CHAPTER 18—HUMAN FACTORS ENGINEERING TABLE OF CONTENTS

18.0 HUMAN FACTORS ENGINEERING 18.1-1

18.1 Human Factors Engineering Program Management 18.1-1

18.1.1 Human Factors Engineering Program Goals, Assumptions and Constraints, and Scope 18.1-1

18.1.1.1 Goals 18.1-1

18.1.1.2 Assumptions and Constraints 18.1-1

18.1.1.3 Applicable U.S. EPR Facilities 18.1-2

18.1.1.4 Applicable Human System Interfaces, Procedures, and Training 18.1-2

18.1.1.5 Applicable Plant Personnel 18.1-3

18.1.1.6 Effects of Modifications on Personnel Performance 18.1-4

18.1.2 Human Factors Engineering and Control Room Design Team Organization 18.1-4

18.1.3 Human Factors Engineering Processes and Procedures 18.1-4

18.1.3.1 Design Process Management Tools 18.1-5

18.1.3.2 Integration of HFE with Other Plant Design Activities 18.1-5

18.1.3.3 HFE Program Milestones 18.1-6

18.1.3.4 HFE Documentation 18.1-6

18.1.3.5 Subcontractor HFE Efforts 18.1-6

18.1.4 Human Factors Engineering Issues Tracking 18.1-7

18.1.5 Technical Program 18.1-7

18.1.5.1 HFE Program Process Drawing 18.1-7

18.1.5.2 Relationship Between HFE and Other Engineering Disciplines 18.1-9

18.1.5.3 HFE Program Element Documentation 18.1-9

18.1.6 References 18.1-9

18.2 Operating Experience Review 18.2-1

18.2.1 Objectives and Scope 18.2-1
18.2.2 Methodology 18.2-1
18.2.3 Evaluation of Results 18.2-2
18.2.4 References 18.2-2
18.3 Functional Requirements Analysis and Functional Allocation 18.3-1
18.3.1 Objectives and Scope 18.3-1
18.3.2 Functional Requirement Analysis Methodology and Results Summary 18.3-1
18.3.3 Functional Allocation Methodology and Results Summary 18.3-3
18.3.4 Changes to Functional Analysis or Allocation 18.3-4
18.3.5 References 18.3-4
18.4 Task Analysis 18.4-1
18.4.1 Task Analysis Objectives and Scope 18.4-1
18.4.2 Task Analysis Methodology 18.4-1
18.4.3 Results Summary 18.4-2
18.4.4 References 18.4-3
18.5 Staffing and Qualifications 18.5-1
18.5.1 Objectives and Scope of Analysis 18.5-1
18.5.2 Staffing and Qualifications Analysis Methodology 18.5-2
18.5.3 Results 18.5-2
18.5.4 References 18.5-2
18.6 Human Reliability Analysis 18.6-1
18.6.1 Objectives and Scope of HRA / HFE Integration 18.6-1
18.6.2 Methodology 18.6-1
18.6.3 Results 18.6-2
18.6.4 References 18.6-3
18.7 Human System Interface Design 18.7-1
18.7.1 Human System Interface Design Inputs 18.7-1
18.7.1.1 Analysis of Personnel Task Requirements 18.7-1
18.7.1.2 System Requirements 18.7-4
18.7.1.3 Regulatory Requirements 18.7-7
18.7.1.4 Other Requirements 18.7-10
18.7.2 Concept of Operations 18.7-10
18.7.2.1 Crew Composition 18.7-10

18.7.2.2 Roles and Responsibilities of Crew Members 18.7-10
18.7.2.3 Personnel Supervision of Plant Automation 18.7-11
18.7.2.4 Use of Main Control Room 18.7-11
18.7.2.5 Crew Member Coordination Methods 18.7-11
18.7.3 Functional Requirements Specification 18.7-13
18.7.4 HSI Concept Design 18.7-13
18.7.4.1 Safety Parameter Display System 18.7-13
18.7.4.2 Operation and Control Centers System 18.7-14
18.7.4.3 Inventory of Alarms, Displays, and Controls 18.7-14
18.7.4.4 Minimum Inventory of Main Control Room Alarms, Displays, and Controls 18.7-14
18.7.4.5 Remote Shutdown Station Alarms, Displays, and Controls 18.7-15
18.7.5 Human Factors Design for the Non-Human System Interface Portion of the Plant 18.7-16
18.7.5.1 Plant Layout Design and Equipment Accessibility 18.7-16
18.7.5.2 Coding, Language, and Information Presentation 18.7-16
18.7.5.3 Lighting of the HMI Rooms and Workspaces 18.7-16
18.7.5.4 Acoustic Environment 18.7-17
18.7.5.5 Personnel Protection Equipment 18.7-17
18.7.5.6 Ambient Conditions 18.7-17
18.7.6 HSI Detailed Design and Integration 18.7-17
18.7.6.1 HSI Style Guide 18.7-17
18.7.6.2 HSI Considerations and Demands on Operators 18.7-20
18.7.6.3 HSI Modifications 18.7-21
18.7.7 HSI Verification and Validation (Tests and Evaluations) 18.7-21
18.7.8 HSI Design Results and Documentation 18.7-21
18.7.9 References 18.7-21

18.8 Procedure Development 18.8-1
18.8.1 Objectives and Scope 18.8-1
18.8.2 Methodology 18.8-1
18.8.2.1 Procedure Writer's Guide 18.8-2
18.8.2.2 Verification and Validation of Procedures 18.8-2
18.8.2.3 Electronic Procedures 18.8-3
18.8.3 Results 18.8-3
18.8.4 References 18.8-3
18.9 Training Program Development 18.9-1
18.9.1 Objectives and Scope 18.9-1
18.9.2 Methodology 18.9-1
18.9.3 Results 18.9-1
18.9.4 References 18.9-2
18.10 Verification and Validation 18.10-1
18.10.1 Objectives 18.10-1
18.10.2 Scope 18.10-1
18.10.3 Methodology 18.10-2
18.10.3.1 HSI Inventory and Characterization 18.10-3
18.10.3.2 HSI Task Support Verification 18.10-4
18.10.3.3 Design Verification 18.10-5
18.10.3.4 Operational Conditions Sampling 18.10-6
18.10.3.5 Integrated System Validation 18.10-9
18.10.3.6 Human Engineering Discrepancy Resolution 18.10-16
18.10.3.7 Results 18.10-18
18.10.4 References 18.10-18
18.11 Design Implementation 18.11-1
18.11.1 Objectives and Scope 18.11-1
18.11.2 Methodology 18.11-1
18.11.2.1 Aspects of the Design Not Verified During the V&V Process 18.11-2
18.11.2.2 Verification of the As-Built HSIs 18.11-2
18.11.3 Verification of the Plant-Specific Procedures and Training 18.11-2

18.11.3.1 Verification that HFE Issues Tracking Database Items Have Been Addressed 18.11-3
18.11.4 Results Summary 18.11-3
18.11.5 References 18.11-3
18.12 Human Performance Monitoring 18.12-1
18.12.1 Objectives and Scope 18.12-1
18.12.2 Methodology 18.12-2
18.12.2.1 Corrective Action Program and Issue Tracking 18.12-2
18.12.2.2 Design Change Process 18.12-3
18.12.2.3 Performance Indicators 18.12-3
18.12.2.4 Probabilistic Risk Assessment 18.12-4
18.12.2.5 Existing Plant Maintenance and Inspection Programs 18.12-4
18.12.3 Results Summary 18.12-4
18.12.4 References 18.12-5

Next File