

Subject: WBN PROBABILISTIC RISK ASSESSMENT – SUMMARY

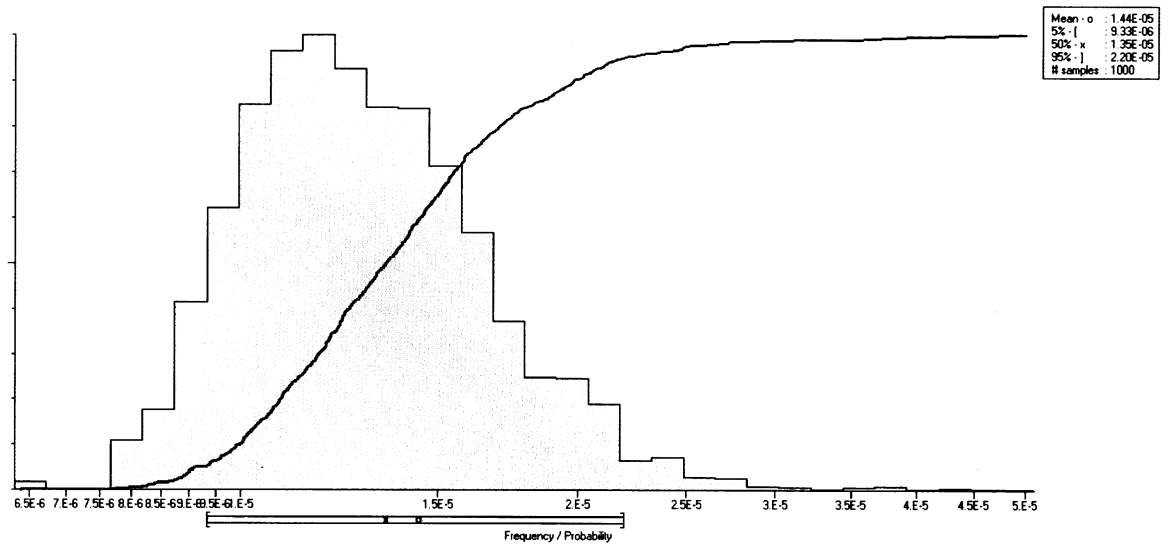


Figure 19 - Unit 1 CDF Uncertainty Plot

Reference 44, Figure 5.8-1

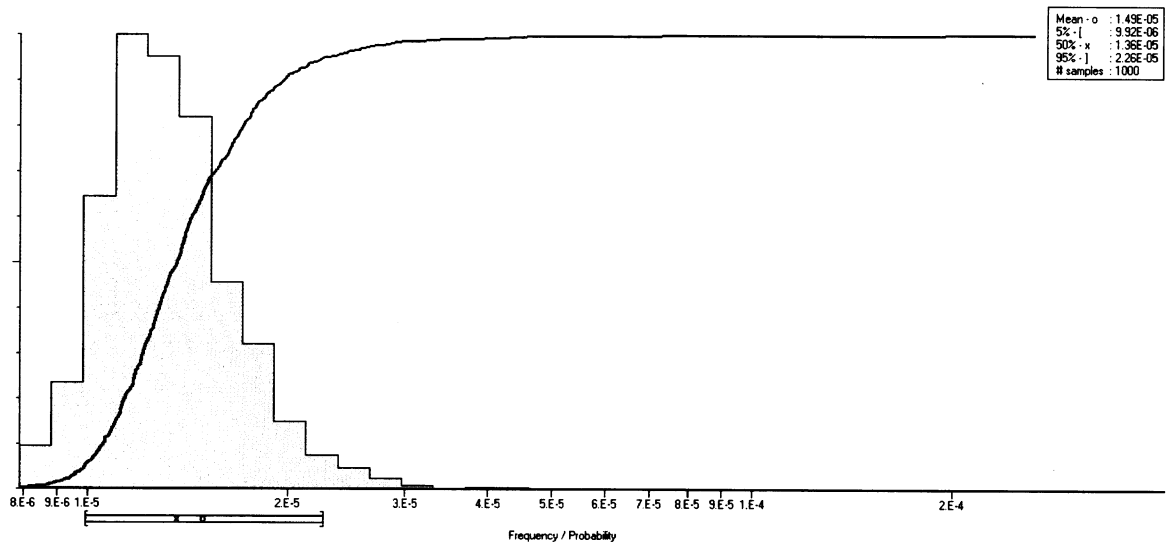


Figure 20 - Unit 2 CDF Uncertainty Plot

Reference 44, Figure 5.8-2

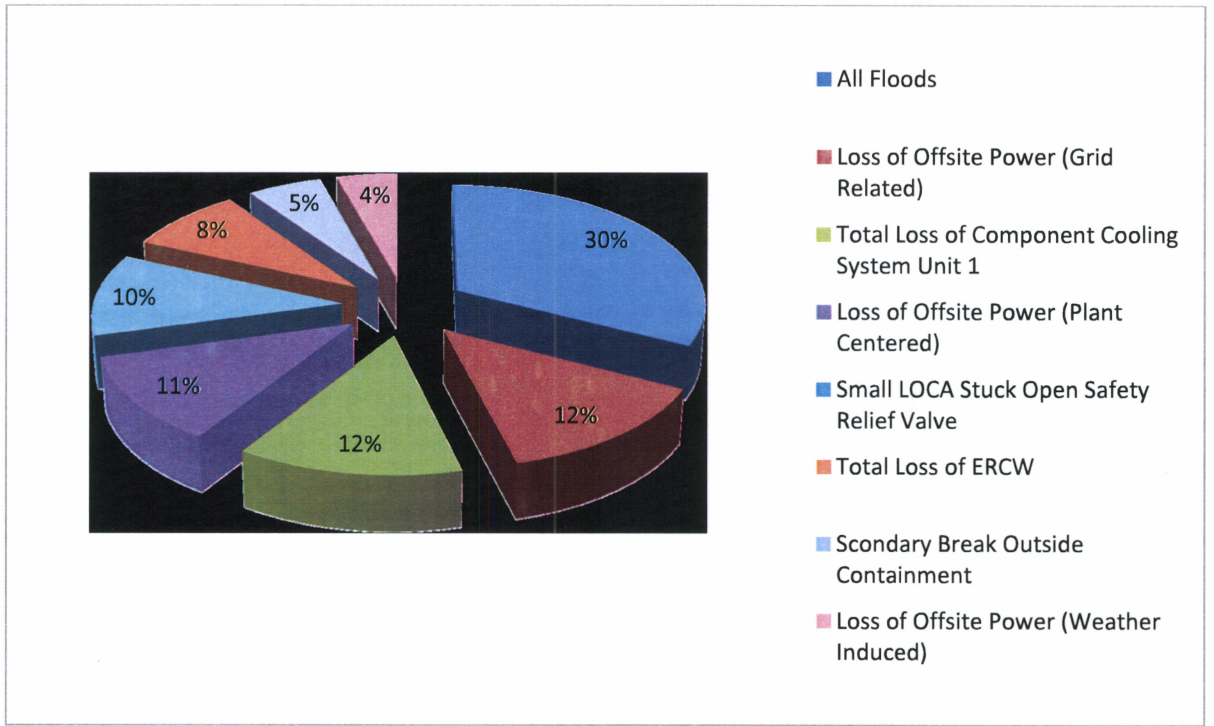


Figure 21 - Unit 1 CDF Initiator Distribution

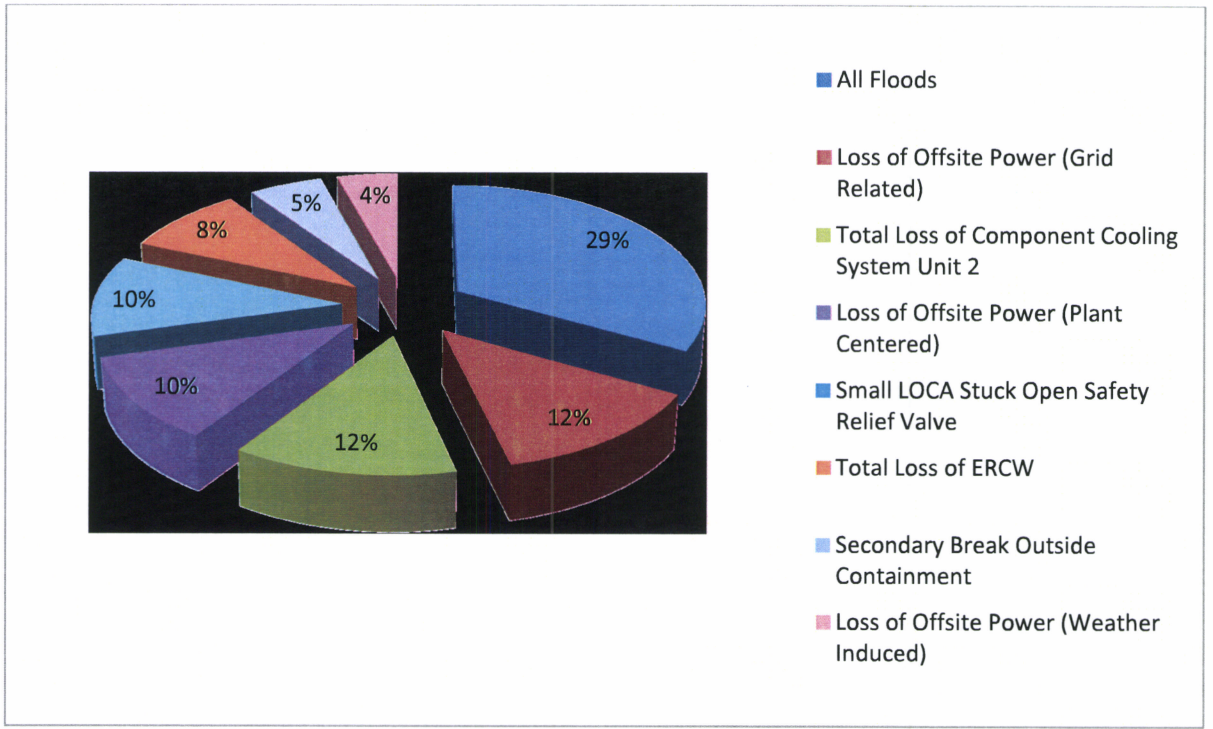


Figure 22 - Unit 2 CDF Initiator Distribution

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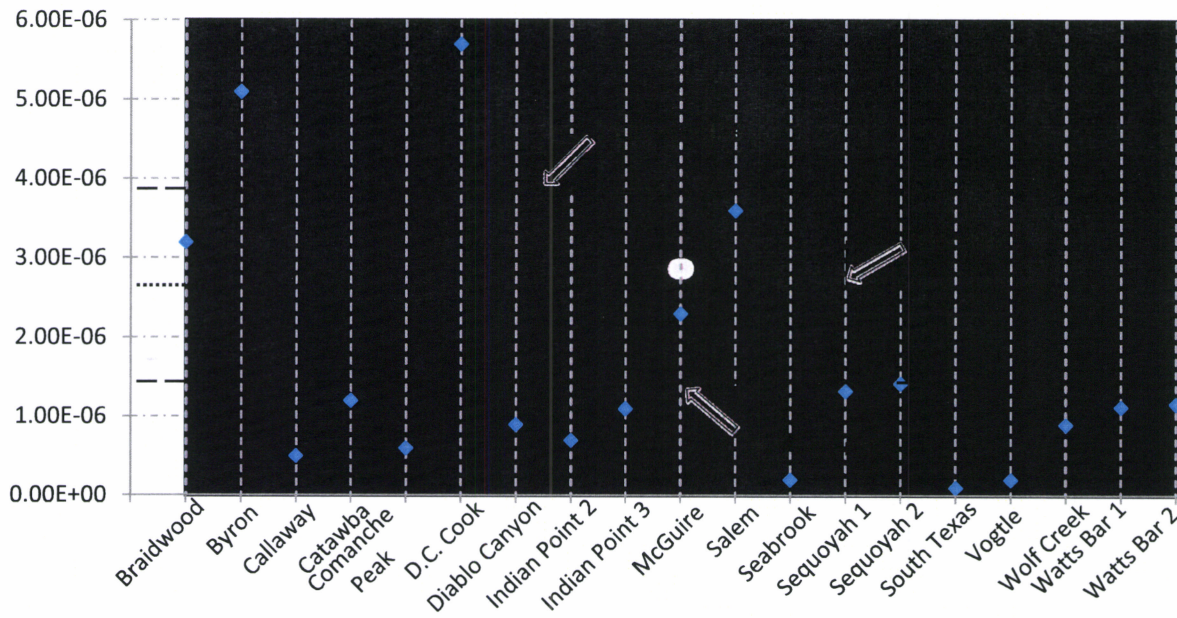


Figure 23 – LERF Comparison with Westinghouse 4-loop Plants

Reference 44, Figure 5.4-2

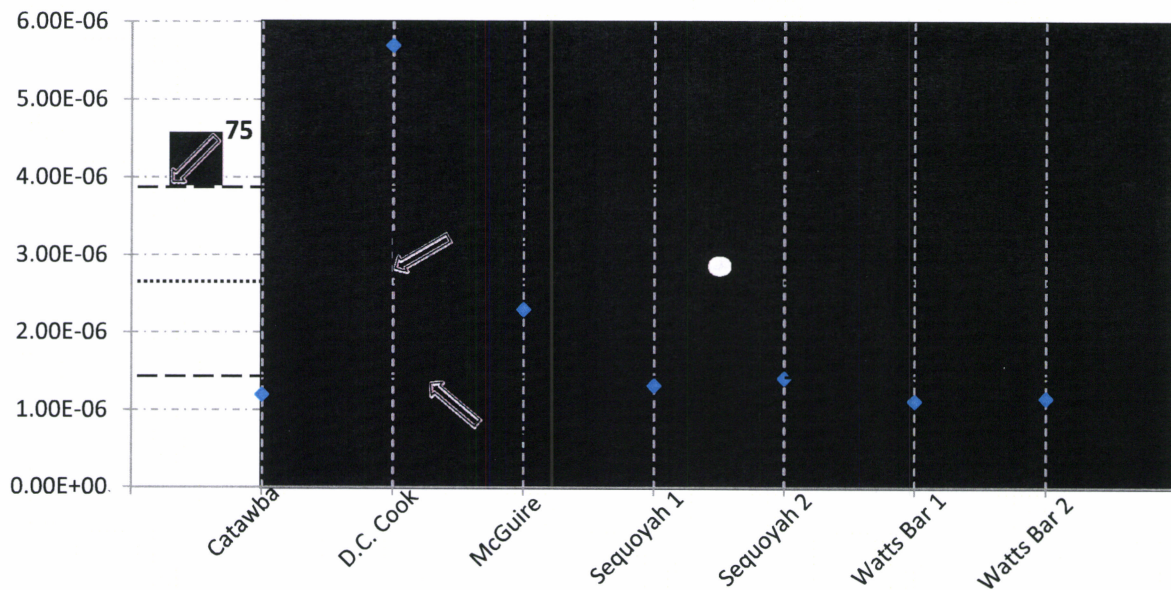


Figure 24 – LERF Comparison with Westinghouse Ice Condenser Containments

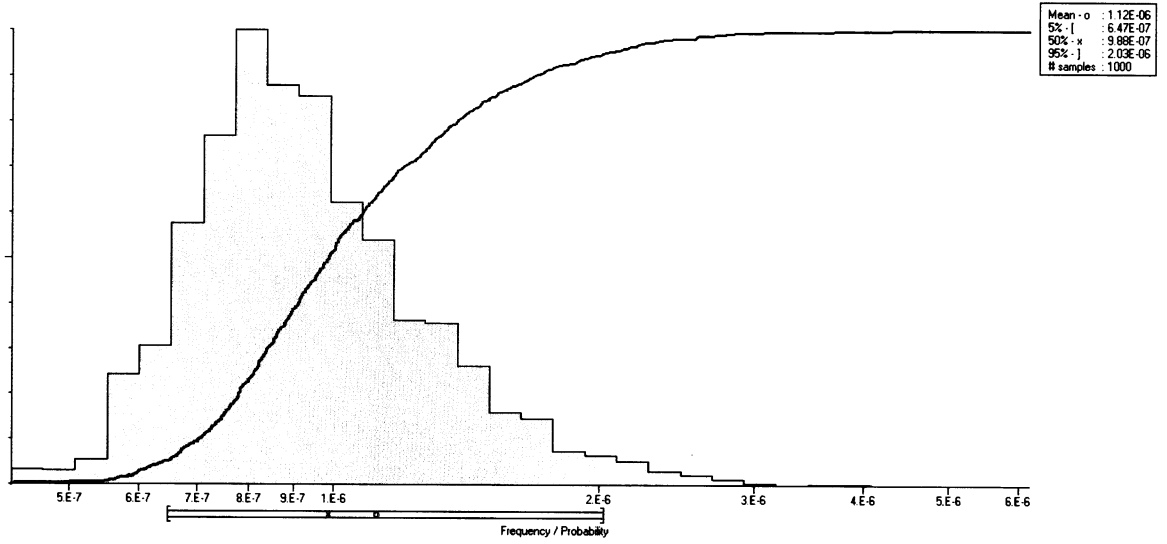


Figure 25 - Unit 1 LERF Uncertainty Plot

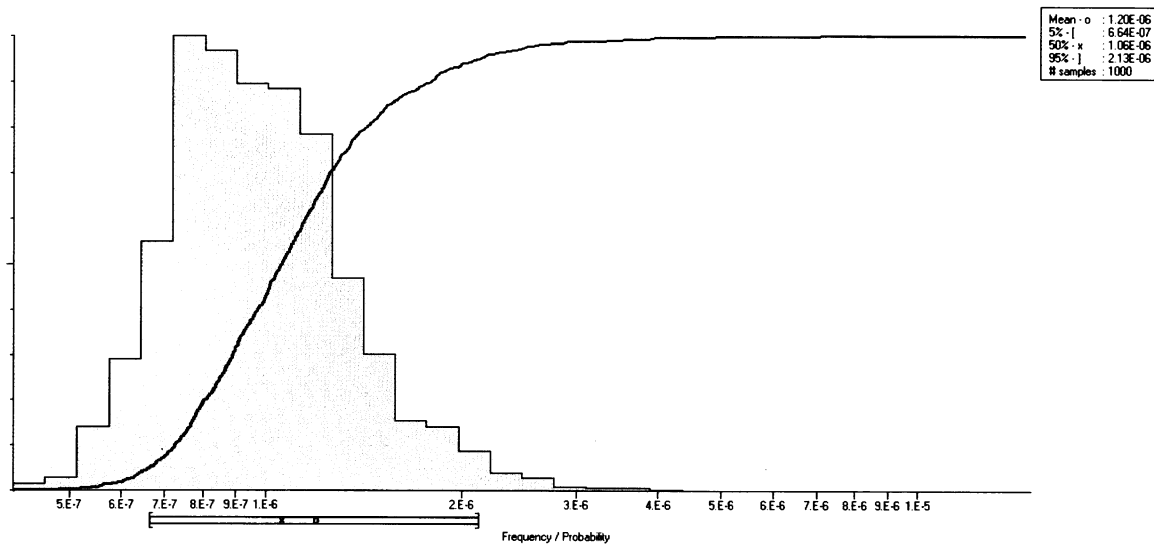


Figure 26 - Unit 2 LERF Uncertainty Plot

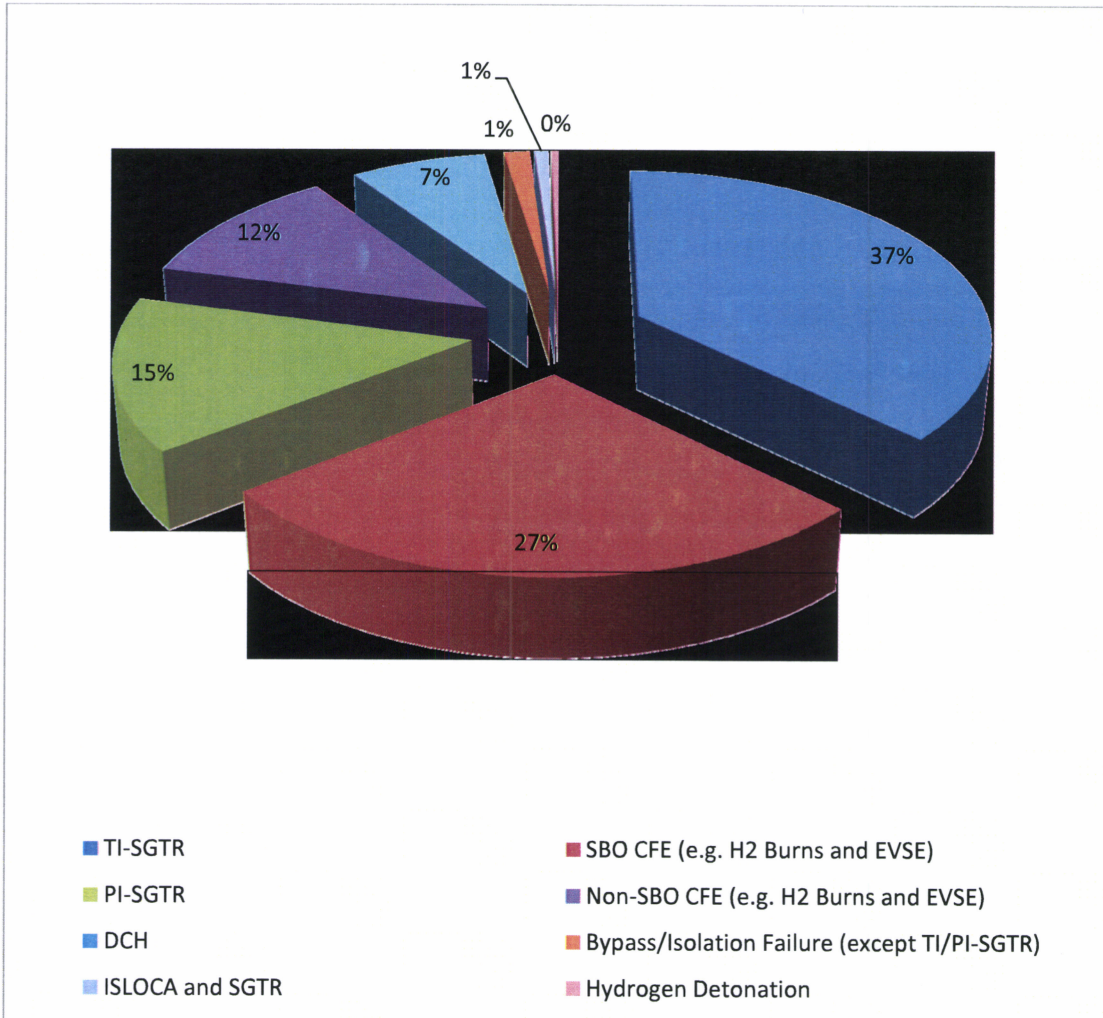


Figure 27 - Unit 1 LERF Phenomena Distribution

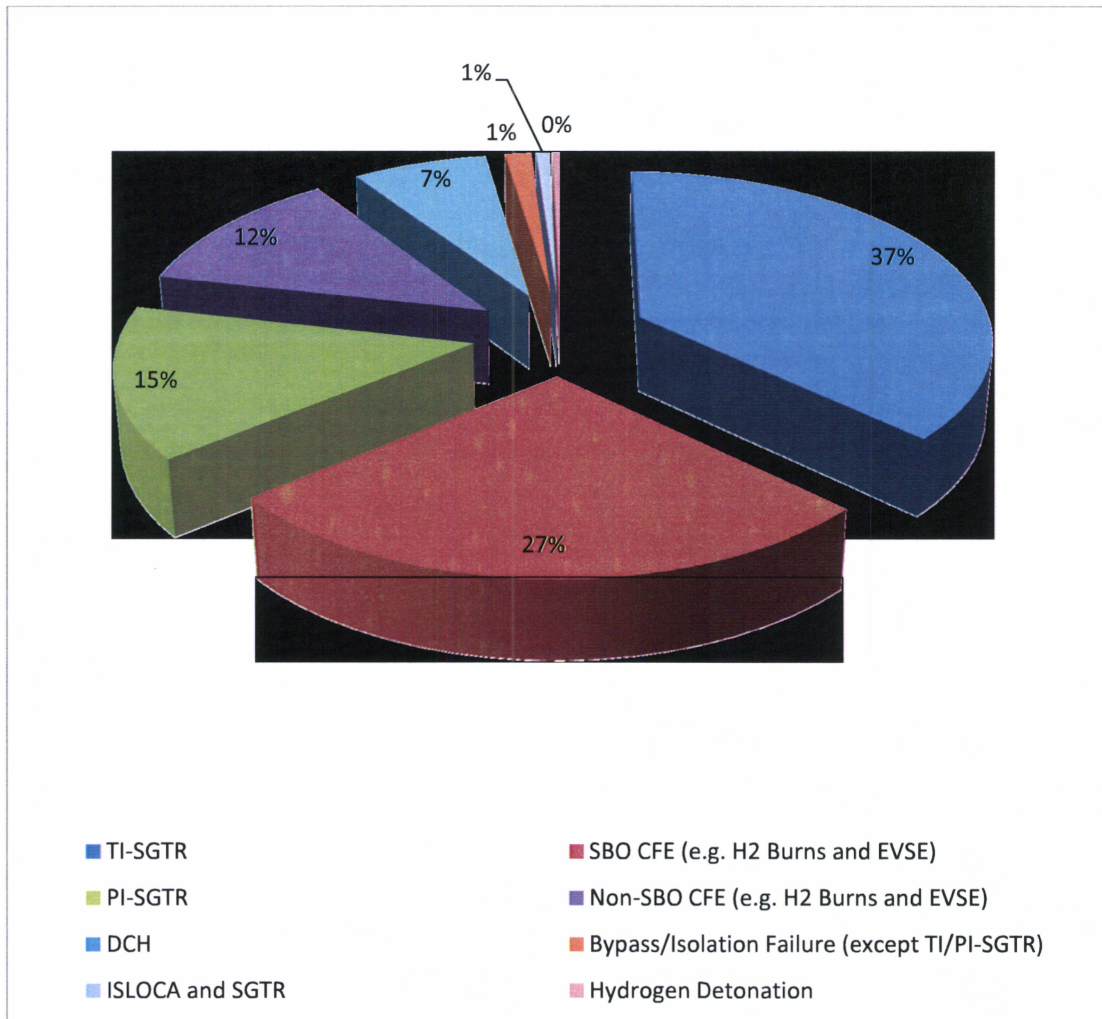


Figure 28 - Unit 2 LERF Phenomena Distribution

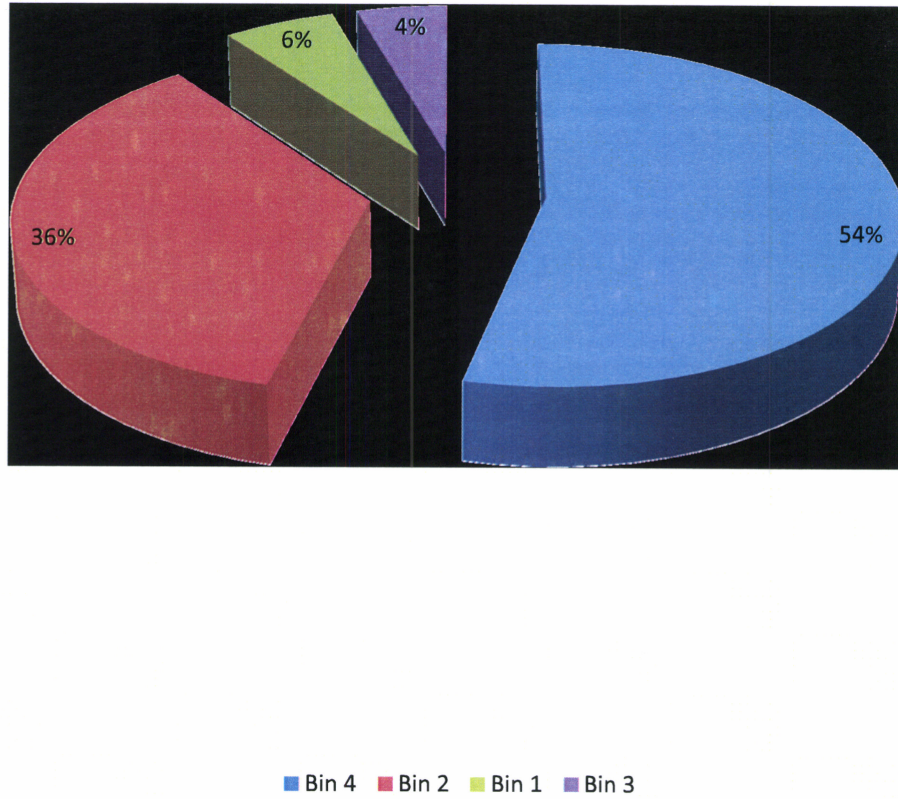
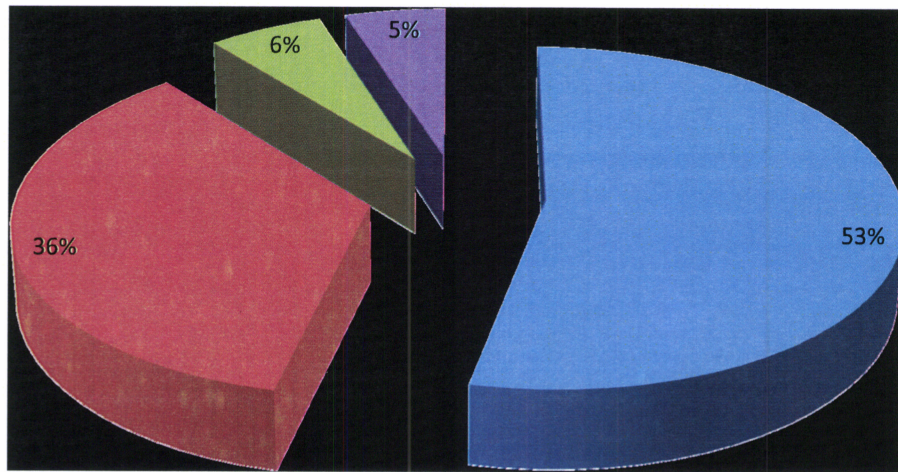


Figure 29 - Unit 1 LERF PDS Distribution



■ Bin 4 ■ Bin 2 ■ Bin 1 ■ Bin 3

Figure 30 - Unit 2 LERF PDS Distribution

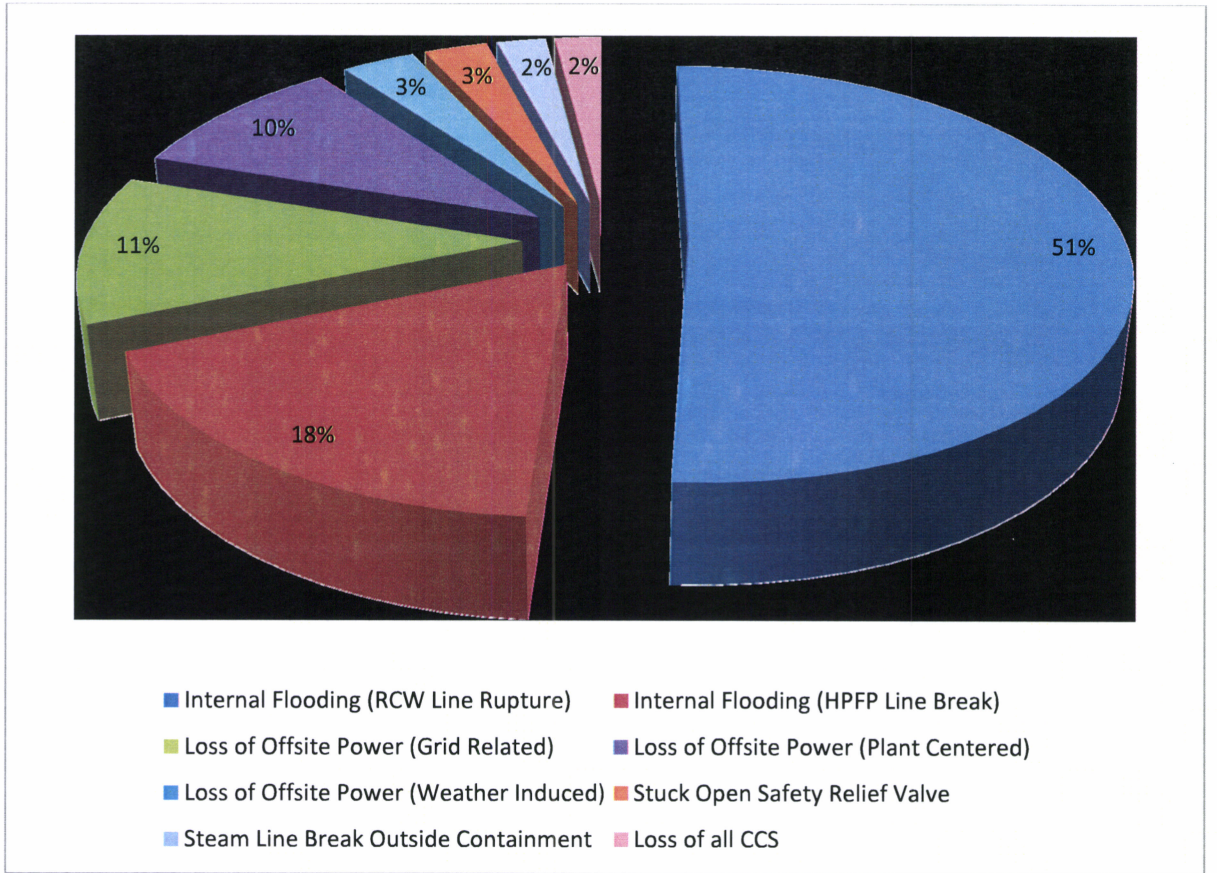


Figure 31 - Unit 1 LERF Initiator Contributions

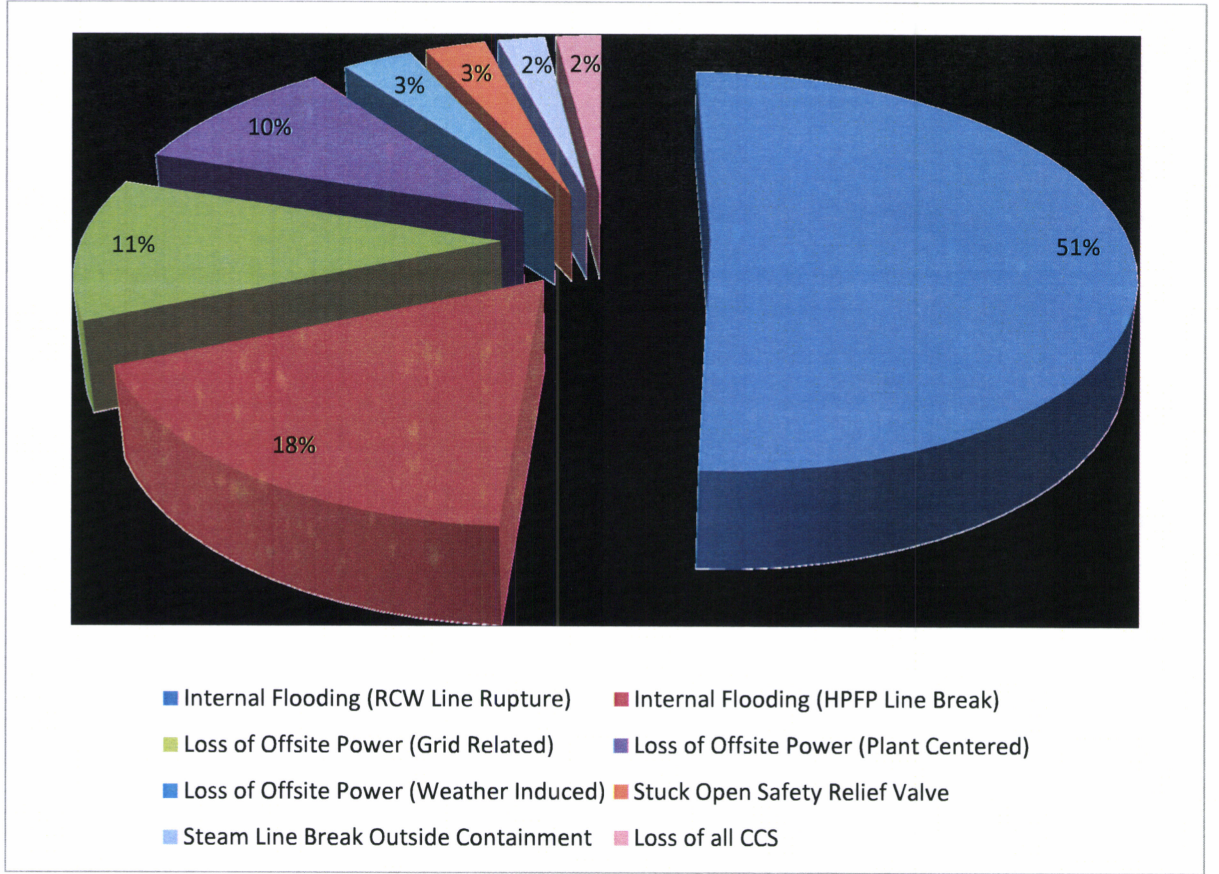


Figure 32 - Unit 2 LERF Initiator Contributions

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8.0 Conclusion

This document represents a summary of the WBN Units 1 and 2 Revision 1 CAFTA PRA model. Appendix B provides the documentation of the Model of record as required by NEDP-26.

Appendix A – Resolution of F&Os



RISKMAN Model
F&Os



CAFTA Model F&Os

Note: See also notes in revision logs of appropriate system notebooks. For example, changes made to the internal flooding analysis to respond to flooding F&Os are documented in the revision log for the flooding notebook.

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Appendix B – Documentation of Model of Record

PRA Model of Record (MOR) Documentation	
Plant and Unit(s)	WBN Units 1 and 2
Model Revision Name and Number	WBN PRA CAFTA Revision 1
Required Evaluation Documentation	
Report Section/Filename	
Name & Version of Software Utilized	Summary Report, Table 52
Final CDF Value	Summary Report, Table 54
Final LERF Value	Summary Report, Table 54
Description of Model	Reference 44, Section 3
Discussion of Major Changes	Summary Report, Section 6.1.14
Master Frequency File/Type Code Report	None
Data Titles/Gate Data/Basic Event Data	WBN_U1_U2_Flood - NEW.caf, WSBN2 - NEW.rr
Initiating Event Frequency Report	Summary Report, Table 3
Initiator Contribution to CDF	Summary Report, Table 59, Table 61
Initiator Contribution to LERF	Summary Report, Table 91, Table 93
Model Stability - CDF/LERF versus Truncation	Reference 44, Section 5.5, Reference 40, Section 5.4
Narrative of top ten sequences/cutsets	Reference 44, Section 5.2
Number of saved sequences/cutsets	Summary Report, Table 54
Top 100 sequences/cutsets	Summary Report, Table 57, Table 58
Basic Event Importance Report	Summary Report, Appendix C
FILEKEEPER Number for Model	Reference 44, Computer File Storage Information Sheet
Required MAAP Evaluation Documentation	
Report Section/Filename	
Version of MAAP Used	Summary Report, Table 52
Description of Model	Reference 43, Reference 40
Discussion of Model Changes	None
Parameter File	Reference 43
Input Files	Summary Report, Table 23
Output Files	None
Plot Files	None
Narrative of Runs	Reference 43, Reference 40
FILEKEEPER Number for Model	References 43, 40, Computer File Storage Information Sheet
Required Other Software Documentation	
Report Section/Filename	
Software Utilized Including Versions	Summary Report, Table 52
Description of Model	N/A
Discussion of Model Changes	N/A
Parameter File	N/A
Input Files	N/A
Output Files	N/A
Plot Files	N/A
Narrative of Runs	N/A
FILEKEEPER Number for Model	Summary Report, Computer File Storage Information Sheet
Independent Review Report	
Independent Review Report	Summary Report, Reference 13
Disposition of Review Comments Letter	Summary Report, Appendix A

Appendix C – Importance Reports



BE Importance.xlsx



Component
Importance.xlsx

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

**Information Related to how the Model and the Peer Review Process
Addressed the Items In The Regulatory Guide 1.200 Revision 2 Tables**

The commitment made in TVA letter dated June 8, 2010, "Watts Bar Nuclear Plant (WBN) Unit 2 – Request for Additional Information Regarding Individual Plant Examination (TAC No. ME3334)" is as follows:

"TVA will provide information how the model and the peer review process addressed the items in the Regulatory Guide 1.200 Revision 2 tables related to internal events including internal flooding for which the NRC position was stated as "Qualification."

TVA Response:

NRC endorsed the ASME PRA Standard but added a limited number of "qualifications" to their endorsement, indicating that they wanted additional information in a few cases. By reference to the ASME PRA Standard, Reg. Guide 1.200, R2, and the WBN peer review report, it was determined that there are three applicable items in Reg. Guide 1.200, R2 for which NRC had a "qualification."

Two items ("DA-C15" and "DA-D9") pertain to how the possibility of repair of failed equipment is modeled in the PRA. The WBN model does not consider repair, see, for example, Page 51 of MDN-000-999-2008-0143, R1.

One item ("IFSN-A6") pertains to the internal flooding analysis. It asks:

ASSESS qualitatively the impact of flood-induced mechanisms that are not formally addressed (e.g., using the mechanisms listed under Capability Category III of this requirement), by using conservative assumptions.

The "flood-induced mechanisms" that are referenced include "Failure by submergence, spray, jet impingement, pipe whip, humidity, condensation, temperature concerns, and any other identified failure modes."

The WBN Internal Flooding Analysis, MDN-000-999-2008-0146, R2, page 34 says:

The effects of submergence, spray, and steam on electrical equipment were explicitly considered in the analysis. Equipment failure due to condensation, pipe whip, jet impingement, pressure and temperature concerns are not considered in this analysis (with the exception of temperature concerns for HELB scenarios).

The approach that was taken in the WBN flooding analysis, in conjunction with information from the station HELB and MELB analyses qualitatively supports a conclusion that risk due to the flood-induced mechanisms listed is acceptable. The WBN PRA internal flooding analysis addressed effects of submergence, spray and steam. The other effects should be bounded by the station HELB analysis. That analysis does not quantify risk as described in section 3 of the WBN UFSAR:

HELB and MELB flooding effects are evaluated on all essential equipment on a case by case basis. If it is determined that an essential component is not qualified or cannot be demonstrated to operate under the adverse flood conditions, then the essential component is protected. Protection is accomplished by relocating the component or by installing a barrier or curb. Safe shutdown is ensured for design basis HELB/MELB flooding events through these actions.

Given the small likelihood of the HELB and MELB initiating events and given that sufficient equipment will remain available to assure safe shutdown given a HELB / MELB event (i.e. CCDPs would be substantially < 1), it is expected that the risk associated with the additional failure modes would be acceptable.

The WBN Peer Review did not specifically consider how the HELB failure modes were addressed but classified element IFSN-A6 as "Category II."

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SR Index	Capability Category II Requirement	Addressed in System Notebook Section	Comments
SY-A23	DEVELOP system model nomenclature in a consistent manner to allow model manipulation and to represent the same designator when a component failure mode is used in multiple systems or trains.	5.4, Appendix C-1	Nomenclature is defined in this notebook Section 4.1.
SY-A24	DO NOT MODEL the repair of hardware faults, unless the probability of repair is justified through an adequate analysis or examination of data. (See DA-C15.)	N/A	Repair of hardware faults was not modeled. See Section 3.5 of this notebook.