



GE Energy

David H. Hinds
Manager, ESBWR

PO Box 780 M/C L60
Wilmington, NC 28402-0780
USA

T 910 675 6363
F 910 362 6363
david.hinds@ge.com

MFN 05-094

Project 717

September 19, 2005

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

**Subject: ESBWR DCD Rev 00 Chapter 18 Cross Reference to NUREG 0711,
Rev. 2**

Attached please find the subject cross reference (file MFN 05-094 Enclosure 1 Chap 18 CR to NUREG 0711.xls). This file contains a cross reference from the NUREG 0711, Rev. 2 sections to the major Chapter 18 sections. Supporting information is provided in the "Comments" column.

When you have had an opportunity to review this information, we would appreciate your feedback and would like to discuss our schedule for providing follow-on information.

If you have any questions about the information provided here, please let me know.

Sincerely,

David H. Hinds
Manager, ESBWR

DDG8

MFN 05-094

Page 2 of 2

Enclosure:

1. MFN 05-094 Enclosure 1 Chap 18 CR to NUREG 0711.xls

cc: WD Beckner USNRC (w/o enclosures)
LA Dudes USNRC (w/o enclosures)
AE Cabbage USNRC (with enclosures)
GB Stramback GE (with enclosures)

MFN 05-094
Enclosure 1

ENCLOSURE 1

MFN 05-094

Chapter 18 Cross Reference to

NUREG 0711, Rev. 2

Chapter 18 Cross reference to NUREG 0711 rev 2

NUREG Section	Nureg page	ESBWR DCD Tier 2	
		Chapter 18 Reference	Comments
1 INTRODUCTION	1	18.1 thru 18.8	Human Performance Monitoring to be provided by COL
1.1 Background	1		
1.2 General Description of the Program Review Model	2		
1.2.1 Review Elements	2		
1.2.2 Sources of Additional Information	3		
1.3 Applications	4		
1.3.1 Application to Current Applicants Under 10 CFR Part 50	4		
1.3.2 Application to Advanced NPP Applicants Under 10 CFR Part 52	5	18.1	Reiterating that the DCD concentrates on plans, repeating the NUREG applicability
1.4 Graded Approach to Review	6		
2 HFE PROGRAM MANAGEMENT	7	Appendix 18E	Team expanded to include System Safety Engineering Maintainability/Inspectability Engineering and Reliability/Availability Engineering
2.1 Background	7		
2.2 Objective	7		
2.3 Applicant Submittals	8		
2.4 Review Criteria	8	Table 18E-1 Para. II(TE-1)	Table E-1 is the detail of the HFE programmatic plans- Table E-1 abbreviated TE-1 herein
2.4.1 General HFE Program Goals and Scope	8		
2.4.2 HFE Team and Organization	9	TE-1 I and II(2)(d)I	
2.4.3 HFE Process and Procedures	10	TE-1 II(2)(b)	
2.4.4 HFE Issues Tracking	10	TE-1 II(2)(d)thru(h)	Defense in Depth and Diversity detail to be addressed in next revision
2.4.5 Technical Program	11		
2.5 Sources of Additional Information	12		
3 OPERATING EXPERIENCE REVIEW	15	TE-1 II(2)(c)	Instrument and DCIS failures to be added in the next revision
3.1 Background	15		
3.2 Objective	16		
3.3 Applicant Submittals	16		
3.4 Review Criteria	16		
3.4.1 Scope	16		
3.4.2 Issue Analysis, Tracking, and Review	17	TE-2	
3.5 Sources of Additional Information	17		
4 FUNCTIONAL REQUIREMENTS ANALYSIS AND FUNCTION ALLOCATION ...	19	TE-1 III,IV&V	Updated figure to address Figure 4.1 from NUREG will be added in next revision.
4.1 Background	19		
4.2 Objective	19		
4.3 Applicant Submittals	19		
4.4 Review Criteria	20		
4.5 Sources of Additional Information	22		
5 TASK ANALYSIS	25	TE-1 V	TA addressing Inspection and Maintenance Tasks will be added in next revision.
5.1 Background	25		
5.2 Objective	25		
5.3 Applicant Submittals	25		
5.4 Review Criteria	25		
5.5 Sources of Additional Information	27		
6 STAFFING AND QUALIFICATIONS	29	TE-1 Para I	

6.1 Background	29
6.2 Objective	29
6.3 Applicant Submittals	29
6.4 Review Criteria	29
6.5 Sources of Additional Information	31
7 HUMAN RELIABILITY ANALYSIS	33
7.1 Background	33
7.2 Objective	35
7.3 Applicant Submittals	35
7.4 Review Criteria	35
7.5 Sources of Additional Information	36
8 HUMAN-SYSTEM INTERFACE DESIGN	37
8.1 Background	37
8.2 Objective	37
8.3 Applicant Submittals	37
8.4 Review Criteria	37
8.4.1 HSI Design Inputs	37
8.4.2 Concept of Operations	38
8.4.3 Functional Requirement Specification	39
8.4.4 HSI Concept Design	39
8.4.5 HSI Detailed Design and Integration	40
8.4.6 HSI Tests and Evaluations	42
8.4.6.1 Trade-Off Evaluations	42
8.4.6.2 Performance-Based Tests	42
8.4.7 HSI Design Documentation	43
8.5 Sources of Additional Information	43
9 PROCEDURE DEVELOPMENT	45
9.1 Background	45
9.2 Objective	45
9.3 Applicant Submittals	45
9.4 Review Criteria	45
9.5 Sources of Additional Information	47
10 TRAINING PROGRAM DEVELOPMENT	49
10.1 Background	49
10.2 Objective	49
10.3 Applicant Submittals	49
10.4 Review Criteria	49
10.4.1 General Approach	49
10.4.2 Organization of Training	50
10.4.3 Learning Objectives	50
10.4.4 Content of Training Program	51
10.4.5 Evaluation and Modification of Training	52
10.4.6 Periodic Re-training	52
10.5 Sources of Additional Information	52
11 HUMAN FACTORS VERIFICATION AND VALIDATION	55
11.1 Background	55

18.8.9
and TE-1 Para V(2) (c&d)

TE-1 VI and Appendices 18G&

Software development plans(Chapter 7B)
and HSI plans overlap. Will be expanded in revision of DCD

Appendix 7B

18.8.5 and 18.8.19
Appendix 7B

Will be addressed by COL

18.8.20&21 COL

Development of normal ops procedures will be addressed by COL
EOPs covered

Chapter 13 &TE-1 II(1) c

Will be addressed by COL

TE-1 VII & 18G

V&V now includes Procedure V&V and simulator HSIs
Testing

11.2 Objective	56
11.3 Applicant Submittals	56
11.4 Review Criteria	56
11.4.1 Operational Conditions Sampling	56
11.4.1.1 Operational Conditions Sampling Review Objectives	56
11.4.1.2 Operational Conditions Review Criteria	57
11.4.1.2.1 Sampling Dimensions	57
11.4.1.2.2 Identification of Scenarios	60
11.4.1.2.3 Special Considerations for Plant Modernization Programs	60
11.4.2 Design Verification	61
11.4.2.1 Inventory and Characterization	61
11.4.2.1.1 Inventory and Characterization Review Objectives	61
11.4.2.1.2 Inventory and Characterization Review Criteria	61
11.4.2.2 HSI Task Support Verification	62
11.4.2.2.1 HSI Task Support Verification Review Objectives	62
11.4.2.2.2 HSI Task Support Verification Review Criteria	62
11.4.2.3 HFE Design Verification	63
11.4.2.3.1 HFE Design Verification Review Objective	63
11.4.2.3.2 HFE Design Verification Review Criteria	63
11.4.3 Integrated System Validation	65
11.4.3.1 Integrated System Validation Review Objective	65
11.4.3.2 Integrated System Validation Review Criteria	66
11.4.3.2.1 Test Objectives	66
11.4.3.2.2 Validation Testbeds	66
11.4.3.2.3 Plant Personnel	67
11.4.3.2.4 Scenario Definition	68
11.4.3.2.5 Performance Measurement	69
11.4.3.2.5.1 Measurement Characteristics	69
11.4.3.2.5.2 Performance Measure Selection	69
11.4.3.2.5.3 Performance Criteria	71
11.4.3.2.6 Test Design	71
11.4.3.2.6.1 Coupling Crews and Scenarios	71
11.4.3.2.6.2 Test Procedures	71
11.4.3.2.6.3 Test Personnel Training	72
11.4.3.2.6.4 Participant Training	72
11.4.3.2.6.5 Pilot Testing	73
11.4.3.2.7 Data Analysis and Interpretation	73
11.4.3.2.8 Validation Conclusions	73
11.4.4 Human Engineering Discrepancy Resolution	74
11.4.4.1 Human Engineering Discrepancy Resolution Review Objective	74
11.4.4.2 Human Engineering Discrepancy Resolution Review Criteria	74
11.5 Sources of Additional Information	78
12 DESIGN IMPLEMENTATION	79
12.1 Background	79
12.2 Objective	80
12.3 Applicant Submittals	80

TE-5&Appendix 7B

the Software Development plan(7B)
includes HFE design Input and HSI is V&V'd under those V&V plans.

18.8.19 COL

Appendix 7B will include extensive
simulator HFE testing schema and performed during COL

Appendix 7B

Appendix 7B manages the implementation

12.4 Review Criteria 80

12.4.1 General Criteria 80

12.4.2 Modernization Programs Consisting of Many Small Modifications 81

12.4.3 Modernization Programs Consisting of Large Modifications During Multiple Outages 81

12.4.4 Modernization Programs Where Both Old and New Equipment are Left in Place 82

12.4.5 Modernization Programs Where New Non-Functional HSIs are in Place in Parallel with Old Functional HSIs 82

12.4.6 Final Plant HFE Design Verification 83

12.5 Sources of Additional Information 83

13 HUMAN PERFORMANCE MONITORING 85

13.1 Background 85

13.2 Objective 85

13.3 Applicant Submittals 85

13.4 Review Criteria 85

13.5 Sources of Additional Information 86

14 REFERENCES 87

GLOSSARY 93

APPENDIX A: HFE Design Team Composition A-1

COL	To be Developed by COL applicant
TE-1 Para I	