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**PALO VERDE**  
NUCLEAR GENERATING STATION

**DOCUMENT TITLE SHEET**

DOCUMENT NUMBER			
13-NS-B25			
Q		QAG	NQR <input checked="" type="checkbox"/>

Title / Description: Risk Impact of Extending the TS LCO for EDG B

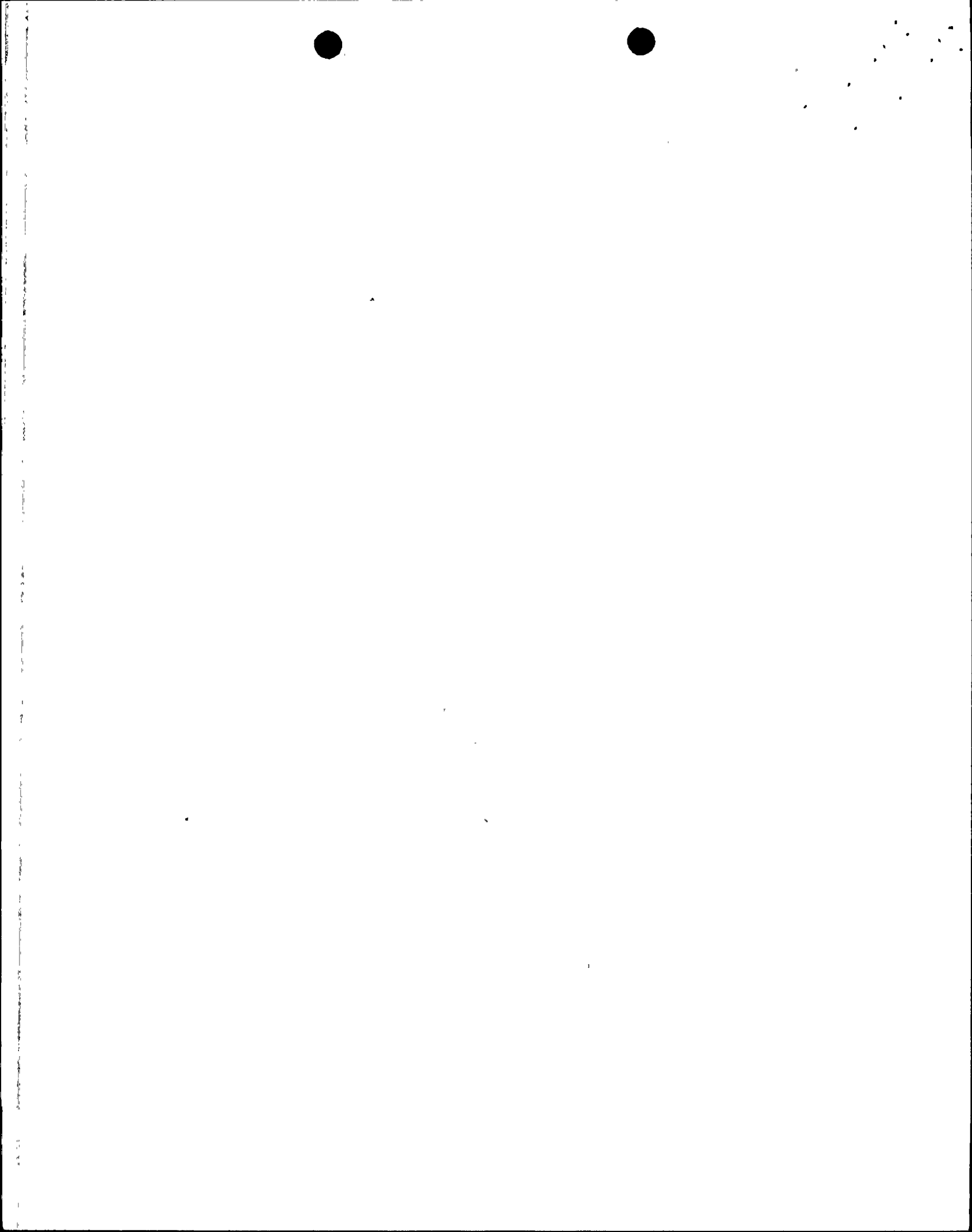
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		4/12/94	N/A	N/A	N/A	N/A	N/A	N/A	4/12/94	N/A	4/12/94	N/A
REV. NO.	REVISION DESCRIPTION	Preparer Date	RDE Date	Second Party Verification Date	Mech. Date	Civil Date	Elec. Date	I & C Date	Independent Verification Date	Other (Specify Org.) Date	RS Date	RDOM Date

CROSS DISCIPLINE REVIEW



# DOCUMENT REVIEW CONTROL FORM

1) DOCUMENT NO. 13-NS-B25	REV. 0 AMEND.	2) DOCUMENT TITLE/DESCRIPTION Risk Impact of Removing Extending the TS LCO for EDG B		
3) RESPONSIBLE ENGINEER R. R. Linthicum	4) DOCUMENT REFERENCE NO.	<input type="checkbox"/> Q <input type="checkbox"/> QAG <input checked="" type="checkbox"/> NQR	5) DATE LOGGED	6) COMMENTS DUE
7) REVIEW REQUIREMENTS/GUIDANCE <input type="checkbox"/> Comments not received by due date may be considered NO COMMENT Independent Technical Review				
8) REVIEW TYPE: <input type="checkbox"/> Independent <input type="checkbox"/> Cross Verification <input type="checkbox"/> Discipline <input type="checkbox"/> Inter-Departmental	9) REVIEWERS Lonnie Bullington			<input type="checkbox"/> COPY  <input type="checkbox"/> ROUTE
10) COMMENTS: (USE ADDITIONAL SHEETS IF NECESSARY) <div style="border: 1px solid black; padding: 5px; margin-top: 10px;">           ① Various typos. see marked up pages            ② Wrong Reference to wrong cutset file            ③ Add note indicating files zipped and what you zipped it with         </div>				
Reviewer's Signature: <u>Lonnie Bullington</u> Date: <u>4/12/94</u>				
11) PROPOSED RESOLUTION OF COMMENTS (USE ADDITIONAL SHEETS IF NECESSARY) <u>All comments incorporated</u>				
12) Reviewer's Acceptance: <u>Lonnie Bullington</u> Date: <u>4/12/94</u>				

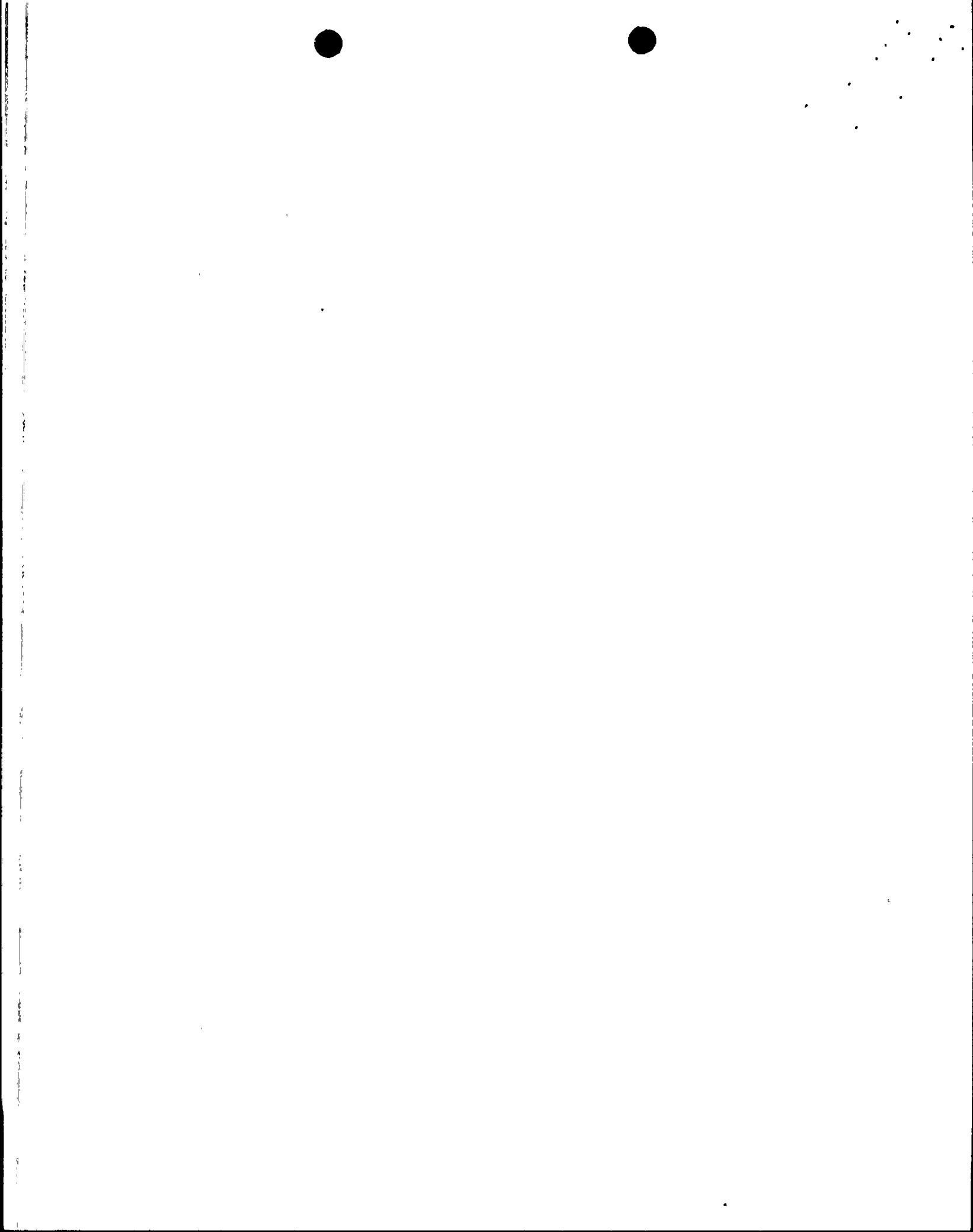


## Executive Summary

This calculation was performed to assess the Risk Impact of Extending the Unit 2 EDG B Technical Specification LCO (Reference 5.1) so that repairs can be completed. At the time that this analysis was performed, the additional time required was uncertain. Therefore, 4 time periods (6, 12, 18 and 24 hours) were analyzed. In order to assess the significance of the added risk from the LCO extension, the risk of performing a plant shutdown with the B EDG Out of Service was calculated. The results are provided in Table 1, "Risk Impact Results," on page 3. These results show that the increase in core damage probability associated with a 24 hour extension ( $1\text{E-}6$ ) is less than the increase in CDF associated with a forced shutdown with the EDG Out of Service ( $4\text{E-}6$ ). It should be noted that this analysis would be applicable to Units 1 & 3 though only Unit 2 was requesting the Notice of Enforcement Discretion.

**Table 1: Risk Impact Results**

Criterion	LCO Extension	Core Damage Probability
Baseline CDF	N/A	$9\text{E-}5/\text{yr.}$
Instantaneous CDF with EDG B OOS	N/A	$5\text{E-}4/\text{yr.}$
Increase in CDP with EDG B OOS	6 hr.	$3\text{E-}7$
	12 hr.	$6\text{E-}7$
	18 hr.	$9\text{E-}7$
	24 hr.	$1\text{E-}6$
CDP from Forced Shutdown with EDG B OOS	N/A	$4\text{E-}6$



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## 1.0 Introduction

During the period April 6, 1994 to April 8, 1994, several problems were found with the Unit 2 EDG B 4L cylinder head, cam lobe and exhaust valves. A decision was made to replace the Unit 2 EDG B 4L cylinder head with a cylinder head assembly from the Unit 3 EDG (Unit 3 was shut-down at the time). Following the replacement the EDG tripped on overspeed during the a four hour run to verify operability. The time required to troubleshoot, take corrective actions and perform operability tests was expected to exceed the remaining LCO Action Time (Reference 5.1).

The R&RA Group was requested to support a Technical Specification Waiver of Compliance on April 8, 1994. This Waiver was to extend the EDG B LCO (Reference 5.1) to allow repairs to be completed. At the time of the request, the time required to complete the repairs was uncertain. Therefore, the risk associated with 4 different extensions (6, 12, 18 and 24 hours).

## 2.0 Methodology

The impact on Core Damage Frequency for the Extended Tech. Spec. LCO was calculated by setting the EDG B Failure to Run Probability to 1 (failed) in the TOTALCD.CUT file (CAFTA). The results were not subsumed to add a level of conservatism to account for the impact of truncated sequences.

The impact of a forced shutdown with the B EDG Out of Service was calculated in a similar manner except that the Miscellaneous Transient Sequence Files were used as PVNGS shutdowns are normally performed by a downpower followed by a manual scram.

## 3.0 Calculations

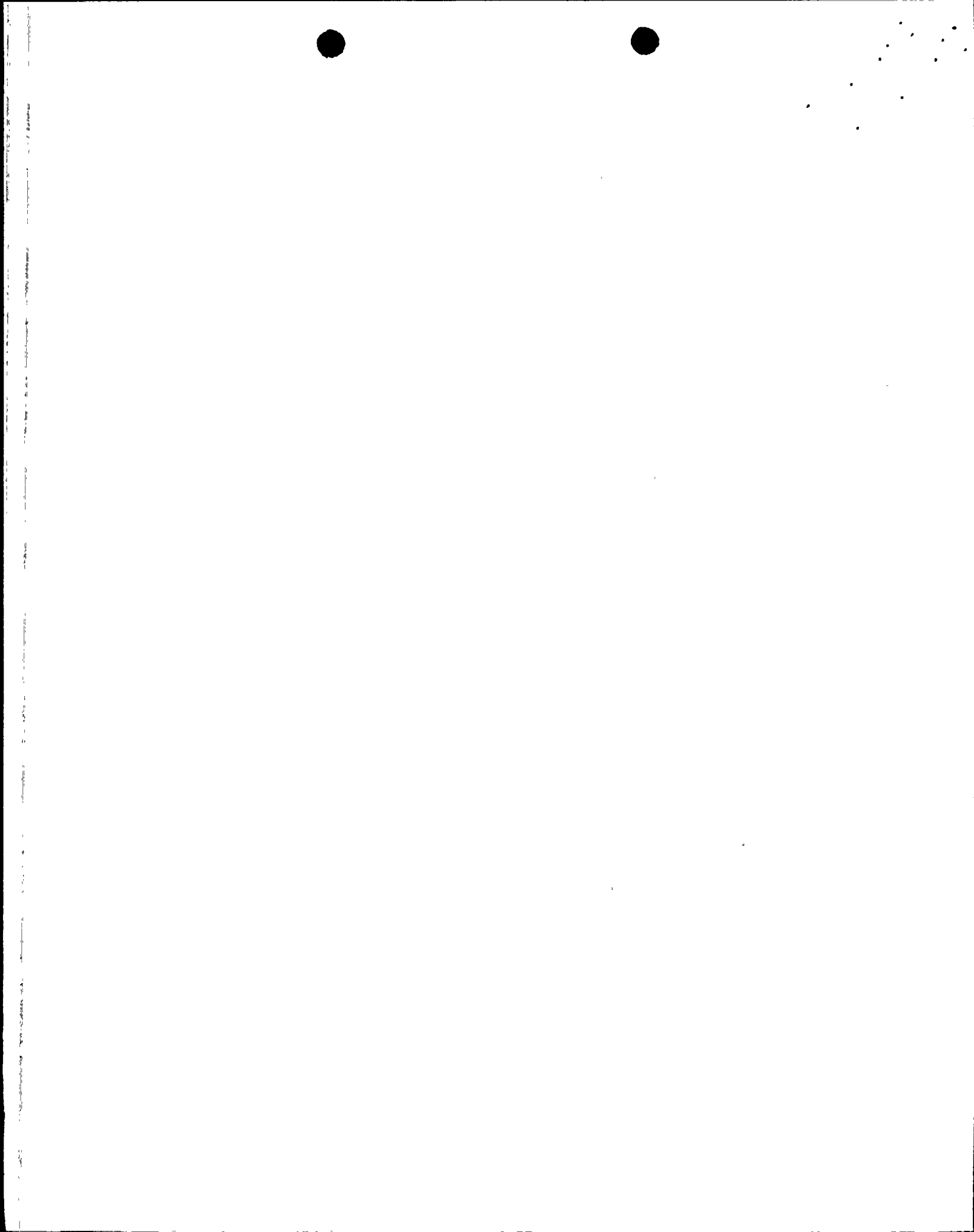
The computer files used for this analysis are contained in Appendix A(diskettes) for archival purposes.

### 3.1 Technical Specification Extension

Section 2.0 provides the methodology for performing this evaluation. The following specific actions were performed to calculate the increase in core damage probability associated with extending the LCO for 6, 12, 18 and 24 hours.

The CAFTA cutset file (TOTALCD.CUT) that contains all of the sequences quantified for the PVNGS Individual Plant Examination (Reference 5.2) was modified by setting the probability of basic event 1PEBG02-DG--2FR (EDG B fails to run) to 1.0 (failed). (This event was chosen as it has the largest failure probability of all of the EDG events in the TOTALCD.CUT file. Therefore, the effects of truncation on the results are minimized.) The CDF calculated with this change is  $4.6E-4/\text{yr}$ . The increase in the probability of core damage is calculated by:

$$\Delta\text{CDP} = \Delta\text{CDF} \times \frac{t}{1\text{yr}}$$



$$\Delta\text{CDP} = 4.6 \times 10^{-4} / \text{yr} \times \frac{t}{8760 \text{ hrs/yr}}$$

$$\Delta\text{CDP} = 5.25 \times 10^{-8} \times t$$

where t is the number of hours for the extension.

**Table 2: CDP Calculations for Extending the LCO**

Time Requested	Increase in CDP
6 hours	3E-7
12 hours	6E-7
18 hours	9E-7
24 hours	1E-6

### 3.2 Forced Shutdown

Section 2.0 provides the methodology for performing this evaluation. The following specific actions were performed to calculate the increase in core damage probability associated with a forced plant shutdown with EDG B Out of Service.

The cutset files for the Miscellaneous Transient Event Tree were reviewed to determine which sequences were impacted by having EDG B Out of Service. Sequences M-S1R.CUT and M-S2R.CUT (RCP Seal LOCA and Stuck Open PSV sequences) are not impacted by the loss of an EDG. Therefore, only sequence M-S3R.CUT was manipulated.

The CAFTA cutset file (M-S3R.CUT) that contains all of the cutsets for Miscellaneous Transient sequence 3 quantified from the PVNGS Individual Plant Examination (Reference 5.2) was modified by setting the probability of basic event 1PEBG02-DG---2FR (EDG B fails to run) to 1.0 (failed). (This event was chosen as it has the largest failure probability of all of the EDG events in the M-S3R.CUT file. Therefore, the effects of truncation on the results are minimized.) The initiator (IEMISC) was also set to 1.0 to calculate the conditional probability of core damage given a shutdown. The CDF calculated with this change is 4E-6.



## 4.0 Results & Conclusions

The results of this analysis are provided in Table 3, "Results," on page 7. These results clearly show that it is safer to complete the work on-line than it is to perform a plant shutdown in accordance with the Technical Specifications.

Table 3: Results

Criterion	LCO Extension	Core Damage Probability
Baseline CDF <sup>a</sup>	N/A	9E-5/yr.
Instantaneous CDF with EDG B OOS	N/A	5E-4/yr.
Increase in CDP with EDG B OOS	6 hr.	3E-7
	12 hr.	6E-7
	18 hr.	9E-7
	24 hr.	1E-6
CDP from Forced Shutdown with EDG B OOS	N/A	4E-6

a. Reference 5.2



## 5.0 References

- 5.1 Technical Specification LCO 3.8.1.1.b/4.8.1.1.2.a.4
- 5.2 PVNGS Individual Plant Examination, April 1992





## Appendix A

### Modified Computer Files for TOTALCD.CUT and M-S3R.CUT

