A	Loss of Component Cooling System Train 1A	--	--	--	--	7.99E-03	--	--
%1CPEX	Core Power Excursion	CPEX	3.29E-03	Lognormal	1.4	--	--	--
%1EX	EXCESSIVE LOCA (VESSEL RUPTURE)	--	3.22E-08	Lognormal	10	--	--	--
%1EXMFW	Excessive Main Feedwater	EXMFW	2.96E-02	Lognormal	1.4	2.93E-02	Lognormal	1.4
%1IMSIV	Inadvertent Closure of all MSIVs	IMSIV	1.53E-02	Lognormal	1.3	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%1ISI	Inadvertent Safety Injection	ISI	1.65E-03	Lognormal	1.4	--	--	--
%1ISL-IERWSTRHR	ISLOCA RWST PIPING INITIATOR FLAG	--	1.56E-08	--	--	--	--	--
%1ISL-IEX107	ISLOCA RHR Supply Line Initiator Flag	--	1.38E-07	--	--	--	--	--
%1ISL-IEX15	ISL - LETDOWN LINE INITIATOR FLAG	--	4.37E-10	--	--	--	--	--
%1ISL-IEX17	ISLOCA RHR HOT LEG INITIATOR FLAG	--	1.78E-10	--	--	--	--	--
%1ISL-IEX20A	ISLOCA RHR COLD LEG INJECTION B Initiator Flag	--	1.74E-08	--	--	--	--	--
%1ISL-IEX20B	ISLOCA RHR COLD LEG INJECTION A Initiator Flag	--	1.74E-08	--	--	--	--	--
%1ISL-IEX21	ISLOCA SI HOT LEG B INITIATOR FLAG	--	2.12E-12	--	--	--	--	--
%1ISL-IEX32	ISLOCA SI HOT LEG A INITIATOR FLAG	--	2.12E-12	--	--	--	--	--
%1ISL-IEX33	ISLOCA SI COLD LEG INJECTION Initiator Flag	--	3.03E-09	--	--	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%1ISL-RHRPMPSEAL	ISLOCA RHR PUMP SEAL INITIATOR FLAG	--	9.19E-06	--	--	--	--	--
%1ISL-SIPMPSEALA	ISLOCA SI PUMP SEAL A Initiator Flag	--	1.30E-08	--	--	--	--	--
%1ISL-SIPMPSEALB	ISLOCA SI PUMP SEAL B Initiator Flag	--	1.30E-08	--	--	--	--	--
%1LDAAC	Loss of 120V AC Vital Instrument Board I	--	--	--	--	4.89E-03	--	--
%1LDBAC	Loss of 120V AC Vital Instrument Board II	--	--	--	--	4.89E-03	--	--
%1LDCAC	Loss of 120V AC Vital Instrument Board III	--	--	--	--	4.89E-03	--	--
%1LDDAC	Loss of 120V AC Vital Instrument Board IV	--	--	--	--	4.89E-03	--	--
%1LLOCA-CL1	LLOCA ON COLD LEG 1	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%1LLOCA-CL2	LLOCA ON COLD LEG 2	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%1LLOCA-CL3	LLOCA ON COLD LEG 3	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%1LLOCA-CL4	LLOCA ON COLD LEG 4	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%1LOCV	Loss of Condenser Vacuum	LOCV	6.58E-02	Lognormal	1.3	6.50E-02	Lognormal	1.3
%1LRCP	Loss of Primary Flow	LRCP	3.62E-02	Lognormal	1.4	3.58E-02	Lognormal	1.4

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%1LVBB1	Loss of Battery Board 1	--	--	--	--	4.36E-03	--	--
%1LVBB2	Loss of Battery Board 2	--	--	--	--	4.36E-03	--	--
%1MLOCA-CL1	MLOCA ON COLD LEG 1	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%1MLOCA-CL2	MLOCA ON COLD LEG 2	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%1MLOCA-CL3	MLOCA ON COLD LEG 3	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%1MLOCA-CL4	MLOCA ON COLD LEG 4	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%1MSIV	Inadvertent Closure of 1 MSIV	MSIV	1.32E-01	Lognormal	1.4	--	--	--
%1MSVO	Steam Generator PORV Fails Open	MSVO	1.65E-03	Lognormal	1.4	--	--	--
%1PLERCW	Partial Loss of ERCW UNIT 1	--	--	--	--	3.28E-03	--	--
%1PLMFW	Partial Loss of Main Feedwater	PLMFW	1.35E-01	Lognormal	1.4	1.29E-01	Lognormal	1.4
%1RTIE	Reactor Trip	RTIE	3.20E-01	Lognormal	1.4	3.27E-01	Lognormal	1.38
%1SGTRSG1	RUPTURED STEAM GENERATOR IS SG1	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%1SGTRSG2	RUPTURED STEAM GENERATOR IS SG2	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%1SGTRSG3	RUPTURED STEAM GENERATOR IS SG3	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%1SGTRSG4	RUPTURED STEAM GENERATOR IS SG4	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%1SLOCA-CL1	SLOCA ON COLD LEG 1	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%1SLOCA-CL2	SLOCA ON COLD LEG 2	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%1SLOCA-CL3	SLOCA ON COLD LEG 3	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%1SLOCA-CL4	SLOCA ON COLD LEG 4	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%1SLOCAL	Small LOCA Stuck Open Safety Relief Valve	SLOCAL	2.88E-03	Lognormal	8.4	--	--	--
%1SLOCAV	VERY SMALL LOCA INITIATING EVENT	SLOCAV	3.82E-03	Lognormal	8.4	--	--	--
%1SSBI-1	SG1 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%1SSBI-2	SG2 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%1SSBI-3	SG3 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%1SSBI-4	SG4 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%1SSBO-1	SECONDARY BREAK OUTSIDE CONTAINMENT SG 1	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%1SSBO-2	SECONDARY BREAK OUTSIDE CONTAINMENT SG 2	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%1SSBO-3	SECONDARY BREAK OUTSIDE CONTAINMENT SG 3	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%1SSBO-4	SECONDARY BREAK OUTSIDE CONTAINMENT SG 4	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%1TLMFW	Total Loss of Main Feedwater	TLMFW	9.59E-02	Lognormal	3.6	1.10E-01	Lognormal	2.74
%1TTIE	Turbine Trip	TTIE	2.04E-01	Lognormal	1.4	2.41E-01	Lognormal	1.35
%2CCS	Total Loss of Component Cooling System Unit 2	--	--	--	--	2.49E-04	--	--
%2CCS2A	Loss of Component Cooling System Train 2A	--	--	--	--	7.65E-03	--	--
%2CPEX	Core Power Excursion	CPEX	3.29E-03	Lognormal	1.4	--	--	--
%2EX	EXCESSIVE LOCA (VESSEL RUPTURE)	EX	3.22E-08	Lognormal	10	--	--	--
%2EXMFW	Excessive Main Feedwater	EXMFW	2.96E-02	Lognormal	1.4	2.93E-02	Lognormal	1.4
%2IMSIV	Inadvertent Closure of all MSIVs	IMSIV	1.53E-02	Lognormal	1.3	--	--	--
%2ISI	Inadvertent Safety Injection	ISI	1.65E-03	Lognormal	1.4	--	--	--
%2ISL-IERWSTRHR	ISLOCA RWST PIPING INITIATOR FLAG	--	1.56E-08	--	--	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%2ISL-IEX107	ISLOCA RHR Supply Line Initiator Flag	--	1.38E-07	--	--	--	--	--
%2ISL-IEX15	ISL - LETDOWN LINE INITIATOR FLAG	--	4.37E-10	--	--	--	--	--
%2ISL-IEX17	ISLOCA RHR HOT LEG INITIATOR FLAG	--	1.78E-10	--	--	--	--	--
%2ISL-IEX20A	ISLOCA RHR COLD LEG INJECTION B Initiator Flag	--	1.74E-08	--	--	--	--	--
%2ISL-IEX20B	ISLOCA RHR COLD LEG INJECTION A Initiator Flag	--	1.74E-08	--	--	--	--	--
%2ISL-IEX21	ISLOCA SI HOT LEG B INITIATOR FLAG	--	2.12E-12	--	--	--	--	--
%2ISL-IEX32	ISLOCA SI HOT LEG A INITIATOR FLAG	--	2.12E-12	--	--	--	--	--
%2ISL-IEX33	ISLOCA SI COLD LEG INJECTION Initiator Flag	--	3.03E-09	--	--	--	--	--
%2ISL-RHRPMPSEAL	ISLOCA RHR PUMP SEAL INITIATOR FLAG	--	9.19E-06	--	--	--	--	--
%2ISL-SIPMPSEALA	ISLOCA SI PUMP SEAL A Initiator Flag	--	1.30E-08	--	--	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%2ISL-SIPMPSEALB	ISLOCA SI PUMP SEAL B Initiator Flag	--	1.30E-08	--	--	--	--	--
%2LDAAC	Loss of 120V AC Vital Instrument Board I	--	--	--	--	4.89E-03	--	--
%2LDBAC	Loss of 120V AC Vital Instrument Board II	--	--	--	--	4.89E-03	--	--
%2LDCAC	Loss of 120V AC Vital Instrument Board III	--	--	--	--	4.89E-03	--	--
%2LDDAC	Loss of 120V AC Vital Instrument Board IV	--	--	--	--	4.89E-03	--	--
%2LLOCA-CL1	LLOCA ON COLD LEG 1	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%2LLOCA-CL2	LLOCA ON COLD LEG 2	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%2LLOCA-CL3	LLOCA ON COLD LEG 3	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%2LLOCA-CL4	LLOCA ON COLD LEG 4	LLOCA/4	3.28E-07	Lognormal	10.7	--	--	--
%2LOCV	Loss of Condenser Vacuum	LOCV	6.58E-02	Lognormal	1.3	6.50E-02	Lognormal	1.3
%2LRCP	Loss of Primary Flow	LRCP	3.62E-02	Lognormal	1.4	3.58E-02	Lognormal	1.4
%2LVBB3	Loss of Battery Board 3	--	--	--	--	4.36E-03	--	--
%2LVBB4	Loss of Battery Board 4	--	--	--	--	4.36E-03	--	--
%2MLOCA-CL1	MLOCA ON COLD LEG 1	MLOCA/4	3.55E-06	Lognormal	10	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%2MLOCA-CL2	MLOCA ON COLD LEG 2	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%2MLOCA-CL3	MLOCA ON COLD LEG 3	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%2MLOCA-CL4	MLOCA ON COLD LEG 4	MLOCA/4	3.55E-06	Lognormal	10	--	--	--
%2MSIV	Inadvertent Closure of 1 MSIV	MSIV	1.32E-01	Lognormal	1.4	--	--	--
%2MSVO	Steam Generator PORV Fails Open	MSVO	1.65E-03	Lognormal	1.4	--	--	--
%2PLERCW	Partial Loss of ERCW UNIT 1	--	--	--	--	3.26E-03	--	--
%2PLMFW	Partial Loss of Main Feedwater	PLMFW	1.35E-01	Lognormal	1.4	1.29E-01	Lognormal	1.4
%2RTIE	Reactor Trip	RTIE	3.20E-01	Lognormal	1.4	3.27E-01	Lognormal	1.38
%2SGTRSG1	RUPTURED STEAM GENERATOR IS SG1	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%2SGTRSG2	RUPTURED STEAM GENERATOR IS SG2	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%2SGTRSG3	RUPTURED STEAM GENERATOR IS SG3	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%2SGTRSG4	RUPTURED STEAM GENERATOR IS SG4	SGTR/4	8.85E-04	Lognormal	8.4	--	--	--
%2SLOCA-CL1	SLOCA ON COLD LEG 1	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%2SLOCA-CL2	SLOCA ON COLD LEG 2	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%2SLOCA-CL3	SLOCA ON COLD LEG 3	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%2SLOCA-CL4	SLOCA ON COLD LEG 4	SLOCAN/4	1.29E-04	Lognormal	8.4	--	--	--
%2SLOCAL	Small LOCA Stuck Open Safety Relief Valve	SLOCAL	2.88E-03	Lognormal	8.4	--	--	--
%2SLOCAV	VERY SMALL LOCA INITIATING EVENT	SLOCAV	3.82E-03	Lognormal	8.4	--	--	--
%2SSBI-1	SG1 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%2SSBI-2	SG2 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%2SSBI-3	SG3 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%2SSBI-4	SG4 IS THE FAULTED SG	SLBIC/4	2.50E-04	Lognormal	31.62	--	--	--
%2SSBO-1	SECONDARY BREAK OUTSIDE CONTAINMENT SG 1	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%2SSBO-2	SECONDARY BREAK OUTSIDE CONTAINMENT SG 2	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%2SSBO-3	SECONDARY BREAK OUTSIDE CONTAINMENT SG 3	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--
%2SSBO-4	SECONDARY BREAK OUTSIDE CONTAINMENT SG 4	SLBOC/4	2.50E-03	Lognormal	1.84	--	--	--

Table 3 - Initiating Event Prior and Posterior Distributions

Initiator Designator	Initiator Description	Variable Name	Prior			Posterior		
			Mean Frequency	Distribution	Error Factor	Mean Frequency	Distribution	Error Factor
%2TLMFW	Total Loss of Main Feedwater	TLMFW	9.59E-02	Lognormal	3.6	1.10E-01	Lognormal	2.74
%2TTIE	Turbine Trip	TTIE	2.04E-01	Lognormal	1.4	2.41E-01	Lognormal	1.35

Reference CAFTA model, Reference 33 Table 5-2 and Section 6, Reference 42 Table 8-2.

Table 4 Comparison of Initiating Event Frequencies

Initiating Event	Description	WBN PRA CAFTA Revision 0	WBN PRA CAFTA Revision 1	Percentage Change
CCSTL	Total Loss of CCS	2.49E-04	2.49E-04	0%
--	ISLOCAs, total	9.41E-06	9.41E-06	0%
--	Flooding, total	2.26E-02	2.26E-02	0%
SLBIC	Steam Line Break Inside Containment	1.00E-03	1.00E-03	0%
ERCW1B	Partial Loss of ERCW	3.28E-03	3.28E-03	0%
ERCW2A	Partial Loss of ERCW	3.26E-03	3.26E-03	0%
SLBOC	Steam Line Break Outside Containment	1.00E-02	1.00E-02	0%
CCSA	Loss of CCS Train 1A	7.99E-03	7.99E-03	0%
LVBBx	Loss of Battery Board x	4.36E-03	4.36E-03	0%
SLOCAN	Small LOCA Non-Isolable	5.20E-04	5.14E-04	-1%
IMSIV	Inadvertent Closure of all MSIVs	1.53E-02	1.53E-02	0%
TLMFW	Total Loss of Main Feedwater	7.01E-02	1.10E-01	57%
EXMFW	Excessive Main Feedwater	3.95E-02	2.93E-02	-26%
SLOCAV	Very Small LOCA Non-Isolable	3.88E-03	3.82E-03	-2%
ISI	Inadvertent Safety Injection	1.03E-02	1.65E-03	-84%
RTIE	Reactor Trip	2.85E-01	3.40E-01	19%
SGTR	Steam Generator Tube Rupture	3.54E-03	3.54E-03	0%
MLOCA	Medium Break LOCA	1.44E-05	1.42E-05	-1%
LLOCA	Large Break LOCA	1.33E-06	1.31E-06	-2%
LRCP	Loss of 1 or More RCS/Primary Flow	2.89E-02	3.58E-02	24%
PLMFW	Partial Loss of Main Feedwater	1.46E-01	1.29E-01	-12%

Table 4 Comparison of Initiating Event Frequencies

Initiating Event	Description	WBN PRA CAFTA Revision 0	WBN PRA CAFTA Revision 1	Percentage Change
LOCV	Loss of Condenser Vacuum	6.53E-02	6.50E-02	0%
LOSP-xx	Loss of Offsite Power, total	2.03E-02	2.03E-02	0%
MSIV	Inadvertent Closure of One MSIV	1.97E-02	1.32E-02	-33%
CPEX	Core Power Excursion	7.27E-03	3.29E-03	-55%
ELOCA	Excessive LOCA	1.00E-07	3.22E-08	-68%
MSVO	Steam Generator PORV Fails Open	8.55E-04	1.65E-03	93%
TTIE	Turbine Trip	2.32E-01	2.41E-01	4%
U1_LDxAC	Loss of 120V AC Vital Board x	4.89E-03	4.89E-03	0%
ERCWTL	Total Loss of ERCW	6.78E-06	6.78E-06	0%
SLOCAL	Stuck Open Safety/Relief Valve	2.88E-03	2.88E-03	0%
TLPCA	Total Loss of Plant Compressed Air	9.81E-03	9.81E-03	0%

Reference 33, Table 8-1, Table 9-1

Reference 41, Table 7-1

Reference 42, Table 8-2

CAFTA Flooding IE Frequency from model

Revision 4 values from R4 IE Notebook

Table 5 – Plant Damage States

PDS	Description
NHD	Containment is not bypassed. There is no or small leakage from the RCS and it is at a high pressure at the time of core damage. There is no feedwater or auxiliary feedwater to the steam generators and the steam generators are dry at the time of core damage.
NLD	Containment is not bypassed. There is a medium or large LOCA from the RCS and it is at low or atmospheric pressure at the time of core damage. There is no feedwater or auxiliary feedwater to the steam generators and the steam generators are dry at the time of core damage.
NHW	Containment is not bypassed. There is no or small leakage from the RCS and it is at a high pressure at the time of core damage. Feedwater or auxiliary feedwater is being supplied to the steam generators and the steam generator water level is at nominal level at the time of core damage.
NLW	Containment is not bypassed. There is a medium or large LOCA from the RCS and it is at low pressure at the time of core damage. Feedwater or auxiliary feedwater is being supplied to the steam generators and the steam generator water level is at nominal level at the time of core damage.
BHD	The containment is bypassed at the time of core damage (i.e., Steam Generator Tube Rupture (SGTR) or ISLOCA). There is no or small leakage from the RCS and it is at high or intermediate pressure (above the accumulator setpoint) at the time of core damage. There is no feedwater or auxiliary feedwater to the steam generators and the steam generators are dry at the time of core damage.
BLD	The containment is bypassed at the time of core damage (i.e., SGTR or ISLOCA). There is a large leakage from the RCS or the RCS has been depressurized and it is at a low pressure at the time of core damage. There is no feedwater or auxiliary feedwater to the steam generators and the steam generators are dry at the time of core damage.
BHW	The containment is bypassed at the time of core damage (i.e., SGTR or ISLOCA). There is no or small leakage from the RCS and it is at high/intermediate pressure at the time of core damage. Feedwater or auxiliary feedwater is being supplied to the steam generators and the steam generators are at nominal level at the time of core damage.
BLW	The containment is bypassed at the time of core damage (i.e., SGTR or ISLOCA). There is large leakage from the RCS or the RCS has been depressurized and it is at a low pressure at the time of core damage. Feedwater or auxiliary feedwater is being supplied to the steam generators and the steam generators are at nominal level at the time of core damage.
Reference 34, Table 6.3-1	

Table 6 – Initiating Event Linkage to Accident Sequence Event Trees

Group	Category	Initiator Designator	Core Damage Event Tree
Loss of Coolant	1. Excessive LOCA (reactor vessel failure)	%1EX	NONE
	2. Large LOCA (> 6-inch diameter)	%1LLOCA-CL1,2,3,4	LLOCA
	3. Medium LOCA (≥ 2 to ≤ 6-inch diameter)	%1MLOCA-Cl1,2,3,4	MLOCA
	4. Small LOCA (non-isolable)	%1SLOCA-Cl1,2,3,4	SLOCA
	5. Small LOCA (isolable)	%1SLOCAL	SLOCA
	6. Very Small LOCA (non-isolable)	%1SLOCAV	SLOCAV
	7. Steam Generator Tube Rupture	%1SGTRSG1,2,3,4	SGTR
	8. Interfacing Systems LOCA — Large and Medium	%1ISL-IERWSTRHR, %1ISL-IEXxxx	ISLOCA
	9. Interfacing Systems LOCA — Small	%1ISL-xxxPMPSEAL	ISLOCA
Transients	10. Reactor Trips	%1RTIE	GTRAN
	11. Core Power Excursion	%1CPEX	GTRAN
	12. Turbine Trip	%1TTIE	GTRAN
	13. Inadvertent Safety Injection	%1ISI	GTRAN
	14. Total Loss of All Main Feedwater	%1TLMFW	GTRAN
	15. Partial Loss of Main Feedwater	%1PLMFW	GTRAN
	16. Loss of Condenser Vacuum	%1LOCV	GTRAN
	17. Excessive Feedwater	%1EXMFW	GTRAN
	18. Inadvertent Closure of One MSIV	%1MSIV	GTRAN
	19. Inadvertent Closure of All MSIVs	%1IMSIV	GTRAN
	20. Loss of Primary Flow	%1LRCP	GTRAN
	21. Steam Line Break Outside Containment	%1SSBO-1, 2, 3, 4	SSBO
	22. Steam Line Break Inside Containment	%1SSBI-1,2,3,4	SSBI
	23. Inadvertent Opening of Main Steam Relief Valves	%1MSVO	SSBO
	24. Inadvertent Safety Injection	%1ISI	GTRAN
Loss of Support Initiating Events	25. Loss of Offsite Power	%0LOSP-GR, PC, WI	GTRAN
	26. Loss of 1-I Vital AC Instrument Board	%1LDAAC,	GTRAN
	27. Loss of 1-II Vital AC Instrument Board	%1LDBAC	GTRAN
	28. Loss of 1-III Vital AC Instrument Board	%1LDCAC	GTRAN
	29. Loss of 1-IV Vital AC Instrument Board	%1LDDAC	GTRAN
	30. Loss of Vital Battery Board I	%1LVBB1	GTRAN
	31. Loss of Vital Battery Board II	%1LVBB2	GTRAN
	32. Total Loss of CCS	%1CCS	GTRAN
	33. Loss of CCS Train A	%1CCS1A	GTRAN
	34. Total Loss of ERCW	%0TERCW	GTRAN

Table 6 – Initiating Event Linkage to Accident Sequence Event Trees

Group	Category	Initiator Designator	Core Damage Event Tree
	35. Loss of ERCW to Unit 1	%1PLERCW	GTRAN
	36. Total Loss of Plant Compressed Air	%0TLPCA	GTRAN
Reference 34, Table 6.1-1			

Table 7 -- Success Criteria for LLOCA

Path Name	ACC	LPI3	LPR3	LPH
Mission Time	N/A	< 1 hour	> 23 hours	24 hours
LLOCA-001	3 of 3 to intact legs	1 of 2 RHR pumps to 3 of 3 intact legs	1 of 2 RHR pumps to 1 of 2 intact legs	1 of 2 RHR pumps to 2 of 4 legs and 1 of 2 SI pumps to 2 of 4 legs

Reference 35, Table 7.2-1

Table 8 -- Success Criteria for MLOCA

Path Name	CVCS	SI	HPR	AFW	AFW1	LPI	LPR
Mission Time	< 1 hour[1]	< 1 hour[1]	> 23 hours[1]	24 hours	N/A	1 hour[1]	23 hours[1]
	6-16 hours[2]	6-18 hours[2]	8-18 hours[2]			7-19 hours[2]	5-17 hours[2]
MLOCA-001	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	1 of 2 CVCS pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	N/A
MLOCA-002	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Open 1 SG PORV or 1 bank of steam dumps within 15 minutes of HPR failure	N/A	1 of 2 RHR pumps to 1 of 2 legs
MLOCA-006	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact legs	1 of 2 SI pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	N/A

Table 8 -- Success Criteria for MLOCA

Path Name	CVCS	SI	HPR	AFW	AFW1	LPI	LPR
Mission Time	< 1 hour[1]	< 1 hour[1]	> 23 hours[1]	24 hours	N/A	1 hour[1]	23 hours[1]
	6-16 hours[2]	6-18 hours[2]	8-18 hours[2]			7-19 hours[2]	5-17 hours[2]
MLOCA-007	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact legs	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Open 1 SG PORV or 1 bank of steam dumps within 15 minutes of HPR failure	N/A	1 of 2 RHR pumps to 1 of 2 legs
MLOCA-011	FAILED	FAILED	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Open 1 SG PORV or 1 bank of steam dumps within 15 minutes of initiator	1 of 2 RHR pumps to 3 of 3 intact legs	1 of 2 RHR pumps to 1 of 2 legs

Note 1: Times given are with containment spray in operation.
Note 2: Times given are without containment spray in operation.

Reference 35, Table 7.3-1

Table 9 -- Success Criteria for SLOCA

Path Name	CVCS	SI	AFW	AFW2	BF	HPR	AFW3	LPI	LPR	LTHR	MUSL
	< 1 hour[1]	< 1 hour[1]				> 23 hours[1]		< 1 hour[1]	> 23 hours[1]		
Mission Time	15 hours[2]	14 hours[2]	13 hours	N/A	N/A	9-10 hours[2]	N/A	5 hours[2]	19 hours[2]	11 hours	24 hours
SLOCA-001	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	1 of 2 CVCS pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	CST refill	N/A
SLOCA-003	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	FAILED	Open 1 SG PORV or 1 bank of steam dumps within 30 minutes of HPR failure	N/A	1 of 2 RHR pumps to 1 of 2 legs	CST refill	N/A
SLOCA-006	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	FAILED	FAILED	N/A	N/A	N/A	Transfer Successful

Table 9 -- Success Criteria for SLOCA

Path Name	CVCS	SI	AFW	AFW2	BF	HPR	AFW3	LPI	LPR	LTHR	MUSL
Mission Time	< 1 hour[1] 15 hours[2]	< 1 hour[1] 14 hours[2]	13 hours	N/A	N/A	> 23 hours[1] 9-10 hours[2]	N/A	< 1 hour[1] 5 hours[2]	> 23 hours[1] 19 hours[2]	11 hours	24 hours
SLOCA-008	1 of 2 CVCS pumps to 3 of 3 intact legs	N/A	FAILED	N/A	1 of 2 CVCS pumps and open 1 PZR PORV within 30 minutes of 26% SG WR	1 of 2 CVCS pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	N/A	N/A
SLOCA-011	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	1 of 2 SI pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	CST refill	N/A
SLOCA-013	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	FAILED	Open 1 SG PORV or 1 bank of steam dumps	N/A	1 of 2 RHR pumps to 1 of 2 legs	CST refill	N/A

Table 9 -- Success Criteria for SLOCA

Path Name	CVCS	SI	AFW	AFW2	BF	HPR	AFW3	LPI	LPR	LTHR	MUSL
	< 1 hour[1]	< 1 hour[1]				> 23 hours[1]		< 1 hour[1]	> 23 hours[1]		
Mission Time	15 hours[2]	14 hours[2]	13 hours	N/A	N/A	9-10 hours[2]	N/A	5 hours[2]	19 hours[2]	11 hours	24 hours
		legs					within 30 minutes of HPR failure				
SLOCA-016	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	N/A	N/A	FAILED	FAILED	N/A	N/A	N/A	Transfer Successful
SLOCA-018	FAILED	1 of 2 Safety Injection pumps to 3 of 3 intact legs	FAILED	N/A	1 of 2 Safety Injection pumps and open 2 PZR PORVs within 25 minutes of 26% SG WR	1 of 2 SI pumps to 3 of 3 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A	N/A	N/A	N/A	N/A
SLOCA-021	FAILED	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Open 1 SG PORV or 1 bank of steam dumps within 60 minutes	N/A	N/A	N/A	1 of 2 RHR pumps to 3 of 3 intact legs	1 of 2 RHR pumps to 1 of 2 legs	CST refill	N/A

Table 9 -- Success Criteria for SLOCA

Path Name	CVCS	SI	AFW	AFW2	BF	HPR	AFW3	LPI	LPR	LTHR	MUSL
Mission Time	< 1 hour[1]	< 1 hour[1]	13 hours	N/A	N/A	> 23 hours[1]	N/A	< 1 hour[1]	> 23 hours[1]	11 hours	24 hours
	15 hours[2]	14 hours[2]				9-10 hours[2]		5 hours[2]	19 hours[2]		
				of initiator							

Note 1: Times given are with containment spray in operation.
Note 2: Times given are without containment spray in operation.

Reference 35, Table 7.4-1

Table 10 -- Success Criteria for SLOCAV

Path Name	AFW	LTHR	CVCS	SI	BF	HPR
Mission Time	**15 hours**	**9 hours**	**3.5 hours[1]**	**18 hours[1]**	**N/A**	**6-10 hours[1]**
SLOCAV-001	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	CST refill	N/A	N/A	N/A	N/A
SLOCAV-002	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SLOCAV-005	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	FAILED	1 of 2 Safety Injection pumps to 4 of 4 legs	1 of 2 Safety Injection pumps, 2 PZR PORVs within 10 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SLOCAV-009	FAILED	N/A	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SLOCAV-012	FAILED	N/A	FAILED	1 of 2 Safety Injection pumps to 4 of 4 legs	1 of 2 Safety Injection pumps, 2 PZR PORVs within 10 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Note 1: Times given are with containment spray in operation. Mission times without containment spray are not given because GTRAN is more representative of the accident scenarios without containment spray in operation.

Reference 35, Table 7.5-1

Table 11 – Success Criteria for SSBI

Path Name	CVCS	SI	AFW	ISOLI	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	< 1 hour	<1 hour	8 hours	N/A	N/A	N/A	16 hours	N/A	N/A	> 23 hours
SSBI-001	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	CST refill	N/A	N/A	N/A
SSBI-002	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	FAILED	Successful SI system reinitiation within 9 hours of CST depletion	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-006	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	FAILED	N/A	Successful SI system reinitiation within 9 hours of CST depletion	N/A	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-009	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	FAILED	N/A	N/A	N/A	N/A	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-011	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	CST refill	N/A	N/A	N/A

Table 11 -- Success Criteria for SSBI

Path Name	CVCS	SI	AFW	ISOLI	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	**< 1 hour**	**<1 hour**	**8 hours**	**N/A**	**N/A**	**N/A**	**16 hours**	**N/A**	**N/A**	**> 23 hours**
SSBI-012	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	FAILED	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-015	1 of 2 CVCS pumps to 4 of 4 legs	N/A	FAILED	FAILED	N/A	N/A	N/A	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-018	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	CST refill	N/A	N/A	N/A
SSBI-019	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	FAILED	Successful SI system reinitiation within 9 hours of CST depletion	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-023	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	Within 1 hour of pressurizer level 32 ft	FAILED	N/A	Successful SI system reinitiation within 9 hours of CST depletion	N/A	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Table 11 -- Success Criteria for SSBI

Path Name	CVCS	SI	AFW	ISOLI	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	**< 1 hour**	**<1 hour**	**8 hours**	**N/A**	**N/A**	**N/A**	**16 hours**	**N/A**	**N/A**	**> 23 hours**
SSBI-026	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	FAILED	N/A	N/A	N/A	N/A	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-028	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	CST refill	N/A	N/A	N/A
SSBI-029	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	FAILED	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-032	FAILED	1 of 2 SI pumps to 4 of 4 legs	FAILED	FAILED	N/A	N/A	N/A	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBI-035	FAILED	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation of faulted SG or 3 of 4 non-faulted SGs	N/A	N/A	CST refill	N/A	N/A	N/A

Reference 35, Table 7.6-1

Table 12 -- Success Criteria for SSBO

Path Name	CVCS	SI	AFW	ISOLO	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	6 hours	6 hours	8 hours	N/A	N/A	N/A	16 hours	N/A	N/A	18 hours
SSBO-001	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	CST refill	N/A	N/A	N/A
SSBO-002	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	FAILED	Successful SI system reinitiation within 9 hours of CST depletion	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-006	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	FAILED	N/A	Successful SI system reinitiation within 9 hours of CST depletion	N/A	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-009	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	FAILED	N/A	N/A	N/A	N/A	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Table 12 -- Success Criteria for SSBO

Path Name	CVCS	SI	AFW	ISOLO	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	6 hours	6 hours	8 hours	N/A	N/A	N/A	16 hours	N/A	N/A	18 hours
SSBO-011	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	CST refill	N/A	N/A	N/A
SSBO-012	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	FAILED	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-015	1 of 2 CVCS pumps to 4 of 4 legs	N/A	FAILED	FAILED	N/A	N/A	N/A	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-018	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	CST refill	N/A	N/A	N/A
SSBO-019	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	PORV reseats	FAILED	Successful SI system reinitiation within 9 hours of CST depletion	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Table 12 -- Success Criteria for SSBO

Path Name	CVCS	SI	AFW	ISOLO	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	6 hours	6 hours	8 hours	N/A	N/A	N/A	16 hours	N/A	N/A	18 hours
SSBO-023	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	Within 1 hour of pressurizer level 32 ft	FAILED	N/A	Successful SI system reinitiation within 9 hours of CST depletion	N/A	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-026	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	FAILED	N/A	N/A	N/A	N/A	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-028	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	CST refill	N/A	N/A	N/A
SSBO-029	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	N/A	N/A	FAILED	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
SSBO-032	FAILED	1 of 2 SI pumps to 4 of 4 legs	FAILED	FAILED	N/A	N/A	N/A	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Table 12 -- Success Criteria for SSBO

Path Name	CVCS	SI	AFW	ISOLO	SSI	PR	LTHR	RSI	BF	HPR
Mission Time	6 hours	6 hours	8 hours	N/A	N/A	N/A	16 hours	N/A	N/A	18 hours
SSBO-035	FAILED	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	Successful Isolation all non-faulted SGs	N/A	N/A	CST refill	N/A	N/A	N/A

Reference 35, Table 7.7-1

Table 13 – Success Criteria for GTRAN

Path Name	AFW	LTHR	CVCS	SI	BF	HPR
Mission Time	10 hours	14 hours	< 1 hour	< I hour	N/A	>23 hours
GTRAN-001	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	CST refill	N/A	N/A	N/A	N/A
GTRAN-002	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 10 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
GTRAN-005	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	FAILED	1 of 2 SI pumps to 4 of 4 legs	1 of 2 Safety Injection pumps, 2 PZR PORVs within 10 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
GTRAN-009	FAILED	N/A	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 10 minutes of 26% SG WR	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump
GTRAN-012	FAILED	N/A	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 Safety Injection pumps, 2 PZR PORVs within 10 minutes of 26% SG WR	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump

Reference 35, Table 7.8-1

Table 14 -- Success Criteria for SGTR

Path Name	CVCS	SI	AFW	SL	AFW5	BF	SSI	RWST	RHR	RECIRC	LTHR
Mission Time	36 hours	36 hours	12 hours	N/A	N/A	N/A	N/A	18 hours	36 hours	33 hours	24 hours
SGTR-001	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	Within 1 hour of pressurizer level 32 ft	N/A	1 of 2 RHR pumps to 2 of 2 intact legs	N/A	N/A
SGTR-002	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	Within 1 hour of pressurizer level 32 ft	N/A	FAILED	N/A	CST refill
SGTR-004	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	FAILED	RWST refill	N/A	N/A	N/A
SGTR-005	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	FAILED	FAILED	N/A	N/A	CST refill
SGTR-007	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	FAILED	N/A	N/A	RWST refill	N/A	N/A	N/A

Table 14 -- Success Criteria for SGTR

Path Name	CVCS	SI	AFW	SL	AFW5	BF	SSI	RWST	RHR	RECIRC	LTHR
Mission Time	36 hours	36 hours	12 hours	N/A	N/A	N/A	N/A	18 hours	36 hours	33 hours	24 hours
SGTR-008	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	FAILED	N/A	N/A	FAILED	N/A	N/A	CST refill
SGTR-010	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	FAILED	N/A	N/A	N/A	RWST refill	N/A	N/A	N/A
SGTR-011	1 of 2 CVCS pumps to 4 of 4 legs	N/A	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	FAILED	N/A	N/A	N/A	FAILED	N/A	N/A	CST refill
SGTR-013	1 of 2 CVCS pumps to 4 of 4 legs	N/A	FAILED	N/A	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 1 hour of 26% SG WR	N/A	N/A	N/A	1 of 2 CVCS pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A
SGTR-016	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	Within 1 hour of pressurizer level 32 ft	N/A	1 of 2 RHR pumps to 2 of 2 intact legs	N/A	N/A

Table 14 -- Success Criteria for SGTR

Path Name	CVCS	SI	AFW	SL	AFW5	BF	SSI	RWST	RHR	RECIRC	LTHR
Mission Time	36 hours	36 hours	12 hours	N/A	N/A	N/A	N/A	18 hours	36 hours	33 hours	24 hours
SGTR-017	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	Within 1 hour of pressurizer level 32 ft	N/A	FAILED	N/A	CST refill
SGTR-019	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	FAILED	RWST refill	N/A	N/A	N/A
SGTR-020	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	FAILED	FAILED	N/A	N/A	CST refill
SGTR-022	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	FAILED	N/A	N/A	RWST refill	N/A	N/A	N/A
SGTR-023	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	FAILED	N/A	N/A	FAILED	N/A	N/A	CST refill
SGTR-025	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	FAILED	N/A	N/A	N/A	RWST refill	N/A	N/A	N/A

Table 14 -- Success Criteria for SGTR

Path Name	CVCS	SI	AFW	SL	AFW5	BF	SSI	RWST	RHR	RECIRC	LTHR
Mission Time	36 hours	36 hours	12 hours	N/A	N/A	N/A	N/A	18 hours	36 hours	33 hours	24 hours
SGTR-026	N/A	1 of 2 SI pumps to 4 of 4 legs	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	FAILED	N/A	N/A	N/A	N/A	N/A	N/A	CST refill
SGTR-028	N/A	1 of 2 SI pumps to 4 of 4 legs	FAILED	N/A	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of FR-H.1	N/A	N/A	N/A	1 of 2 SI pumps to 4 of 4 intact legs supported by 1 of 2 RHR pumps taking suction from the sump	N/A
SGTR-031	FAILED	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	N/A	N/A	1 of 2 RHR pumps to 2 of 2 intact legs	N/A	N/A
SGTR-032	FAILED	FAILED	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 unaffected SG	Isolate ruptured SG within 15 minutes of initiator	Open 1 SG PORV or 1 bank of steam dumps within 25 minutes of initiator	N/A	N/A	N/A	FAILED	N/A	CST refill

Reference 35, Table 7.9-1

Table 15 -- Success Criteria for ATWS

Path Name	MRI	AM	AF100	AF50	SR	LTS	LTHR
Mission Time	N/A	N/A	AFW pumps must be available and injecting for 24 hours	AFW pumps must be available and injecting for 24 hours	N/A	1 hour	24 hours
ATWS-001	Rod insertion is successful	AMSAC is successful	2 of 2 MD AFW pumps and 1 of 1 TD AFW pump to 4 of 4 SGs	N/A	3 of 3 pressurizer safety valves and required pressurizer PORVs	Successful Emergency Boration	N/A
ATWS-002	Rod insertion is successful	AMSAC is successful	2 of 2 MD AFW pumps and 1 of 1 TD AFW pump to 4 of 4 SGs	N/A	3 of 3 pressurizer safety valves and required pressurizer PORVs	FAILED	CST refill
ATWS-005	Rod insertion is successful	AMSAC is successful	FAILED	2 of 2 MD AFW or 1 of 1 TD AFW or 1 of 2 MD AFW and 1 of 1 TD AFW to 4 of 4 SGs	3 of 3 pressurizer safety valves and required pressurizer PORVs	Successful Emergency Boration	N/A
ATWS-006	Rod insertion is successful	AMSAC is successful	FAILED	2 of 2 MD AFW or 1 of 1 TD AFW or 1 of 2 MD AFW and 1 of 1 TD AFW to 4 of 4 SGs	3 of 3 pressurizer safety valves and required pressurizer PORVs	FAILED	CST refill
ATWS-011	FAILED	AMSAC is successful	2 of 2 MD AFW pumps and 1 of 1 TD AFW pump to 4 of 4 SGs	N/A	3 of 3 pressurizer safety valves and required pressurizer PORVs	Successful Emergency Boration	N/A

Table 15 -- Success Criteria for ATWS

Path Name	MRI	AM	AF100	AF50	SR	LTS	LTHR
Mission Time	N/A	N/A	AFW pumps must be available and injecting for 24 hours	AFW pumps must be available and injecting for 24 hours	N/A	1 hour	24 hours
ATWS-012	FAILED	AMSAC is successful	2 of 2 MD AFW pumps and 1 of 1 TD AFW pump to 4 of 4 SGs	N/A	3 of 3 pressurizer safety valves and required pressurizer PORVs	FAILED	CST refill
ATWS-015	FAILED	AMSAC is successful	FAILED	2 of 2 MD AFW or 1 of 1 TD AFW or 1 of 2 MD AFW and 1 of 1 TD AFW to 4 of 4 SGs	3 of 3 pressurizer safety valves and required pressurizer PORVs	Successful Emergency Boration	N/A
ATWS-016	FAILED	AMSAC is successful	FAILED	2 of 2 MD AFW or 1 of 1 TD AFW or 1 of 2 MD AFW and 1 of 1 TD AFW to 4 of 4 SGs	3 of 3 pressurizer safety valves and required pressurizer PORVs	FAILED	CST refill

Reference 35, Table 7.10-1

Table 16 -- Success Criteria for ISLOCA

Path Name	CVCS	SI	STL	AFW	LTHR	BF	HPR	RWST
Mission Time	24 hours	24 hours	N/A	12 hours	12 hours	N/A	18 hours	24 hours
ISLM-001	1 of 2 CVCS pumps to 4 of 4 legs	N/A	Path Isolation	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	CST refill	N/A	N/A	N/A
ISLM-002	1 of 2 CVCS pumps to 4 of 4 legs	N/A	Path Isolation	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps, 1 of 2 RHR pumps to 4 of 4 legs	N/A
ISLM-005	1 of 2 CVCS pumps to 4 of 4 legs	N/A	Path Isolation	FAILED	N/A	1 of 2 CVCS pumps, 1 PZR PORV within 15 minutes of 26% SG WR	1 of 2 CVCS pumps, 1 of 2 RHR pumps to 4 of 4 legs	N/A
ISLM-008	1 of 2 CVCS pumps to 4 of 4 legs	N/A	FAILED	FAILED	N/A	N/A	N/A	RWST refill

Table 16 -- Success Criteria for ISLOCA

Path Name	CVCS	SI	STL	AFW	LTHR	BF	HPR	RWST
Mission Time	24 hours	24 hours	N/A	12 hours	12 hours	N/A	18 hours	24 hours
ISLM-010	FAILED	1 of 2 SI pumps to 4 of 4 legs	Path Isolation	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	CST refill	N/A	N/A	N/A
ISLM-011	FAILED	1 of 2 SI pumps to 4 of 4 legs	Path Isolation	1 of 2 MD AFW pumps or 1 of 1 TD AFW pump to 1 SG	FAILED	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 Safety Injection pumps, 1 of 2 RHR pumps to 4 of 4 legs	N/A
ISLM-014	FAILED	1 of 2 SI pumps to 4 of 4 legs	Path Isolation	FAILED	N/A	1 of 2 Safety Injection pumps, 2 PZR PORVs within 30 minutes of 26% SG WR	1 of 2 Safety Injection pumps, 1 of 2 RHR pumps to 4 of 4 legs	N/A
ISLM-017	FAILED	1 of 2 SI pumps to 4 of 4 legs	FAILED	FAILED	N/A	N/A	N/A	RWST refill

Reference 35, Table 7.11-1

Table 17 – Success Criteria Comparison: LLOCA

	CPNPP	WBN	Delta
Accumulators	2 of 4 accumulators to 2 of 4 cold legs	3 of 3 accumulators to 3 of 3 intact cold legs	MAAP 4.0.5 analysis cannot determine the success of accumulators in break sizes greater than 10 inches. Therefore, the success criteria must be determined from the UFSAR (Section 15.4 of Reference 3).
Low Pressure Injection	1 of 2 RHR pumps to 1 of 4 cold legs	1 of 2 RHR pumps to 3 of 3 intact cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Cold Leg Low Pressure Recirculation	1 of 2 RHR pumps to 1 of 4 cold legs	1 of 2 RHR pumps to 1 of 2 intact cold legs	During recirculation mode, the RHR pumps can only discharge to 2 RCS legs.
Hot Leg Low Pressure Recirculation	1 of 2 RHR trains or 1 of 2 SI trains	1 of 2 RHR pumps to 2 of 4 legs and 1 of 2 SI pumps to 2 of 4 legs	The WBN success criteria is correct per Reference 2.
Reference 35, Appendix B			

Table 18 – Success Criteria Comparison: MLOCA

	CPNPP	WBN	Delta
AFW	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 4 SGs	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 4 SGs	No delta.
High pressure injection (CCPs)	1 of 2 centrifugal charging pumps to 1 of 4 cold legs	1 of 2 CVCS to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure injection (SIPs)	1 of 2 Safety Injection Pumps to 1 of 4 cold legs	1 of 2 SI pumps to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Secondary depressurization and Secondary heat removal	1 of 4 Atmospheric Relief Valves or 1 of 3 Banks of Steam Dump Valves	1 of 4 SG PORVs or 1 Bank of Steam Dumps	No delta.
Accumulator Injection	2 of 4 Accumulators to 2 of 4 cold legs	Not credited	The accumulators are not credited in this model.
Low pressure injection	1 of 2 RHR pumps to 1 of 4 cold legs	1 of 2 RHR pumps to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Cold leg low pressure recirculation	1 of 2 RHR trains from the containment sump to 1 of 4 cold legs	1 of 2 RHR pumps taking suction from the containment sump to 1 of 2 cold legs	During recirculation mode, the RHR pumps can only discharge to 2 RCS legs.
Hot leg low pressure recirculation	1 of 2 RHR trains in hot leg recirculation from the containment sump to 1 of 4 hot legs	Not required	Hot leg recirculation is not required for MLOCAs because the water in the core does not deplete to the levels of a LLOCA. LLOCAs require hot leg recirculation because the water leaves the core very rapidly and the boron concentration may reach its solubility limits very quickly. However with a MLOCA, the water in the core does not evacuate as quickly. (Reference 13)

Table 18 – Success Criteria Comparison: MLOCA

	CPNPP	WBN	Delta
Long term cooling	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump	Credited via low pressure recirculation	No delta.
High pressure recirculation	No information	1 of 2 CVCS pumps or 1 of 2 SI pumps aligned to 1 of 2 RHR pumps	For a MLOCA, high pressure recirculation is required (and gives success) when only the high pressure ECCS pumps are available.
Reference 35, Appendix B			

Table 19 – Success Criteria Comparison: SLOCA

	CPNPP	WBN	Delta
Auxiliary Feedwater	1 of 2 MD pumps or 1 TD pump to 1 of 4 SGs	1 of 2 MD pumps or 1 TD pump to 1 of 4 SGs	No delta.
High pressure injection (CCPs)	1 of 2 centrifugal charging pumps to 1 of 4 cold legs	1 of 2 CVCS to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure injection (SIPs)	1 of 2 Safety Injection Pumps to 1 of 4 cold legs	1 of 2 SI pumps to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Secondary Depressurization and Secondary Heat Removal	1 of 4 Atmospheric Relief Valves or 1 of 3 Banks of Steam Dumps Valves	1 of 4 SG PORVs or 1 Bank of Steam Dumps	No delta.
Bleed and Feed	1 CCP and 1 SIP and 1 PZR PORV	1 of 2 CVCS pumps and 1 PZR PORV or 1 of 2 SI pumps and 2 PZR PORVs	The CPNPP success criteria is based on conservative licensing basis analysis. WBN is based on realistic analysis.
Accumulator injection	2 of 4 accumulators to 1 of 4 cold legs	Not credited	The accumulators are not credited in this model.
Low pressure injection	1 of 2 RHR pumps to 1 of 4 cold legs	1 of 2 RHR pumps to 3 of 3 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure cold leg recirculation	1 of 2 CCP to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available CCP 1 of 2 SIPs to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available SIP	1 of 2 CVCS pumps to 3 of 3 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump 1 of 2 SI pumps to 1 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Low pressure cold leg recirculation	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump	1 of 2 RHR pumps taking suction from the containment sump delivering to 2 of 2 cold legs	During recirculation mode, the RHR pumps can only discharge to 2 RCS legs.

Table 19 – Success Criteria Comparison: SLOCA			
	CPNPP	**WBN**	**Delta**
Long term RHR shutdown cooling	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump	Credited via low pressure recirculation	No delta.
Reference 35, Appendix B			

Table 20 – Success Criteria Comparison: SLOCAV

	CPNPP	WBN	Delta
Main Feedwater	1 of 2 main feedwater pumps to 1 of 4 SGs	Not credited	Main feedwater is not credited in this analysis. Given a reactor trip (the first node in SLOCAV Event Tree), the main feedwater will terminate.
Auxiliary Feedwater	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 4 SGs	1 of 2 MD AFW pumps or 1 TD pump to 1 of 4 SGs	No delta.
High pressure injection (CCPs)	1 of 2 centrifugal charging pumps to 1 of 4 cold legs	1 of 2 CVCS pumps to 4 of 4 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure injection (SIPs)	1 of 2 safety injection pumps to 1 of 4 cold legs	Not credited	This analysis models normal charging and ECCS charging.
Secondary Depressurization and Secondary Heat Removal	1 of 4 Atmospheric Relief Valves or 1 of 3 banks of Steam Dump Valves	1 of 4 SG PORVs or 1 Bank of Steam Dumps	No delta.
Bleed and Feed	1 CCP and 1 SIP and 1 PORV or 2 CCPs and 1 PORV	1 of 2 CVCS pumps and 1 PZR PORV or 1 of 2 SI pumps and 2 PZR PORVs	The CPNPP success criteria is based on conservative licensing basis analysis. WBN is based on realistic analysis.
Low pressure injection	1 of 2 RHR pumps to 1 of 4 cold legs	1 of 2 RHR pumps to 4 of 4 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure cold leg recirculation	1 of 2 CCPs to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available CCP 1 of 2 SIPs to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available SIP	1 of 2 CVCS pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump 1 of 2 SI pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.

Table 20 – Success Criteria Comparison: SLOCAV

	CPNPP	WBN	Delta
Low pressure cold leg recirculation	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump and providing flow to the available CCP or SIP	1 of 2 RHR pumps taking suction from the containment sump delivering to 2 of 2 cold legs	During recirculation mode, the RHR pumps can only discharge to 2 RCS legs.
Long term RHR shutdown cooling	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump	Credited via low pressure recirculation	No delta.
Reference 35, Appendix B			

Table 21 – Success Criteria Comparison: Transient

	CPNPP	WBN	Delta
Main Feedwater	1 of 2 main feedwater pumps to 1 of 4 SGs	Not credited	Main feedwater is not credited in this analysis. Given a reactor trip (the first node in GTRAN Event Tree), the main feedwater will terminate.
Auxiliary Feedwater	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 4 SGs	1 MD AFW pump or 1 TD pump to 1 of 4 SGs	No delta.
Condensate	1 of 2 condensate pumps to 1 of 4 SGs	Not credited	Condensate pumps are not credited in this model.
High pressure injection (CCPs)	1 of 2 centrifugal charging pumps to 1 of 4 cold legs	Not credited	This analysis does not credit high pressure injection.
High pressure injection (SIPs)	1 of 2 safety injection pumps to 1 of 4 cold legs	Not credited	This analysis does not credit high pressure injection.
Secondary depressurization and heat removal	1 of 3 AFW pumps (1TDAFW or 1 of 2 MDAFW) or 1 of 2 MFW pumps to 1 of 4 Steam Generators	1 of 2 MD AFW pumps or 1 TD pump to 1 of 4 SGs	No delta.
Bleed and Feed	1 centrifugal charging pump (CCP) and 1 safety injection pump (SIP) and 1 PORV or 2 CCPs and 1 PORV	1 of 2 CVCS pumps and 1 PZR PORV or 1 of 2 SI pumps and 2 PZR PORVs	The CPNPP success criteria is based on conservative licensing basis analysis. WBN is based on realistic analysis.
High pressure recirculation	1 of 2 CCPs to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available CCP 1 of 2 SIPs to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available SIP	1 of 2 CVCS pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump 1 of 2 SI pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.

Table 21 – Success Criteria Comparison: Transient

	CPNPP	WBN	Delta
Low pressure recirculation	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump and providing flow to the available CCP or SIP	Not credited	Low pressure recirculation is not credited in this model.
Long term RHR shutdown cooling	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump and providing suction flow to the available CCP or SIP	Credited via SGs or normal RHR	Credit taken from transition to normal RHR cooling.
Reference 35, Appendix B			

Table 22 – Success Criteria Comparison: SGTR

	CPNPP	WBN	Delta
SG Isolation	Isolate AFW and Main Steam on the faulted SG	Operator Identifies and isolates the ruptured SG	No delta.
Main Feedwater	1 of 2 main feedwater pumps to 1 of 4 SGs	Not credited	Main feedwater is not credited in this analysis. Given a reactor trip (the first node in SGTR Event Tree), the main feedwater will terminate.
Auxiliary Feedwater	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 4 SGs	1 of 2 MD AFW pumps or 1 TD AFW to 1 of 3 unaffected SGs	No delta.
Condensate	1 of 2 condensate pumps to 1 of 4 SGs	Not credited	Condensate pumps are not credited in this model.
High pressure injection (CCPs)	1 of 2 centrifugal charging pumps to 1 of 4 cold legs	1 of 2 CVCS pumps to 4 of 4 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
High pressure injection (SIPs)	1 of 2 Safety Injection Pumps to 1 of 4 cold legs	1 of 2 SI pumps to 4 of 4 cold legs	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Secondary Depressurization and Heat removal	1 of 3 AFW pumps or 1 of 2 MFW pumps to 2 INTACT Steam Generators and Steam Relief with 2 of 4 ARVs on INTACT Steam Generators with successful feedwater makeup or 1 of 3 Banks of Steam Dump valves	1 of 2 MD AFW pumps or 1 TD AFW pump to 1 of 3 intact SGs and 1 of 3 SG PORVs	No credit taken for the steam dumps.
Bleed and Feed	1 CCP and 1 SIP and 1 PORV or 2 CCPs and 1 PORV	1 of 2 CVCS pumps and 1 PZR PORV or 1 of 2 SI pumps and 2 PZR PORVs	The CPNPP success criteria is based on conservative licensing basis analysis. WBN is based on realistic analysis.

Table 22 – Success Criteria Comparison: SGTR

	CPNPP	WBN	Delta
High pressure recirculation	1 of 2 CCP to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available CCP 1 of 2 SIP to 1 of 4 cold legs and 1 of 2 RHR trains taking suction from the containment sumps and providing suction flow to the available SIP	1 of 2 CVCS pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump 1 of 2 SI pumps to 4 of 4 cold legs aligned to 1 of 2 RHR pumps taking suction from the containment sump	The results cannot justify 1 of 4 loops based on flow balancing that limits flow through a single loop.
Low pressure recirculation	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump and providing flow to the available CCP or SIP	No credited.	Low pressure recirculation is not credited in this model.
Long term RHR shutdown cooling	1 of 2 RHR trains to 1 of 4 cold legs taking suction from the containment sump or 1 of 3 AFW pumps to 1 of 4 SGs with long term suction from 1of 2 Station Service Water supply lines	1 of 2 RHR pumps taking suction from the hot leg and discharging into the cold leg.	No delta.
Reference 35, Appendix B			

Table 23 – MAAP Runs

MAAP Run Identifier	Description
BF_A	3/8 inch equivalent break modeling success path SLOCA-008
BF_B	3/8 inch equivalent break modeling success path SLOCA-018
BF_C	Bleed and Feed Requirements,
BF_D	Bleed and Feed Requirements,
BF_E	Bleed and Feed Requirements,
BF_F	Bleed and Feed Requirements,
BF_G	Bleed and Feed Requirements,
GTRAN_C	Models success path GTRAN-001
GTRAN_C_4SG	Reactor Trip at time zero with AFW delivered to 4 SG
GTRAN_D	CST depletion time
ISLOCA_C	Models success path ISLM-001
ISLOCA_D	Models success path ISLM-002
ISLOCA_E	Models success path ISLM-005
ISLOCA_F	Models success path ISLM-008
ISLOCA_J	Models success path ISLM-010
ISLOCA_K	Models success path ISLM-011
ISLOCA_M	Models success path ISLM-017
L2-ARF6.inp	Supports ARF model
L2-Basecasebf.inp	SLOCA with delayed B&F. All systems available.
L2-CS2.inp	SLOCA with loss of AFW, IC available.
L2-CS4C.inp	SLOCA with failed HPR, produces approximately 900 lbs H_2.
L2-Ex-vessel.inp	6 inch LOCA with ex-vessel cooling is enabled.
L2-Ex-vessel1.inp	2 inch LOCA with ex-vessel cooling is enabled.
L2-Ex-vessel2.inp	6 inch LOCA with ex-vessel cooling is disabled.
L2-Ex-vessel3.inp	2 inch LOCA with ex-vessel cooling is disabled.
L2_GTRAN2.inp	General Transient produces 550 lbs of H_2
L2_GTRAN2A.inp	General Transient with 15 v/o H_2 at vessel breach Containment peak pressure of 26.6 psia
L2_GTRAN2c.inp	General Transient with igniters available

Table 23 – MAAP Runs

MAAP Run Identifier	Description
	Containment peak pressure of 45.5 psia
L2_GTRAN2D.inp	General Transient with 12 v/o H_2 at vessel breach
L2-H2det.inp	Supports ARF model
L2-HLCreep2.inp	Supports ARF model
L2-HLCreep3.inp	Supports ARF model
L2-IC2.inp	Initial ice mass available with inlet doors unavailable. SLOCA with loss of AFW; CS available.
L2-IC_IDD4.inp	Initial ice mass available with 4 intermediate deck doors.
L2-IC_LID2.inp	Initial ice mass available with 2 sets of lower inlet doors
L2-IC_LID4.inp	Initial ice mass available with 4 sets of lower inlet doors
L2-IC_LID6.inp	Initial ice mass available with 6 sets of lower inlet doors
L2-IC_TDD4.inp	Initial ice mass available with 4 top deck doors.
L2-IC_SC.inp	Initial ice mass with 4 sets of lower inlet doors, 4 intermediate deck doors, and 4 top deck doors.
L2-Igniter3A.inp	Supports ARF model
L2_LLOCA2A.inp	Supports ARF model
L2_LLOCA2B.inp	Supports ARF model
L2_LLOCA4c.inp	LLOCA with no ECCS mitigation.
L2-RCP3.inp	SBO conditions with 480 gpm RCP seal LOCA
L2-RCP3b.inp	SBO with RCP seal LOCA
L2-RCP6cc.inp	RCP Seal LOCA at 480 gpm
L2_SBO.inp	SBO produces approximately 500 lbs of H_2. (Standard Parameters) Containment peak pressure of 51 psia
L2-SBO5.inp	SBO conditions that give DCH with any vessel failure
L2_SBO6.inp	SBO conditions that give DCH with only creep vessel failure
L2_SBO11.inp	SBO case without Seal Table failure modeled. SBO produces approximately 500 lbs H_2. Simultaneous HPME and H_2 burns. Produces highest containment pressure = 80 psia (Temp Spike = 900 °F). Containment peak pressure of 81 psia
L2_SBO12.inp	SBO case with Seal Table failure modeled.
L2_SBO13.inp	SBO with power recovery produces approximately 600 lb H_2

Table 23 – MAAP Runs

MAAP Run Identifier	Description
	In-core H_2 generation of 570 lbs
L2_SBOA_4ACC.inp	In-core H_2 generation of 533 lbs
L2_SBOc.inp	SBO with igniters available Containment peak pressure of 51 psia
L2_SBOe.inp	SBO produces approximately 560 lbs of H_2
L2-WB_SBO_1.inp	Supports ARF model
LLOCA_A	6 inch equivalent break modeling success path LLOCA-001
LLOCA_B	10 inch equivalent break modeling success path LLOCA-001
LLOCA_E	6-inch mission time for LLOCA
LLOCA_F	Minimum recirculation time; RWST depletion
LLOCA_G	Hot leg recirculation
LLOCA_M	Design Basis Accident modeling success path LLOCA-001
MLOCA_A	6 inch equivalent break modeling success path MLOCA-001
MLOCA_B	2 inch equivalent break modeling success path MLOCA-001
MLOCA_C	6 inch equivalent break modeling success path MLOCA-006
MLOCA_D	2 inch equivalent break modeling success path MLOCA-006
MLOCA_E	2 inch equivalent break modeling success path MLOCA-007
MLOCA_F	Minimum recirculation time
MLOCA_G	6 inch equivalent break modeling success path MLOCA-007
MLOCA_H	2 inch, LPR time with containment spray
MLOCA_J	2 inch equivalent break modeling success path MLOCA-011
MLOCA_K	6 inch, LPR time with containment spray
MLOCA_L	6 inch equivalent break modeling success path MLOCA-011
MLOCA_M	6 inch, LPR time with containment spray
MLOCA_N	2 inch, LPR time with containment spray
MLOCA_P	2 inch equivalent break modeling success path MLOCA-002
MLOCA_Q	6 inch equivalent break modeling success path MLOCA-002
MLOCA_R	2 inch, HPR time with containment spray
MLOCA_S	6 inch, HPR time with containment spray
MLOCA_T	2 inch, HPR time with containment spray
MLOCA_U	6 inch, HPR time with containment spray

Table 23 – MAAP Runs

MAAP Run Identifier	Description
MLOCA_V	Operator fails to decrease RCS
MS_A	Transient Bleed and Feed
MS_B	Transient Bleed and Feed
RCP_A.inp	RCP seal leaks compared to LOCA
RCP_B.inp	RCP seal leaks compared to LOCA
RCP_C.inp	RCP seal leaks compared to LOCA
RCP_D.inp	RCP seal leaks compared to LOCA
RCP_E.inp	RCP seal leaks compared to LOCA
RCP_F.inp	RCP seal leaks compared to LOCA
SBO_A	Models AFW, 4 hr battery time, 21 gpm per pump seal LOCA, no AC power recovery
SBO_B	Models AFW, 4 hr battery time, 182 gpm per pump seal LOCA, no AC power recovery
SBO_C	Models AFW, 4 hr battery time, 480 gpm per pump seal LOCA, no AC power recovery
SBO_D	Models AFW and RCS cooldown, 4 hr battery time, 21 gpm per pump seal LOCA, no AC power recovery
SBO_E	Models AFW and RCS cooldown, 4 hr battery time, 182 gpm per pump seal LOCA, no AC power recovery
SBO_F	Models AFW and RCS cooldown, 4 hr battery time, 480 gpm per pump seal LOCA, no AC power recovery
SBO_G	Models AFW and RCS cooldown, 8 hr battery time, 21 gpm per pump seal LOCA, no AC power recovery
SBO_H	Models AFW and RCS cooldown, 8 hr battery time, 182 gpm per pump seal LOCA, no AC power recovery
SBO_J	Models 21 gpm per pump seal LOCA, no AC power recovery
SBO_K	Models 182 gpm per pump seal LOCA, no AC power recovery
SBO_L	Models 480 gpm per pump seal LOCA, no AC power recovery
SBO_M	Models AFW, 8 hr battery time, 21 gpm per pump seal LOCA, no AC power recovery
SBO_N	Models AFW, 8 hr battery time, 182 gpm per pump seal LOCA, no AC power recovery
SBO_P	Models AFW, 8 hr battery time, 480 gpm per pump seal LOCA, no AC power recovery
SBO_Q	Models AFW and RCS cooldown, 8 hr battery time, 480 gpm per pump seal

Table 23 – MAAP Runs

MAAP Run Identifier	Description
	LOCA, no AC power recovery
SGTR_A	Charging pumps with AFW
SGTR_AA	Models success path SGTR-005
SGTR_AB	Models success path SGTR-020
SGTR_AC	Models success path SGTR-008
SGTR_AD	Models success path SGTR-023
SGTR_AE	Models success path SGTR-026
SGTR_B	SI pump with AFW
SGTR_C	Charging pumps with no AFW
SGTR_E	RCS depressurization
SGTR_F	CST depletion times
SGTR_G	CST depletion times
SGTR_H	Models success path SGTR-001
SGTR_K	Models success path SGTR-013
SGTR_L	SI pump with AFW
SGTR_M	Models success path SGTR-028
SGTR_N	Models success path SGTR-004
SGTR_P	RWST refill
SGTR_Q	Models success path SGTR-032
SGTR_R	Models success path SGTR-016
SGTR_S	Models success path SGTR-017
SGTR_T	Models success path SGTR-019
SGTR_U	Models success path SGTR-022
SGTR_V	Models success path SGTR-025
SGTR_W	Models success path SGTR-031
SGTR_X	Models success path SGTR-010
SGTR_Y	Models success path SGTR-007
SGTR_Z	Models success path SGTR-002
SGTR27	Models success path SGTR-011
SLB_A	Pressurizer Overfill
SLOCA_A	2 inch equivalent break modeling success path SLOCA-001

Table 23 – MAAP Runs

MAAP Run Identifier	Description
SLOCA_B	3/8 inch equivalent break modeling success path SLOCA-001
SLOCA_C	2 inch equivalent break modeling success path SLOCA-011
SLOCA_D	3/8 inch equivalent break modeling success path SLOCA-011
SLOCA_E	2 inch equivalent break modeling success path SLOCA-013
SLOCA_ECS	SLOCA with containment spray and LPR
SLOCA_F	3/8 inch equivalent break modeling success path SLOCA-013
SLOCA_FCS	SLOCA with containment spray and LPR
SLOCA_G	3/8 inch equivalent break modeling success path SLOCA-003
SLOCA_GCS	SLOCA with containment spray and LPR
SLOCA_H	2 inch equivalent break modeling success path SLOCA-003
SLOCA_HCS	SLOCA with containment spray and LPR
SLOCA_J	CST depletion times with charging injection
SLOCA_K	CST depletion times with SI injection
SLOCA_L	Recirculation switchover times
SLOCA_M	3/8 inch equivalent break modeling success path SLOCA-021
SLOCA_MCS	SLOCA with containment spray and LPR
SLOCA_N	2 inch equivalent break modeling success path SLOCA-021
SLOCA_NCS	SLOCA with containment spray and LPR
SLOCA_P	2 inch, no depressurization, core damage
SLOCA_Q	3/8 inch, no depressurization, core damage
SLOCA_S	Operator fails to depressurize RCS
SLOCA_T	SLOCA with containment spray and HPR
SLOCA_U	SLOCA with containment spray and HPR
SLOCA_V	SLOCA with containment spray and HPR
SLOCA_W	SLOCA with containment spray and HPR
SLOCA_X	SLOCA with containment spray and HPR
SLOCA_Y	Modeling success path SLOCA-006
SLOCA_Z	Modeling success path SLOCA-016
SLOCAV_A	Models success path SLOCAV-001
SLOCAV_B	Models success path SLOCAV-005
SLOCAV_C	Plant response, no operator actions modeled

Table 23 – MAAP Runs

MAAP Run Identifier	Description
SLOCAV_D	Blocked SI signal
SLOCAV_E	Long term cooling with RHR
SLOCAV_F	Success with 1/8 inch equivalent break size
SLOCAV_G	Success with 1/8 inch equivalent break size
SLOCAV_J	Models success path SLOCAV-002
SLOCAV_K	Models success path SLOCAV-005
SLOCAV_N	Models success path SLOCAV-009
SLOCAV_P	Models success path SLOCAV-012
SSBI-001	Models success path SSBI-001
SSBI-002	Models success path SSBI-002
SSBI-006	Models success path SSBI-006
SSBI-009	Models success path SSBI-009
SSBI-011	Models success path SSBI-011
SSBI-012	Models success path SSBI-012
SSBI-015	Models success path SSBI-015
SSBI-015A	Charging pump bleed and feed
SSBI-018	Models success path SSBI-018
SSBI-019	Models success path SSBI-019
SSBI-023	Models success path SSBI-023
SSBI-026	Models success path SSBI-026
SSBI-028	Models success path SSBI-028
SSBI-029	Models success path SSBI-029
SSBI-032	Models success path SSBI-032
SSBI-032A	SI pump bleed and feed
SSBI-035	Models success path SSBI-035
SSBO-001	Models success path SSBO-001
SSBO-002	Models success path SSBO-002
SSBO-006	Models success path SSBO-006
SSBO-009	Models success path SSBO-009
SSBO-011	Models success path SSBO-011
SSBO-012	Models success path SSBO-012