

TVA 10897 (DNE 6-86)

QA Record

DNE CALCULATIONS

TITLE MELB Safe Shutdown Analysis			PLANT/UNIT Watts Bar 1 & 2		
PREPARING ORGANIZATION Sargent & Lundy		KEY NOUNS (Consult RIMS DESCRIPTORS LIST) PIPE RUPTURES, FLOODING, SHUTDOWN, NUC SAFETY SYSTEMS			
BRANCH/PROJECT IDENTIFIERS WBN-OSG4-103		Each time these calculations are issued, preparator must ensure that the original (RO) RIMS accession number is filled in. Rev 948 (for RIMS' use) RIMS accession number			
APPLICABLE DESIGN DOCUMENT(S) WB-DC-40-31.51		RO 880513C0011 B26 '88 0504 021			
SAR SECTION(S) N/A		UNID SYSTEM(S) N/A		RIMS accession number	
Revision 0		R1	R2	R3	Safety-related? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
ECN No. (or indicate Not Applicable) N/A					Statement of Problem The purpose of this evaluation is to demonstrate the safe shutdown can be achieved for design basis MELB flooding events.
Prepared <i>[Signature]</i>					
Checked <i>Thomas J. Kane</i>					
Reviewed <i>Kevin W. Abraham</i>					
Approved <i>Peter O. McInally</i>					
Date 5/2/88					
Use form TVA 10534 if more space required.	List all pages added by this revision.				
	List all pages deleted by this revision.				
	List all pages changed by this revision.				
Abstract					
<p>These calculations contain an unverified assumption(s) that must be verified later. Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>An analysis was performed to ensure that safe shutdown conditions can be achieved and maintained following a postulated moderate energy fluid system line break (MELB) in areas of the plant where internal flood levels could cause a safe shutdown concern. The basis for this analysis were the results from the MELB flood level calculation and the MELB Shutdown equipment list.</p> <p>A field walkdown was performed by Sargent & Lundy to identify Class 1E electrical equipment which could be submerged by calculated MELB flood levels. These flood levels are listed as 'h1' for the primary MELB flood height in the zone and 'h2' for the secondary MELB flood height from flooding sources outside of the zone. When such equipment was recorded as being submerged, an analysis was performed to demonstrate that sufficient diversity and redundancy exist in plant essential systems to ensure that a safe plant shutdown can be achieved and maintained.</p> <p>Revision 2 of 3C38-0387-002 is attached.</p>					
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SUMMARY

An analysis was performed to ensure that safe shutdown conditions can be achieved and maintained following postulated moderate energy fluid system line breaks (MELB) in areas of the plant where internal flood levels could cause a safe shutdown concern. The bases for this analysis were the results from the MELB flood level calculation [1] and the MELB safe shutdown logic diagram and equipment list [2].

A field walkdown was performed at Watts Bar by Sargent & Lundy to identify electrical equipment which could be submerged by calculated MELB flood levels. These flood levels are listed as 'h1' for the primary MELB flood height in the zone and 'h2' for the secondary MELB flood height from flooding sources outside of the zone. When such equipment was recorded as being submerged, an analysis was performed to demonstrate that sufficient diversity and redundancy exist in plant essential systems to ensure that a plant safe shutdown condition can be achieved and maintained.

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1.0 INTRODUCTION

This calculation addresses the ability to achieve safe shutdown for the design basis MELB flooding events detailed in a separate flood level calculation [1]. Code of Federal Regulations 10 CFR 50, Appendix A, GDC 4, requires that structures, systems and components important-to-safety shall be designed to accommodate the effects of and be compatible with the environmental conditions associated with postulated piping failures. The effects of postulated piping failures include fluid jets, sprays, and pipe whips, while the environmental conditions include pressure, temperature, humidity, radiation, and submergence. The effects of fluid jets, sprays, and pipe whips are not within the scope of this calculation. The impact of certain environmental conditions associated with piping failures such as pressure, temperature, humidity, radiation, and HELB submergence are also not within the scope of this calculation. The effect of postulated flooding events on plant structures is addressed elsewhere and not within the scope of this calculation [3], [4].

This evaluation includes consideration of initiating events (piping failure), reactor/turbine trip with loss-of-offsite power (LOOP) as required, single active failure (SAF), and effects of submergence of any essential components for each design basis MELB flooding event. In addition, flood levels due to postulated piping failures in non-seismic piping are calculated and essential equipment which requires protection from this type of flooding is identified (see Tables 1.0 and 3.0). Multiple spurious operation of submerged non-essential components is also evaluated (see Section 4.4).

Additional issues related to MELB flooding, namely the availability of safe shutdown power and control power supplies, Class 1E electrical boards, and the effect of submergence of cables or cables within conduits are not within the scope of this analysis and they are examined elsewhere [5], [6], [7].

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TABLE 1.0
Flood Zones with Submerged Essential Components

Flood Zone	Shutdown Evaluation	Non-Seismic MELB Flood Level (in)		Essential Equipment Submerged By Non-Seismic MELB
		h1	h2	
692.0-A7	Table 2.1	5	NR	None
692.0-A25	Table 2.1	5	NR	None
713.0-A1	Table 2.2	2	2	Table 3.0
713.0-A6	Table 2.3	6	NR	None
713.0-A19	Table 2.3	8	NR	None
729.0-A1	Table 2.4	-	NR	None
729.0-A11	Table 2.4	-	NR	None
737.0-A3	Table 2.5	21	NR	None
737.0-A5	Table 2.6	-	2	None
737.0-A6	Table 2.6	NR	98	Table 3.0
755.0-C1	Table 2.7	-	NR	None
742.0-C	Table 2.8	-	3	Table 3.0
742.0-D5	Table 2.8	-	3	None
742.0-D6	Table 2.8	-	3	None
742.0-D7	Table 2.8	-	3	None
760.5-D3	Table 2.9	NR	NR	None
760.5-D6	Table 2.9	NR	NR	None
760.5-D9	Table 2.9	NR	NR	None
760.5-D12	Table 2.9	NR	NR	None
711.0-E1	Table 2.10	22	NR	Table 3.0

Notes

- Where flooding evaluations could be combined for certain Unit 1 and counterpart Unit 2 flood zones which experienced similar floods and submerged essential equipment, these evaluations were presented on the same table. These combined evaluations are designated with slashes between zones (e.g. 713.0-A6/713.0-A19) to indicate that these are separate flooding events which can be analyzed together with any differences noted.