

CHAPTER 4— REACTOR LIST OF FIGURES

Figure 4.2-1—U.S. EPR Fuel Assembly	4.2-65
Figure 4.2-2—Fuel Rod Assembly	4.2-66
Figure 4.2-3—Instrument Lance Position	4.2-67
Figure 4.2-4—Intermediate HTP Spacer Grid Cross Section	4.2-68
Figure 4.2-5—HTP Spacer Grid Characteristics	4.2-69
Figure 4.2-6—HMP End Grid Assembly	4.2-70
Figure 4.2-7—Guide Tube QD Connection with Top Nozzle	4.2-71
Figure 4.2-8—MONOBLOC™ Guide Tube Assembly	4.2-72
Figure 4.2-9—QD Top Nozzle Assembly	4.2-73
Figure 4.2-10—FUELGUARD™ Lower Nozzle Arrangement	4.2-74
Figure 4.2-11—Guide Tube Screw Connection at Bottom Nozzle.....	4.2-75
Figure 4.2-12—Rod Cluster Control Assembly	4.2-76
Figure 4.2-13—RCCA Control Rod.....	4.2-77
Figure 4.2-14—RCCA Spider	4.2-78
Figure 4.2-15—Thimble Plug Assembly	4.2-79
Figure 4.2-16—TPA Spider Showing the Guide Ring Positions	4.2-80
Figure 4.2-17—Primary Source Assembly.....	4.2-81
Figure 4.2-18—Secondary Source Assembly.....	4.2-82
Figure 4.2-19—Primary Neutron Source Rod.....	4.2-83
Figure 4.2-20—Secondary Neutron Source Rod	4.2-84
Figure 4.2-21—Control Template	4.2-85
Figure 4.3-1—Cross Section of the U.S. EPR High Thermal Performance Fuel Assembly	4.3-55
Figure 4.3-2—U.S. EPR Rod Group Insertion Limits Versus Thermal Power	4.3-56
Figure 4.3-3—Typical Initial Core Loading Map.....	4.3-57
Figure 4.3-4—Uranium Consumption and Plutonium Production Versus Burnup .	4.3-58
Figure 4.3-5—Boron Concentration Versus Burnup for a First Core	4.3-59
Figure 4.3-6—Fuel Assembly Designs A1 and A2.....	4.3-60
Figure 4.3-7— Fuel Assembly Designs B1 and B2.....	4.3-61

Figure 4.3-8— Fuel Assembly Designs C1 and C2	4.3-62
Figure 4.3-9—Fuel Assembly Design C3.....	4.3-63
Figure 4.3-10—Quarter Core Relative Assembly Radial Power Distribution (HFP at BOL, ARO, No Xenon)	4.3-64
Figure 4.3-11—Quarter Core Relative Assembly Radial Power Distribution (HFP Near BOL, ARO, Equilibrium Xenon Power Distribution)	4.3-65
Figure 4.3-12—Quarter Core Relative Assembly Radial Power Distribution (HFP Near BOL, Bank D at PDIL, Equilibrium Xenon Power Distribution).....	4.3-66
Figure 4.3-13—Quarter Core Relative Assembly Radial Power Distribution (HFP Near MOL, ARO, Equilibrium Xenon Power Distribution).....	4.3-67
Figure 4.3-14—Quarter Core Relative Assembly Radial Power Distribution (HFP Near MOL, Bank D at PDIL, Equilibrium Xenon Power Distribution).....	4.3-68
Figure 4.3-15—Quarter Core Relative Assembly Radial Power Distribution (HFP Near EOL, ARO, Equilibrium Xenon Power Distribution)	4.3-69
Figure 4.3-16—Quarter Core Relative Assembly Radial Power Distribution (HFP Near EOL, Bank D at PDIL, Equilibrium Xenon Power Distribution).....	4.3-70
Figure 4.3-17—Fuel Assembly (½ Assembly Symmetry) Power Distribution (HFP Near BOL, ARO, Equilibrium Xenon Power Distribution)	4.3-71
Figure 4.3-18—Fuel Assembly (½ Assembly Symmetry) Power Distribution (HFP Near EOL, ARO, Equilibrium Xenon Power Distribution)	4.3-72
Figure 4.3-19—Typical Axial Power Shape at Beginning of Life	4.3-73
Figure 4.3-20—Typical Axial Power Shape at Middle of Life.....	4.3-74
Figure 4.3-21—Typical Axial Power Shape at End of Life	4.3-75
Figure 4.3-22—Comparison of Typical Fuel Assembly Axial Power Distributions with a Core Average Axial Power Distribution and Bank D Slightly Inserted	4.3-76
Figure 4.3-23—Maximum F_Q as a Function of Core Height	4.3-77
Figure 4.3-24—Measured Values of F_Q for Steady State Full Power Rod Configurations.....	4.3-78
Figure 4.3-25—Typical Doppler Temperature Coefficient	4.3-79
Figure 4.3-26—Typical Doppler-Only Power Coefficient at BOL and EOL.....	4.3-80
Figure 4.3-27—Typical Doppler-Only Power Defect at BOL and EOL	4.3-81
Figure 4.3-28—Typical Zero Power Moderator Temperature Coefficient at BOL...	4.3-82

Figure 4.3-29—Typical Zero Power Moderator Temperature Coefficient as a Function of Boron Concentration at BOL 4.3-83

Figure 4.3-30—Typical Zero Power Moderator Temperature Coefficient at EOL... 4.3-84

Figure 4.3-31—Typical Hot Full Power Moderator Temperature Coefficient 4.3-85

Figure 4.3-32—Typical Total Power Coefficient at BOL and EOL 4.3-86

Figure 4.3-33—Typical Total Power Defect at BOL and EOL..... 4.3-87

Figure 4.3-34—Rod Cluster Control Assembly Pattern 4.3-88

Figure 4.3-35—Differential Bank Worth with Two Banks in Overlap 4.3-89

Figure 4.3-36—Rod Position versus Time of Travel after Rod Release 4.3-90

Figure 4.3-37—Reactivity Worth versus Rod Position..... 4.3-91

Figure 4.3-38—Typical Damped Xenon Oscillation 4.3-92

Figure 4.3-39—Typical Layout of the Reflector 4.3-93

Figure 4.3-40—U.S. EPR Reflector Geometry 4.3-94

Figure 4.4-1—Axial Distribution of Quality and Void Fraction in the Limiting Subchannel 4.4-29

Figure 4.4-2—Radial Distribution of Quality and Void Fraction at the Core Exit.... 4.4-30

Figure 4.4-3—Assembly Average Flow and Enthalpy Distribution at Core Inlet (1/8 core)..... 4.4-31

Figure 4.4-4—Assembly Average Flow and Enthalpy Distribution at Core Mid-Plane (1/8 Core) 4.4-32

Figure 4.4-5—Assembly Average Flow and Enthalpy Distribution at Core Exit (1/8 Core)..... 4.4-33

Figure 4.4-6—Location of Flow Distribution Device Beneath the Core..... 4.4-34

Figure 4.4-7—Average RCS Temperature vs. Core Power..... 4.4-35

Figure 4.4-8—Arrangement of Incore Instrumentation (Top View)..... 4.4-36

Figure 4.4-9—Overview of the Aeroball Measurement System..... 4.4-37

Figure 4.4-10—Arrangement of Incore Instrumentation (Side View) 4.4-38

Figure 4.4-11—Aeroball Probe 4.4-39