



xLPR Version 2

NRC-EPRI Capstone Reports

xLPR User Group Meeting

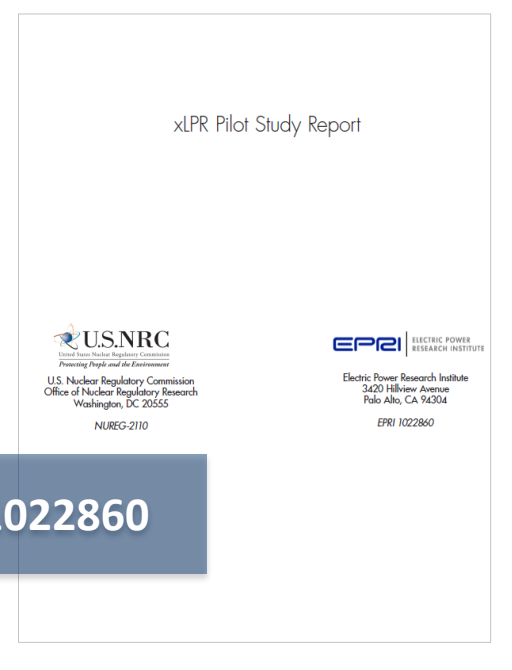
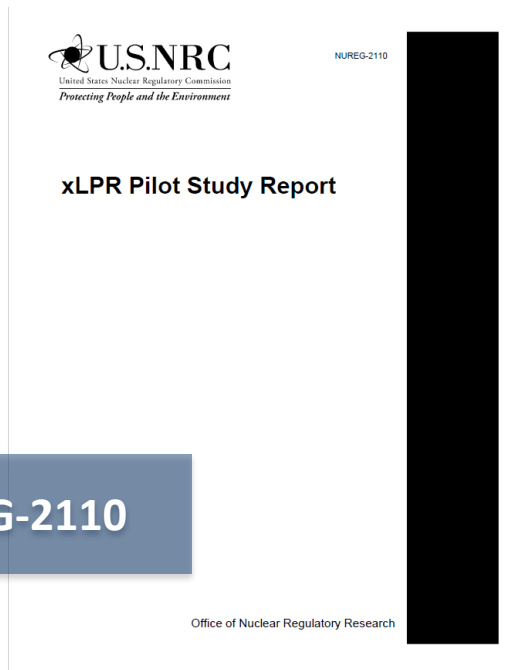
August 18, 2021



PROBABILISTIC FRACTURE MECHANICS CODE

BACKGROUND

- xLPR Version 1 (Pilot Study) Capstone Reports





PROBABILISTIC FRACTURE MECHANICS CODE

VERSION 2 CAPSTONE REPORTS

COMING SOON!



NUREG-2247

**EXTREMELY LOW
PROBABILITY OF
RUPTURE VERSION 2
PROBABILISTIC
FRACTURE
MECHANICS CODE**

NUREG-2247

Office of Nuclear Regulatory Research

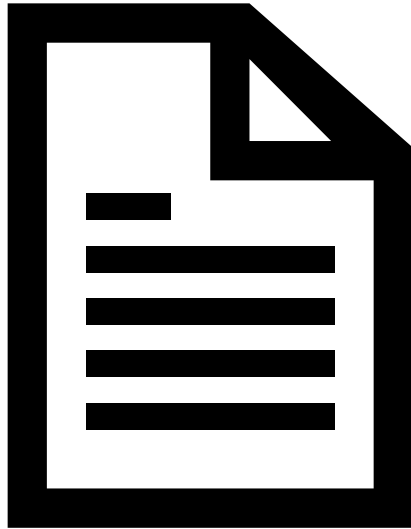


Extremely Low Probability of Rupture Version 2
Probabilistic Fracture Mechanics Code

EPRI 3002013307



VERSION 2 CAPSTONE REPORT OVERVIEW



- 1 INTRODUCTION
- 2 CODE STRUCTURE, OPERATION, AND THEORY
- 3 QUALITY ASSURANCE
- 4 UNCERTAINTIES
- 5 TRIAL INPUTS AND ANALYSES
- 6 RECOMMENDATIONS
- 7 CONCLUSIONS
- 8 REFERENCES



VERSION 2 CAPSTONE REPORT CONTENTS (1/6)

1 INTRODUCTION

2 CC > **Primer on Probabilistic Fracture Mechanics**

3 QI > **Summary of Pilot Study**

4 UI > **Version 2 Objectives**

5 TR > **Development Team**

6 RECOMMENDATIONS

7 CONCLUSIONS

8 REFERENCES



VERSION 2 CAPSTONE REPORT CONTENTS (2/6)

1 INTRODUCTION

2 CODE STRUCTURE, OPERATION, AND THEORY

3 QI > Features, Problem Representation, Basic Design and Operation

4 UI > Models

5 TR > Computational Framework

6 RECOMMENDATIONS

7 CONCLUSIONS

8 REFERENCES



VERSION 2 CAPSTONE REPORT CONTENTS (3/6)

1 INTRODUCTION

2 CODE STRUCTURE, OPERATION, AND THEORY

3 QUALITY ASSURANCE

4 UNCERTAINTIES

- > **Standards**

5 TR

- > **Software Development Process**

6 RE

- > **Verification and Validation**

7 CC

- > **External Reviews**

8 RE



VERSION 2 CAPSTONE REPORT CONTENTS (4/6)

1 INTRODUCTION

2 CODE STRUCTURE, OPERATION, AND THEORY

3 QUALITY ASSURANCE

4 UNCERTAINTIES

5 TRIAL RUNS AND ANALYSES

> **Background**

6 RE

> **Major Assumptions and Simplifications**

7 CC

8 REFERENCES



VERSION 2 CAPSTONE REPORT CONTENTS (5/6)

1 INTRODUCTION

2 CODE STRUCTURE, OPERATION, AND THEORY

3 QUALITY ASSURANCE

4 UNCERTAINTIES

5 TRIAL INPUTS AND ANALYSES

6 RECOMMENDATIONS

- > **Input Cases and Scenarios**

7 CONCLUSIONS

- > **Selection of Analysis Results**

8 REFERENCES



VERSION 2 CAPSTONE REPORT CONTENTS (6/6)

1 INTRODUCTION

2 CODE STRUCTURE, OPERATION, AND THEORY

3 QUALITY ASSURANCE

4 UNCERTAINTIES

5 TRIAL INPUTS AND ANALYSES

6 RECOMMENDATIONS

7 CONCLUSIONS

8 REFERENCES

> **NRC/RES and EPRI Goals and Objectives for Version 2 Fully Achieved**



PROBABILISTIC FRACTURE MECHANICS CODE

VERSION 2 CAPSTONE REPORT SUPPORTING TECHNICAL REPORTS

Project Team Unit	Models Group									
	Crack Transition Subgroup	COD Subgroup		Leak Rate Subgroup	Crack Stability Subgroup				ISI Subgroup	
Technical Reports	Subgroup Report [35]	Subgroup Report [88]		Subgroup Report [97]	Subgroup Report [112]				Subgroup Report [118]	
Requirements Documentation	SRD	SRD	SRD	SRD	SRD	SRD	SRD	SRD	SRD	
Implementation Phase Documentation	SDD	SDD	SDD	SDD	SDD	SDD	SDD	SDD	SDD	
Implementation Phase Documentation	Crack Transition Module	ACOD Module	CCOD Module	Leak Rate Module	ASCS Module	ATWCS Module	SCSCS Module	MCSCS Module	CTWCS Module	ISI Module
Test Phase Documentation	STP	STP	STP	STP	STP	STP	STP	STP	STP	
	STRR	STRR	STRR	STRR	STRR	STRR	STRR	STRR	STRR	

PUBLICLY AVAILABLE



VERSION 2 CAPSTONE REPORT SUPPORTING TECHNICAL REPORT LISTING

- Models*
 - Welding Residual Stresses
 - Crack Initiation
 - Stress Intensity Factors
 - Cyclic Stress Intensity Factors
 - Crack Growth and Coalescence
 - Crack Transition
 - Crack Opening Displacement
 - Leak Rate
 - Crack Stability
 - Inservice Inspection
- Computational Framework*
- Sources and Treatment of Uncertainties*
- Inputs*
- Scenario Analyses*
- Acceptance Criteria (ML16271A436)
- Project Integration Board*
- External Review Board (ML17276A683)

* Packaged under ML16341B038



PROBABILISTIC FRACTURE MECHANICS CODE

VERSION 2 QUALITY ASSURANCE DOCUMENTS

Project Team Unit	Models Group									
	Crack Transition Subgroup	ACOD Subgroup	CCOD Subgroup	Leak Rate Subgroup	ASCS Subgroup	ATWCS Subgroup	SCSCS Subgroup	MCSCS Subgroup	CTWCS Subgroup	ISI Subgroup
Technical Reports	Crack Transition Report [85]	Subgroup Report [88]	Subgroup Report [97]	Subgroup Report [112]	Subgroup Report [118]					
Requirements Phase Documentation	SRD	SRD	SRD	SRD	SRD	SRD	SRD	SRD	SRD	SRD
Design Phase Documentation	SDD	SDD	SDD	SDD	SDD	SDD	SDD	SDD	SDD	SDD
Implementation Phase Documentation	Crack Transition Module	ACOD Module	CCOD Module	Leak Rate Module	ASCS Module	ATWCS Module	SCSCS Module	MCSCS Module	CTWCS Module	ISI Module
Test Phase Documentation	STP	STP	STP	STP	STP	STP	STP	STP	STP	STP
	STRR	STRR	STRR	STRR	STRR	STRR	STRR	STRR	STRR	STRR

AVAILABLE TO USER GROUP