CONSOLIDATED EDISON COMPANY

INDIAN POINT 2 NUCLEAR PLANT SIMULATOR

MASTER INDEX

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12.1.1 Hardware Reference Manuals

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12.1.1.2 Gould Concept 32/67 CPU Gould SS6/CMOS CPU (Real Time) Reference Manual (301-000410-003)

12.1.1.3 Concept 32/97, 32/97 Computer Basic System (301-003070-001)

12.1.2 Hardware Technical Manuals

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12.1.2.4 High-Speed Data Interface, Models 9130, 9131, 9132; High-Speed Inter-Bus Link, Models 9135 and 9136 (303-000270-201)

12.1.2.5 Power Fail System (303-000310-001)

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12.1.2.16 Gould High Speed Disc Processor (HSDP) Model 8064 Technical Manual (303-006160-000)

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12.1.2.18 Gould Single Lot 6/CMOS CPU Technical Manual (303-006270-002)

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12.1.3.3 Line Printer/Floppy Disc Controller, Models 8030, 8031 and 8174-8177 8319 (304-000250-304)

12.1.3.4 High-Speed Data Interface, Models 9130, 9131, 9132; High-Speed Inter-Bus Link, Models 9135 and 9136 (304-000270-701)

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12.1.3.22 Asynchronous Communications Multiplexer, Model 8512-2 (304-006180-102)

12.1.3.23 SS6/CMOS CPU Model 3630 Drawing Manual (304-6270-001)

12.1.3.24 CPU Cabinet (Model 1) 3841 Drawing Manual (304-6370-004)

12.1.3.25 Gould Peripheral (Expansion) Cabinet Model 3970 Drawing Manual (304-6380-004)

12.1.3.26 SMD-E Disk Drive Models 8812, 8813, and 8814 Drawing Manual (304-006900-001)

12.1.4 Hardware Installation Manuals

12.1.4.1 Concept 32/97, Computer Basic System (306-003070-000)

12.1.4.2 Multiprocessor Shared Memory System, Site Preparation and Installation Manual (306-003140-002)

12.1.4.3 Gould 6041 & 6741 Installation Manual (306-006330-100)

12.1.5 Hardware Design Manuals/User's Manuals

12.1.5.1 Input/Output Processor (IOP) Model 8000 and 8001, User Interface Manual (310-000890-001)

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12.1.6 Site Preparation Manuals

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12.1.7.2 Gould 6041 and 6741 System Manual (312-006330-100)

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12.1.10.2 MPX-32, Release 3.4 Volume I Overview and System Services (323-001551-400)

12.1.10.3 MPX-32, Release 3.4 Volume II Utilities and Processors (323-001552-400)

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12.-- Victoreen R45, R46, R47, R49, R53, Panel Assemblies

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12.-- 5115A Display Editor/Keyboard User's Manual (130-5115-003)

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12.-- Aycon 15 Color Graphics System 5215A Display Generator, Operations and Maintenance Manual (150-6040-031)

12.-- Slow-Scan Analog Patriot Series, High-Resolution Color Monitors, Operation and Maintenance (150-8800-001)

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12.- Climatronics Corp.

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- 12.– Engineering Design Specification for 64 Conductor Twist-N-Flat Cable Assembly Dwg. No. AE-314-5096
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12.- Conrac Display Products

- 12.– Installation, Operation, and Maintenance Manual Model 7211 RGB Color Monitor (IB-106517-999)

12.- Control Data Corporation

- 12.– CDC Storage Module Drive, BK6XX, BK7XX, Installation and Checkout, General Maintenance Information, Preventative Maintenance, Tests and Adjustments, Trouble Analysis, Repair and Replacement, Volume 1 (83322310)
- 12.– CDC Storage Module Drive, BK6XX, BK7XX, General Description, Operation, Theory of Operation, Discrete Component Circuits, Hardware Reference Manual (83322320)
- 12.– CDC Storage Module Drive, BK6XX, BK7XX, Diagrams, Wire Lists, Parts Data, Volume 2 (83325380)
- 12.– Guide for Disk Drive Operator, 9764/9766 SMD's (83323780)

12.- Dataproducts

- 12.– 300 LPM/600 LPM/1000 LPM Acoustic Cabinet Line Printers, Maintenance Guide Vol. I (DpC267788A)
- 12.– 300 LPM/600 LPM/1000 LPM Acoustic Cabinet Line Printers, Maintenance Guide Vol. II (DpC267788A)

12.- Dialight

- 12.– Dialight Instruction Sheet (5100-127-0244-00)

12.- Digitec Corp

- 12.– Digitec Model 2210 Multimeter
- 12.– Digitec®, IQ-280A Series, Intelligent Digital Panel Meters Voltmeter/Ammeter Models, Models 2810A, 2811A, 2812A, and 2820A (P/N 88-02800A-01, Rev. E-1)

12.- Durgin & Browne Incorporated

- 12.– Applications, Installation and Operating Manual Preset Timer (AM-4020)

12.- Dynalantic Corp.

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12.-- User Manual Dynalantic Synchroscope (P/N D232D41010-1)

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12.- Electronic Resources (Division of Whittaker)
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12.- Hewlett Packard
- 12.-- 5201L Scaler-Timer Operating and Service Manual (02279-1)

12.- Imprimis Technology Incorporated
- 12.-- Imprimis Sabre Eight-Inch Module Drive, PA8A1, PA8D1, PA8A2, PA8D2, General Description Operation Installation and Checkout Parts Data, Hardware Maintenance Manual Vol. 1 (83325410)
- 12.-- Imprimis Sabre Eight-Inch Module Drive, PA8A1, PA8D1, PA8A2, PA8D2, General Maintenance Information Trouble Analysis Repair and Replacement Hardware Maintenance Manual Vol. 2 (83325420)
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- 12.-- Speedomax 430 Series Recorders (Model 431-436 Incl.) Directions (177821. Rev. C1)
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12.- Liebert
- 12.-- Liebert Dataware Installation Manual 50-150 kVA (SL-20144)

12.- Moore Industries
- 12.-- Instruction Manual SCT Signal Converter (146-701-00E)
- 12.-- User's Manual IPT Current-To-Pressure Transmitter (170-701-00D)

12.- Moore Products
- 12.-- Service Instructions M/P Control Stations "P53" Remote - Set Circuit (SD524P53T)

12.- Pine Instrument Co.
- 12.-- Bentley-Nevada Interface Drawing No. AB06BENT

12.- Rochester Instruments Systems
- 12.-- ET-1215 Dual Current/Voltage Alarm with Fixed Deadband (A-1067-593)

12.- Seiko Instruments
- 12.-- Seiko Instruments CH-5300 Color Hardcopier Maintenance Procedures (C2-MMP01)
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12.- Storage Technology Corporation
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- 12.-- StorageTek, 1960 Series Tape Subsystem, Field Engineering Maintenance Manual, IPC PN Compatibility MMLL (PN91657-7)
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12.- Tektronix

- 12.-- 4632 Hard Copy Unit Service Manual (070-1686-04)
- 12.-- Tektronix 4693DX Color Image Printer Device Driver (070-6468-01)

12.- Televideo Systems, Inc

- 12.-- 9220 Video Display Terminal, Operator's Manual (131977-00)
- 12.-- Televideo 9220 Video Display Terminal Maintenance Manual (131979-00)

12.- Texas Instruments

- 12.-- Tigraph 200A User's Manual (2493502-0001) (Esterline Angus Instrument Corp.)

12.- Tracor Westronics

- 12.-- Instruction and Maintenance Manual, D5E
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12.- Unholtz-Dickie Corporation

- 12.-- Vibration Test Equipment Operating and Servicing Instructions Model 1112H(0) Signal Conditioner

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- 12.-- Installation, Operation and Service Instructions Series 7984 Predetermining Counter/ Totalizer 115 Vac (FS576013-075)

12.- Victoreen, Inc.

- 12.-- Installation, Operation, and Maintenance Instruction Manual High Range Simulator Model 876A-1-S8 (PN 876A-1-S8-1)
- 12.-- Installation, Operation, and Maintenance Instruction Manual Simulator Model 856-10-S3 (PN 856-10-S3-1)
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12.- Westinghouse

- 12.-- Westinghouse, Combustion Control Div., Optimac Electronic Recorder (IB 104-601)

12.- Yokogawa Corporation of American

- 12.-- Instruction Manual Model SIHK Indicator (with alarm) Yew Series 80 (IM 1B4B8-01E)
- 12.-- Instruction Manual Models SLCD-151, -171, -251, -271 (style E) Indicating Controller Yew Series 80 (IM 1B4C1-03E)
- 12.-- Technical Manual Expert Set-Turning Controllers Yew Series (TI-IB4C0-01E)

12.- Wang Laboratories

- 12.-- The Wang Professional Computer, Printer Support Diskette Release 6.0, Customer Software Release Notice (715-1604)
- 12.-- The Professional Computer, Printer Software Administration Guide (715-0693A)

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12.– The LCS15 Printer with Desktop Systems Overview (715-1179)

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   H. Determination of Proper C_L for an Admittance
   I. Development of Proper Model-to-Model Interfacing
   J. Modeling of Various Valve Characteristics
   K. Modeling of Single-Phase Fluid Tank Liquid Parameters
   L. Technique for Concentration Transport
   M. Modeling of Single-Phase Tank Liquid Parameters
   N. Modeling of Gas Space Parameters in Closed Tanks Using the Ideal Gas Law
   O. Modeling of Piping Network Fluid Mass
   P. Modeling of Stratification in Tanks
   Q. Modeling of Self-Regulating Pressure Control Valves
   R. Model Interface with the Heat Exchanger Handler
   S. Model Interface with the Pump Handler
   T. Modeling of Compressible Gas Systems as a Single-Phase Network
   U. Library Function Usage in Single-Phase Fluid Models
   V. Model Interface with the Check Valve Handler
   W. Simplified Heat Transfer Calculation Methods for Use in Single-Phase Fluid Models
3. Equilibrium Multiphase Fluid Systems Models
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   B. Simplifications and Justifications
   C. Equilibrium Two-Phase Fluid Systems Pressure Equations
      - Pressure Equations in Saturation Condition
      - Pressure Equation for a Solid Tank
      - Solution of the Pressure Equation
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      - Simple Tanks
      - Heat Exchangers

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E. Tank Levels
- Horizontal Cylindrical Tanks

F. Concentration of Nondecaying Species

4. Non-Equilibrium Multiphase Fluid Systems Models

A. Containment Model - Fundamental Techniques
- Introduction
- System Model Arrangement
- Fluid Nodes - Flow Links: Concepts
- Fluid Nodes - Flow Links: General Description

B. Containment Model - Implementation
- Program Organization
- Model Simplifications and Justifications
- System Conservation Equations
- Process Models
- Numerical Solution
- Physical Properties of Fluids
- Other Numerical and Utility Routines

C. Reactor Coolant System Model - Fundamental Techniques
- Introduction
- Model Components
- Interior Fluid Nodes
- Exterior Fluid Nodes
- Internal Flow Links
- Exterior Flow Links
- RCS Overview
- RCS Solution

D. Reactor Coolant System Model (RCS) - Implementation
- Program Description
- Special Simulation Items and Interfaces
- Assumptions
- Simplifications
- Description of Equations
  - Mass and Energy Balances Module (RCH)
  - Parameters and Properties Module (RCM)
  - Flow Solution Module (RCW)
  - Interface Module (RCX)

E. Steam Generator Model
- Steam Generator Recirculating Flow
- Steam Generator Homogenized Node Energy Balances

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- Steam Generator/Main Steam Generator Pressures and Steam Flows
  - Assumptions and Approximations for Calculations of Pressures and Steam Flows
  - Steam Generator Pressures and Steam Line Flows
- Alternative Steam Line Solution Technique
- Model for Heat Transfer Between Reactor Coolant System and Steam Generator
  - Assumptions and Approximations for the Heat Transfer Calculations
  - Nodalization
  - Primary Hot Leg and Cold Leg Temperature Profile
  - Secondary Temperature Profile
- Heat Transfer to Steam Generator Bundle Nodes
  - Calculation of Heat Fluxes
  - Heat Transfer to Primary Side Nodes
  - Heat Transfer Resistances

F. Reactor Coolant Pump Model (RCP)
- Assumptions
- Simplifications
- Preliminary Calculations

5. Electrical Systems Models

A. Fundamental Techniques
- Introduction
- Brief History of Electrical Modeling
- Electrical Machinery Modeling Techniques
  - Swing Equation - Basics
  - Swing Equation for an Induction Motor
  - Swing Equation for the Diesel Generator
  - Electrical Representation of a Synchronous Machine
  - Direct and Quadrature Axis Coordinate System
  - Modeling Saturation
  - Main Generator/Switchyard Electrical Interface
  - Voltage Regulators, Exciters, and the IEEE
  - Electrical Representation of an Induction Motor
  - Model of a DC Motor
  - Model of an AC Synchronous Motor
  - Various Types of Overcurrent Protection Devices
  - Induction Disk Overcurrent Devices
  - Main Generator, Diesel Generator, and Other Protective Relays

B. Network Models
- Introduction
- Network Theory
  - Derivation of the Mathematical Model

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- Terminology
- Derivation of the Transformer Model
- Electrical Model References, Implicit and Explicit

6. Instrumentation and Control Systems Models
   A. Introduction
   B. Fundamental Techniques
      - Forward Difference
      - Z-Transform
   C. Algorithm for Basic Control Blocks
      - Filter or Lag Unit
      - Lead Lag Unit
      - Impulse or Rate Unit
      - Typical Control Look
      - Simulation of Logic Elements
   D. Controllers
      - Assumptions and Simplifications
      - Mathematical Derivation
      - Nonlinear Effects and Auto-Manual Transfer
      - Appendix
7. Radiation Monitoring System
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   B. Model Summary
   C. All Models Detail
   D. Transport Model
   E. Detector Model
   F. Simplifications and Justifications

VI. STANDARD LIBRARIES FOR MATHEMATICAL MODELING

1. A New Steam Property Library
   A. Naming Convention
   B. Derivation
      - Cubic Spline Saturation Line Properties
      - Extrapolation Superheated and Subcooled Steam Properties
      - Basic Cubic Spline Evaluation
   C. Use of the New Steam Property Library
   D. Steam Property Code Size, Speed, Accuracy, Completeness, and Consistency
   E. Installation of the Steam Property Library
   F. Steam Property Function Descriptions

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SECTION 14 ACCEPTANCE TEST PROCEDURES

14.1 Integration Tests

14.1.1 PUMPxx Component Handler Tests

14.1.1.1 PUMP01
14.1.1.2 PUMP02
14.1.1.3 PUMP03
14.1.1.4 PUMP04
14.1.1.5 PUMP05
14.1.1.6 PUMP06
14.1.1.7 PUMP07
14.1.1.8 PUMP08
14.1.1.9 PUMP09
14.1.1.10 PUMP10
14.1.1.11 PUMP11
14.1.1.12 PUMP12
14.1.1.13 PUMP13
14.1.1.14 PUMP14
14.1.1.15 PUMP15
14.1.1.16 PUMP16
14.1.1.17 PUMP17
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14.1.1.19 PUMP19
14.1.1.20 PUMP20
14.1.1.21 PUMP21
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14.1.1.23 PUMP23
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14.1.1.25 PUMP25
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14.1.1.31 PUMP31
14.1.1.32 PUMP32
14.1.1.33 PUMP33
14.1.1.34 PUMP34
14.1.1.35 PUMP35
14.1.1.36 PUMP36
14.1.1.37 PUMP37

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14.1.1.38 PUMP38
14.1.1.39 PUMP39
14.1.1.40 Intentionally Omitted
14.1.1.41 PUMP41
14.1.1.42 PUMP42
14.1.2 VALVExx Component Handler Tests
14.1.2.1 VALVE01
14.1.2.2 VALVE02
14.1.2.3 VALVE03
14.1.2.4 VALVE04
14.1.2.5 VALVE05
14.1.2.6 VALVE06
14.1.2.7 VALVE07
14.1.2.8 VALVE08
14.1.2.9 VALVE09
14.1.2.10 VALVE10
14.1.2.11 VALVE11
14.1.2.12 VALVE12
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14.1.2.19 VALVE19
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14.1.2.25 VALVE25
14.1.2.26 VALVE26
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14.1.2.28 VALVE28
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14.1.2.30 VALVE30
14.1.2.31 VALVE31
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14.1.2.33 VALVE33

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14.1.2.34 VALVE34
14.1.2.35 VALVE35
14.1.2.36 VALVE36
14.1.2.37 VALVE37
14.1.2.38 VALVE38
14.1.2.39 VALVE39
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14.1.2.41 VALVE41
14.1.2.42 VALVE42
14.1.2.43 VALVE43
14.1.2.44 VALVE44
14.1.2.45 VALVE45
14.1.2.46 VALVE46
14.1.2.47 VALVE47
14.1.2.48 VALVE48
14.1.2.49 VALVE49
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14.1.2.51 VALVE51
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14.1.2.53 VALVE53
14.1.2.54 VALVE54
14.1.2.55 VALVE55
14.1.2.56 VALVE56
14.1.2.57 VALVE57
14.1.2.58 VALVE58
14.1.2.59 VALVE59
14.1.2.60 VALVE60
14.1.2.61 VALVE61
14.1.2.62 VALVE62
14.1.2.63 VALVE63
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14.1.2.65 VALVE65
14.1.2.66 VALVE66
14.1.2.67 VALVE67
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14.1.2.69 VALVE69
14.1.2.70 VALVE70

14.1.3 Software Model Integration Tests

14.1.3.1 RTC

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14.1.3.2	RCS
14.1.3.3	CFM
14.1.3.4	CRF
14.1.3.5	RCP
14.1.3.6	RVL
14.1.3.7	PRT
14.1.3.8	SGN
14.1.3.9	SGB
14.1.3.10	CVC
14.1.3.11	RHR
14.1.3.12	SIS
14.1.3.13	CCW
14.1.3.14	CNS
14.1.3.15	CNM
14.1.3.16	WPS
14.1.3.17	NSS
14.1.3.18	SFP
14.1.3.19	DIM
14.1.3.20	FPS
14.1.3.21	MSS
14.1.3.22	TCA
14.1.3.23	CFW
14.1.3.24	AFW
14.1.3.25	FWH
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14.1.2.29	CWS
14.1.3.30	CAS
14.1.3.31	HVA
14.1.3.32	GEN
14.1.3.33	DSG
14.1.3.34	SWD
14.1.3.35	SYN
14.1.3.36	Intentionally Deleted
14.1.3.37	GTG
14.1.3.38	MGA
14.1.3.39	SGS
14.1.3.40	SWS

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14.1.3.41 AWS
14.1.3.42 DRM
14.1.3.43 NIS
14.1.3.44 PCS
14.1.3.45 PPL
14.1.3.46 RMS
14.1.3.47 PSW
14.1.3.48 SSS
14.1.3.49 SMM
14.1.3.50 EPS
14.1.3.51 Intentionally Omitted
14.1.3.52 TSI

14.1.4 Periodic Handler Tests
14.1.4.1 Pump (PUMPHAND)
14.1.4.2 Single-Phase Heat Exchanger (HTX)
14.1.4.3 Motor (MOTHAND)
14.1.4.4 Valve (VLVHAND)
14.1.4.5 Safety and Relief Valve (SRV)
14.1.4.6 Major Check Valve (CHK)
14.1.4.7 Control Valve (CVH)
14.1.4.8 Instrumentation Channel (ICH)
14.1.4.9 Bistable (BST)
14.1.4.10 Visual Annunciator (ALMHAND)
14.1.4.11 Status Light (STATHAND)
14.1.4.12 Controller (CNH)
14.1.4.13 Plant Protection Relay (RLYFNC)
14.1.4.14 Time Delay (DELAY)
14.1.4.15 Degraded Power Function (PWRFNC)
14.1.4.16 Current and Potential Transformer Output Function (CTPTFNC)

14.1.5 Interlock Handler Tests
14.1.5.1 INTKL
14.1.5.2 INTKLB

14.1.6 Breakerxx Component Handler Tests
14.1.6.1 BKR01
14.1.6.2 BKR02
14.1.6.3 BKR03
14.1.6.4 BKR04
14.1.6.5 BKR05
14.1.6.6 BKR06

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14.1.6.7 BKR07
14.1.6.8 BKR08
14.1.6.9 BKR09

14.2 Pre-FAT Testing
14.2.1 Panel Hardware Verification Tests
14.2.1.1 Annunciators
14.2.1.2 Nameplates
14.2.1.3 Meters
14.2.1.4 Recorders
14.2.1.5 Status Lights
14.2.1.6 Controllers
14.2.1.7 Switches
14.2.1.7 Miscellaneous Components
14.2.2 120 Hour Continuous Operations Test
14.2.3 Hardware Test Equipment and Special Tools
14.2.4 Noise Simulation Test
14.2.5 Certification of compliance to codes and standards
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14.2.6.1 I/O System Spare Capacity Test
14.2.7 Hardware Documentation
14.2.8 Computer Systems Tests
14.2.8.1 Computer Hardware Configuration Test
14.2.8.2 Spare Memory Test
14.2.8.2.1 Gould Computers Spare Memory Test
14.2.8.2.2 Sun Computers Spare Memory Test
14.2.8.3 Duty Cycle Test
14.2.8.3.1 Gould Computers Duty Cycle Test
14.2.8.3.2 Sun Computers Duty Cycle Rest
14.2.8.4 Computer Hardware Diagnostics
14.2.8.4.1 Self Diagnostic Test
14.2.8.4.2 Level 1 Macro Test
14.2.8.4.3 Level 2 Macro Test
14.2.8.5 Instructor Station Display Response Test
14.2.9 Voltage and Ground Test
14.2.10 Display Systems Test
14.2.11 Communication System Test
14.2.12 Overtemperature Test
14.2.13 Emergency Trip Test

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14.3 Westinghouse FAT Tests

- 14.3.1 Simulator Control Systems Tests
  - 14.3.1.1 Instructor System Test
  - 14.3.1.2 Remote Simulator Control Test
  - 14.3.1.3 Hardware Diagnostics Test
  - 14.3.1.4 Instructor Station Display Response Test
- 14.3.2 Individual System Tests
  - 14.3.2.1 Excore Nuclear Instrumentation System (NIS)
  - 14.3.2.2 Plant Control System (PCS)
    - 14.3.2.2.1 Steam Dump Control Test
    - 14.3.2.2.2 Reactor Control Test
    - 14.3.2.2.3 Feedwater Control Test
    - 14.3.2.2.4 Pressurizer Pressure Control Test
    - 14.3.2.2.5 Pressurizer Level Control Test
    - 14.3.2.2.6 Rod Insertion Limit Test
    - 14.3.2.2.7 Steam Generator Water Level Control Test
  - 14.3.2.3 Plant Protection Logic System (PPL)
  - 14.3.2.4 Electrical Distribution System (EPS)
    - 14.3.2.4.1 Equipment/Electrical Supply Bus Connections
    - 14.3.2.4.2 Interconnecting Breaker Logic
  - 14.3.2.5 Radiation Monitoring System (RMS)
- 14.3.3 Integrated System Tests ANS-3.5,1985, Section 4.1
  - 14.3.3.1 Initial Condition Verification and Control Board Lineup Checks
    - 14.3.3.1.1 Cold Shutdown, BOL
    - 14.3.3.1.2 Hot Standby, BOL
    - 14.3.3.1.3 100% Power, BOL
    - 14.3.3.1.4 100% Power, MOL
    - 14.3.3.1.5 100% Power, EOL
    - 14.3.3.1.6 100% Power, Coastdown
- 14.3.4 Steady State Drift Test ANS-3.5, 1985, Section 4.1
  - 14.3.4.1 100% Power, BOL, Eq. Xe.

Note: Numbers in parentheses correspond to the numbers in parentheses in the indicated section of ANS-3.5, 1985.

- 14.3.5 Heat and Mass Balance Tests ANS-3.5, 1985, Section 4.1 (2)
  - 14.3.5.1 100% Power Heat Balance
  - 14.3.5.2 75% Power Heat Balance
  - 14.3.5.3 NSSS Mass Balance
  - 14.3.5.4 BOP Mass Balance

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14.3.6 Startup Tests ANS-3.5, 1985, Section 3.1.1

14.3.6.1 Core Physics Tests (9)

14.3.6.1.1 Initial Criticality

14.3.6.1.2 NIS Overlap Test

14.3.6.1.3 Rod Worth Test

14.3.6.1.4 Boron Worth Test

14.3.6.1.5 Isothermal Temperature Coefficient

14.3.6.2 Pressurizer Heater and Spray Capability Test (10)

14.3.7 Normal Operations Tests ANS-3.5, 1985, Section 3.1.1

14.3.7.1 Plant Heatup from Cold Shutdown Draindown to Hot Standby (1,3)

14.3.7.2 Reactor Startup (2)

14.3.7.3 Plant Startup from Zero Power Condition to Full Power Operation (3,5)

14.3.7.4 Operations at Power (6)

14.3.7.5 Plant Shutdown from Full Power Operation to Zero Power Condition (8)

14.3.7.6 Plant Cooldown from Zero Power to Cold Shutdown Condition (8)

*14.3.7.7 Plant Recovery from Reactor Trip (4)

14.3.8 Failure Tests ANS-3.5, 1985, Section 3.1.2

14.3.8.1 Auxiliary Feedwater System

14.3.8.1.1 AFW Pump Discharge Header Break (Flex Leak) (10)

14.3.8.2 Compressed Air System

14.3.8.2.1 Compressed Air System Header Break (2)

14.3.8.2.2 Instrument Air Compressor Trip (2)

14.3.8.3 Component Cooling Water System

14.3.8.3.1 Leak in Component Cooling Water Pump Suction Header (Flex Leak) (8)

14.3.8.3.2 Thermal Barrier Heat Exchanger Leak (8)

14.3.8.4 Incore Nuclear Instrumentation

None

14.3.8.5 Condensate and Main Feedwater

14.3.8.5.1 Main Feed Pump Discharge Line Break (OC) (9,20)

14.3.8.5.2 Loss of Condenser Vacuum (5)

14.3.8.5.3 Main Feedwater Pump Trip (9)

14.3.8.6 Containment and Containment HVAC

None

14.3.8.7 Containment Spray System Failures

None

* This test also fulfills Manual Reactor Trip transient for ANS-3.5, Appendix B, Section B.2.2.

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14.3.8.8	Control Rod Drive		
	14.3.8.8.1	Stuck Rod (Trippable)	(12)
	14.3.8.8.2	Dropped Rod (Stationary Gripper)	
	14.3.8.8.3	IRPI Blown Fuse	(22)
14.3.8.9	Chemical and Volume Control		
	14.3.8.9.1	Charging Pump Suction Header Leak	(18)
	14.3.8.9.2	Charging Line Leak Inside Containment	(18,1b)
	14.3.8.9.3	Volume Control Tank Leak	(18,1b)
	14.3.8.9.4	Boric Acid Filter Plugs	(17)
	14.3.8.9.5	RCP #1 Seal Failure	
	14.3.8.9.6	RCP #2 Seal Failure	
	14.3.8.9.7	Spurious Opening of MOV-333	(17)
	14.3.8.9.8	Charging Pump Speed Controller Failure	(18)
	14.3.8.9.9	Charging Pump Reduced Capacity	(18)
14.3.8.10	Circulating Water		
	14.3.8.10.1	Condenser Tube Leak	
14.3.8.11	Diesel Generator		
	None		
14.3.8.12	Turbine Control		
	14.3.8.12.1	Turbine Trip Failure	(23)
14.3.8.13	Electrical Distribution		
	14.3.8.13.1	Loss of Station Service Transformer	(3)
	14.3.8.13.2	Loss of Unit Aux Transformer	
14.3.8.14	Fire Protection		
	14.3.8.14.1	Plant Fire	
14.3.8.15	Feedwater Heaters, Extractions, Drains, and Vents		
	14.3.8.15.1	Feedwater Heater Tube Leak (HP)	
	14.3.8.15.2	Feedwater Heater Tube Leak (LP)	
14.3.8.16	Main Generator		
	14.3.8.16.1	Loss of Main Transformer	(3)
	14.3.8.16.2	Generator Trip Failure	(16)
14.3.8.17	Gas Turbine Generator		
	None		
14.3.8.18	Heating, Ventilation, and Air Conditioning		
	None		
14.3.8.19	Inplant Computer		
	None		
14.3.8.20	Meteorological Monitoring		
	None		

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14.3.8.21	Main Generator Auxiliaries		
	14.3.8.21.1	Core Monitor Failure	
14.3.8.22	Main Turbine, Main Steam		
	None		
14.3.8.23	Excore Nuclear Instrumentation		
	14.3.8.23.1	Source Range Blown Fuse	(21)
	14.3.8.23.2	Source Range Channel High Voltage Failure	(21)
	14.3.8.23.3	Intermediate Range Channel Compensating Voltage Failure	(21)
	14.3.8.23.4	Power Range Channel Summing and Level Amp Failure	(21)
14.3.8.24	Nuclear Sampling		
	None		
14.3.8.25	Plant Control System		
	14.3.8.25.1	Variable Heater Reduced Capacity	(18)
	14.3.8.25.2	B/U Group Heater Reduced Capacity	(18)
	14.3.8.25.3	TREF Program Failure	(17)
	14.3.8.25.4	Rod Speed Dead Band CTL Failure	(17)
	14.3.8.25.5	Rod Speed Control Failure	(17)
	14.3.8.25.6	Steam Dump Turbine Trip Control Failure	(17)
	14.3.8.25.7	Steam Dump Load Rej Control Failure	(17)
	14.3.8.25.8	Steam Dump Arming Solenoid Failure	(22)
	14.3.8.25.9	Pressurizer Level Programmer Failure	(18)
	14.3.8.25.10	S/G Level Programmer Failure	(22)
	14.3.8.25.11	Pressurizer Level Controller Failure	(18)
	14.3.8.25.12	Feedwater Flow Controller Failure	(22)
	14.3.8.25.13	T_{avg} Bistable Failure	(22)
	14.3.8.25.14	Feedwater Isolation Failure	(9,23)
	14.3.8.25.15	Wide Range RTD Failure	(22)
	14.3.8.25.16	Wide Range Pressure Failure	(22)
	14.3.8.25.17	Pressurizer Level Transmitter Failure (High)	(22)
	14.3.8.25.18	Steamline Flow Transmitter Failure (High)	(22)
	14.3.8.25.19	Steam Generator Level Transmitter Failure (Low)	(22)
	14.3.8.25.20	First Stage Press Transmitter Failure (Low)	(22)
	14.3.8.25.21	Feedline Flow Transmitter Failure (Low)	(22)
	14.3.8.25.22	S/G Press Transmitter Failure (High)	(22)
	14.3.8.25.23	Containment Press Transmitter Failure (High)	(22)
14.3.8.26	Plant Protection Logic		
	14.3.8.26.1	Reactor Trip to Turbine Trip Failure	(24)

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	14.3.8.26.2	Inadvertent Reactor Trip-Relay Failure	(19)
	14.3.8.26.3	SI Train Failure-Relay	(23)
	14.3.8.26.4	Containment Isolation Failure	(23)
14.3.8.27	Pressurizer Relief Tank		
	None		
14.3.8.28	Reactor Coolant Pump		
	14.3.8.28.1	RCP Locked Rotor	(4)
	14.3.8.28.2	RCP Sheared Pump Shaft	(4)
	14.3.8.28.3	RCP Trip (Below P-8)	
14.3.8.29	Reactor Coolant System with Pressurizer		
	14.3.8.29.1	RCS Control Rod Ejection	(1b,c)
	14.3.8.29.2	Steam Generator Tube Leak	
	14.3.8.29.3	Loop Flow Transmitter Failure	(22)
	14.3.8.29.4	Cold Leg RTD Failure (Narrow Range)	(22)
	14.3.8.29.5	Pressurizer Spray Valve Failure	
14.3.8.30	Residual Heat Removal		
	14.3.8.30.1	RHR Pump Discharge Header Leak	(7)
14.3.8.31	Radiation Monitoring		
	14.3.8.31.1	Containment High Activity	
	14.3.8.31.2	Plant Vent High Activity	
	14.3.8.31.3	High Radioiodine Activity	
14.3.8.32	Reactor Makeup Water		
	14.3.8.32.1	RMW Pump Discharge Line Break	
14.3.8.33	Reactor Core		
	None		
14.3.8.34	Reactor Vessel Level Indication		
	14.3.8.34.1	Sensing Line Leak	
14.3.8.35	Spent Fuel Pool		
	14.3.8.35.1	Refueling Flange Leak	
14.3.8.36	Steam Generator Blowdown		
	None		
14.3.8.37	Steam Generator, Main Steam Header, and Drains		
	14.3.8.37.1	Steam Generator Safety Valve Failure	(17)
	14.3.8.37.2	Atmospheric Steam Dump Valve Controller Failure	(17)
	14.3.8.37.3	Stuck Open Condenser Dump Valve	(17)
14.3.8.38	Service Gas System		
	None		
14.3.8.39	Safety Injection System		
	None		

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14.3.8.40 Switchyard

14.3.8.40.1 138 KV Line Fault (3)

14.3.8.41 Service Water System

14.3.8.41.1 Service Water to CCW Leak (7,6)

14.3.8.42 Synchronizer

None

14.3.8.43 Turbine Supervisory Instrumentation

None

14.3.8.44 Waste Processing System

None

14.3.9 Malfunction Scenario Tests

14.3.9.1 Loss of All AC Power

14.3.9.2 Loss of All Feedwater

14.3.9.3 Natural Circulation Cooldown with Steam Void in Vessel (RVLIS available)

14.3.9.4 SGTR with Loss of Reactor Coolant - Saturated Recovery Desired

14.3.9.5 Inadvertent Turbine Trip (Maximum power level that does not cause an immediate reactor trip)

14.3.9.6 RCS Rupture

14.3.9.7 Main Steamline Break Inside Containment

14.3.9.8 Main Steamline Break Outside Containment

14.3.9.9 Simultaneous Trip of Both Main Feedpumps

14.3.9.10 Simultaneous Closure of All Main Steam Isolation Valves

14.3.9.11 Simultaneous Trip of All Reactor Coolant Pumps

14.3.9.12 Maximum Rate Power Ramp 100% to 75% to 100%

14.3.9.13 LOCA with Blackout

14.3.9.14 Pressurizer PORV Stuck Open Without High Head SI

14.3.9.15 Turbine Trip

14.3.9.16 Loss of Instrument Air

14.3.9.17 Main Generator Trip

14.3.9.18 Main Feedline Break Inside Containment

14.3.9.19 Main Feedline Break Outside Containment

14.3.9.20 Fuel Clad Failure

14.3.9.21 Loss of Condenser Vacuum

14.3.9.22 Loss of Shutdown Cooling (All RHR Pumps Trip)

14.3.9.23 Manual Reactor Trip

14.3.9.24 RCP Trip at 100% Power

14.3.9.25 Reactor Fails to Trip (ATWS)

14.3.9.26 Loss of Service Water (ALL SWS Pumps Trip)

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14.3.9.27 Loss of CCW (All CCW Pumps Trip)
14.3.9.28 Loss of Protective System Channel
14.3.9.29 Stuck Rod
14.3.9.30 Dropped Rod (Moveable Gripper)
14.3.9.31 Logic Cabinet Urgent Failure
14.3.9.32 Improper Bank Overlap
14.3.9.33 Uncontrolled Rod Motion
14.3.9.34 Uncoupled Rod
14.3.9.35 Plugged Boric Acid Filter
14.3.9.36 Pressurizer Pressure Controller Failure
14.3.9.37 Power Range Channel Failure
14.3.9.38 Intermediate Range Channel Failure
14.3.9.39 Source Range Channel Failure
14.3.9.40 Pressurizer Level Transmitter Failure (Low)
14.3.9.41 Steam Generator Level Transmitter Failure (High)
14.3.9.42 First Stage Pressure Transmitter Failure (High)
14.3.9.43 Feed Flow Transmitter Failure (High)
14.3.9.44 Steam Generator Pressure Transmitter Failure (Low)
14.3.9.45 Steam Flow Transmitter Failure (Low)
14.3.9.46 Hot Well Level Controller Failure
14.3.9.47 AFW Pump Trip
14.3.9.48 SIS Pump Trip
14.3.9.49 Loss of 6.9 KV Bus
14.3.9.50 Loss of 480 V Bus
14.3.9.51 Loss of 125 VAC Bus
14.3.9.52 Loss of 120 VDC Bus
14.3.9.53 Loss of Station Aux Transformer
14.3.9.54 Diesel Generator Trip
14.3.9.55 Charging Line Leak Outside Containment
14.3.9.56 Pressurizer PORV Failure
14.3.9.57 Pressurizer Safety Valve Failure

14.4 Con Edison FAT Tests

The Con Edison FAT will be a repeat of the tests in sections 14.2.8.2, 14.2.8.3, 14.3.3, 14.3.4, 14.3.5, 14.3.6, 14.3.7 and 14.3.9.

14.5 On-site Tests

The on-site tests will be a repeat of the tests in sections 14.2.2, 14.2.4, 14.2.5, 14.2.8, 14.2.9, 14.2.10, 14.2.11, 14.3.3 and 14.3.7.

14.5.1 90 Day Availability Test

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SECTION 15 DESIGN DATABASE REPORT

Output of CMS Database.

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SECTION 16 FAILURE DESCRIPTIONS

16.1 System Failures

16.1.1 Auxiliary Feedwater
16.1.2 Compressed Air
16.1.3 Component Cooling Water
16.1.4 Incore Nuclear Instrumentation
16.1.5 Condensate and Main Feedwater
16.1.6 Containment and Containment HVAC
16.1.7 Containment Spray
16.1.8 Control Rod Drive
16.1.9 Chemical and Volume Control
16.1.10 Circulating Water
16.1.11 Diesel Generator
16.1.12 Turbine Control
16.1.13 Electrical Distribution
16.1.14 Fire Protection
16.1.15 Feedwater Heaters, Extractions, Drains and Vents
16.1.16 Main Generator
16.1.17 Gas Turbine Generator
16.1.18 Heating, Ventilation and Air Conditioning
16.1.19 Inplant Computer
16.1.20 Meteorological Monitoring
16.1.21 Main Generator Auxiliaries
16.1.22 Main Turbine, Main Steam
16.1.23 Excore Nuclear Instrumentation
16.1.24 Nuclear Sampling
16.1.25 Plant Control
16.1.26 Plant Protection Logic
16.1.27 Pressurizer Relief Tank
16.1.28 Reactor Coolant Pump
16.1.29 Reactor Coolant System and Pressurizer
16.1.30 Residual Heat Removal
16.1.31 Radiation Monitoring
16.1.32 Reactor Makeup Water
16.1.33 Reactor Core
16.1.34 Reactor Vessel Level Indication
16.1.35 Spent Fuel Pool
16.1.36 Steam Generator Blowdown
16.1.37 Steam Generator, Main Steam Header, and Drains
16.1.38 Service Gas

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SECTION 16 FAILURE DESCRIPTIONS (cont)

16.1.39 Safety Injection
16.1.40 Switchyard
16.1.41 Service Water
16.1.42 Synchronizer
16.1.43 Turbine Supervisory Instrumentation
16.1.44 Waste Processing
16.1.45 Auxiliary Turbines
16.1.46 City Water
16.1.47 Digital Impact Monitor

16.2 Component Failures
16.2.1 Circuit Breakers
16.2.2 Valves
16.2.3 Pumps
16.2.4 Heat Exchangers
16.2.5 Bistables
16.2.6 Transmitters and Controllers
16.2.7 Relays
16.2.8 Motors

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SECTION 17 SIMULATION INSTALLATION SERVICES

17.1 Training Facility Specification

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ATTACHMENT E2-F

Training Module List
[Existing Simulator Module Index]

ATTACHMENT E2-F
SIMULATOR MODULE INDEX

SIMULATOR TRAINING SCENARIOS

PERFORM THE REQUIRED IMMEDIATE ACTION STEPS IN E-0 FOR AN SI

PERFORM THE REQUIRED ACTIONS IN E-0 TO DIAGNOIS A RCS LOCA

PERFORM THE REQUIRED ACTIONS IN E-0 TO DIAGNOIS A SGTR

PERFORM THE REQUIRED ACTIONS IN E-0 TO DIAGNOIS A SECONDARY LOSS OF COOLANT

PERFORM THE REQUIRED ACTIONS IN E-0 FOR A REACTOR TRIP WITH NO SI

PERFORM REQ ACT FOR NAT CIRC C/D W/STM VOID (W/RVLIS) IAW ES-0.3

PERFORM THE REQUIRED ACTIONS IN E-0 TO DIAGNOSE AN INADVERTANT SI

PERFORM REQ ACT FOR NAT CIRC C/D W/STM VOID (W/0 RVLIS) IAW ES-0.4

PERFORM REQ ACT FOR COLD LEG RECIRC ES-1.3

PERFORM REQ ACT FOR HOT LEG RECIRC ES-1.4

PERFORM REQ ACT FOR POST S/G COOLDOWN WITH BACKFILL IAW ES-3.1

PERFORM REQ ACT FOR POST S/G COOLDOWN WITH BLOWDOWN IAW ES-3.2

PERFORM REQ ACT FOR POST S/G COOLDOWN WITH STEAM DUMP IAW ES-3.3

PERFORM REQ ACT FOR RECOVERY FROM LOSS OF ALL AC W/SI IAW ECA 0.2

PERFORM REQ ACT FOR LOSS OF EMERGENCY COOLANT RECIRC IAW ECA-1.1

PERFORM REQ ACT FOR UNCONTROLLED DEPRESS OF ALL S/G IAW ECA-2.1

PERFORM REQ ACT FOR SGTR W/LOCA SUBCOOLED RECOVERY DESIRED ECA-3.1

PERFORM ACTIONS FOR A SMALL LOCA IAW ES-1.2

PERFORM REQUIRED ACTIONS FOR A REACTOR TRIP IAW ES-0.1

PERFORM REQUIRED ACTIONS FOR A STEAM GENERATOR TUBE RUPTURE IAW E-3

PERFORM REQ ACT FOR SGTR W/LOCA SATURATED RECOVERY DESIRED ECA-3.2

PERFORM REQUIRED ACTIONS FOR A STEAM LINE RUPTURE IAW E-2

PERORM REQUIRED ACTION FOR A PLANT H/U FROM <20OF TO >20OF IAW POP-1.1

PERFORM REQUIRED ACTIONS FOR LOSS OF ALL AC IAW ECA-0.0

PERFORM REQ ACT FOR SGTR W/LOSS OF PRESSURIZER CONTROL ECA-3.3

PERFORM REQUIRED ACTIONS FOR INADVERTANT SAFEGUARDS ACTUATION IAW ES-1.1

REACTOR STARTUP TO THE POAH IAW POP-1.2

REACTOR SHUTDOWN IAW POP-3.1

PERFORM ACTION FOR LOSS OF HEAT SINK IAW FR-H.1

PERFORM REQUIRED ACTIONS FOR A LOCA IAW E-1

PERFORM REQUIRED ACTIONS FOR LOCA OUTSIDE CONTAINMENT IAW ECA-1.2

PERFORM REQUIRED ACTIONS FOR LOSS OF FORCED FLOW/NATURAL CIRC IAW ES-0.2

PERFORM THE REQUIRED ACTIONS FOR A ATWS TAW FR-S.1

PERFORM REQ ACT FOR RESPONSE TO INADEQUATE CORE COOLING TAW FR-C.1

PERFORM REQ ACT FOR RESPONSE TO DEGRADED CORE COOLING IAW FR-C.2

PERFORM REQ ACT FOR RESPONSE TO IMMINENT PTS IAW FR-P.1

PERFORM REQ ACT FOR RESPONSE TO ANTICIPATED PTS IAW FR-P.2

PERFORM REQ ACT FOR HIGH CONTAINMENT PRESSURE IAW FR-Z.1

PERFORM REQUIRED ACTIONS FOR A PLANT H/U FROM <35OF TO >35OF IAW POP-1.1

PERFORM REQUIRED ACTIONS FOR A PLANT S/U FROM ZERO POWER TO 20OMW IAW POP-1.3

PERFORM REQUIRED ACTIONS TO RAISE PLANT POWER TO FULL POWER IAW POP-1.3

PERFORM REQUIRED ACTIONS FOR OPERATION AT POWER IAW POP-2.1

PERFORM REQUIRED ACTIONS TO S/D PLANT TO ZERO POWER CONDITION IAW POP-3.1

PERFORM REQUIRED ACTIONS TO INCREASE RCS BORON CONC FOR SDM IAW POP-3.1/3.2

PERFORM REQUIRED ACTIONS FOR A PLANT C/D TO LESS THAN 35OF IAW POP-3.3

PERFORM REQUIRED ACTIONS FOR A PLANT C/D FROM <35OF TO <20OF IAW POP-3.3

MONITOR THE CRITICAL SAFETY FUNCTION STATUS TREES

PERFORM THE REQUIRED ACTIONS TO RESPOND TO CONTAINMENT FLOODING IAW FR-Z.2

PERFORM REQ ACTIONS/RECOVER FROM A DROPPED ROD

MITIGATE THE CONSEQUENCES OF A CONTINUOUS ROD WITHDRAWAL/INSERTION

PERFORM REQUIRED ACTIONS FOR FAILURE OF CONTROL BANKS TO MOVE

PERFORM REQUIRED ACTIONS FOR ROD MOTION OUT OF SEQUENCE

COOLDOWN THE RCS

PERFORM REQ ACTIONS/OPERATE THE RCS WITH HIGH RADIOACTIVITY

PERFORM REQ ACTIONS/OPERATE THE RCS WITH EXCESSIVE LEAKAGE

START AN RCP

STOP AN RCP

PERFORM REQ ACTIONS/RECOVER FROM A SEAL FAILURE

FILL A RCP SEAL STANDPIPE

PERFORM THE REQUIRED ACTIONS FOR A LOSS OF AN RCP

BORATE THE RCS

DILUTE THE RCS

LINEUP THE MAKEUP CONTROL SYSTEM FOR AUTOMATIC OPERATION

OPERATE THE MAKEUP CONTROL SYSTEM IN MANUAL

START, STOP, AND SHIFT CHARGING PUMPS

SHIFT LETDOWN ORIFICES

PERFORM REQ ACTIONS/RECOVER FROM A FAILURE OF THE VCT MAKEUP CONTROL SYSTEM

ESTABLISH EXCESS LETDOWN

PERFORM REQUIRED ACTIONS FOR AN UNCONTROLLED REACTIVITY ADDITION

TRANSFER CHARGING PUMP FROM MANUAL TO AUTOMATIC CONTROL IAW SOP-3.1

START ADDITIONAL CHARGING PUMPS WHEN WARMUP TIME NOT AVAILABLE IAW SOP-3.1

TRANSFER CONTROL OF OPERATING CHARGING PUMP IAW SOP-3.1

ESTABLISH/INCREASE LETDOWN FLOW IAW SOP-3.1

PLACE THE RHR SYSTEM IN SERVICE

REMOVE RHR FROM SERVICE

PLACE OPS IN SERVICE

STARTUP THE CCW SYSTEM

PERFORM REQ ACTIONS/RECOVER FROM A LOSS OF CCW

PERFORM REQ ACTIONS/RECOVER FROM CCW INLEAKAGE

OPERATE THE PRESSURE CONTROL SYSTEM IN INDIVIDUAL MANUAL

PERFORM THE REQUIRED ACTIONS FOR A WIDE RANGE PRESSURE CHANNEL FAILS LOW

PERFORM THE REQUIRED ACTIONS FOR A WIDE RANGE PRESSURE CHANNEL FAILS HIGH

SHIFT PRESSURE CONTROL FROM AUTOMATIC TO MAIN MANUAL CONTROL

OPERATE THE LEVEL CONTROL SYSTEM IN MANUAL

PLACE THE LEVEL CONTROL SYSTEM IN AUTOMATIC

PERFORM REQ ACTIONS/RECOVER FROM A LEVEL CHANNEL FAILURE (HIGH)

PERFORM REQ ACTIONS/RECOVER FROM A LEVEL CHANNEL FAILURE (LOW)

PERFORM REQUIRED ACTIONS FOR MALFUNCTION OF ROD POSITION INDICATOR

PERFORM REQ ACTIONS/RECOVER FROM A SOURCE RANGE FAILURE

PERFORM REQ ACTIONS/RECOVER FROM AN INTERMEDIATE RANGE FAILURE

PERFORM REQ ACTIONS/RECOVER FROM A POWER RANGE FAILURE

REMOVE AN EXCORE NI CHANNEL FROM SERVICE

RECOVER FROM A S/G LEVEL CHANNEL FAILURE (LOW)

RECOVER FROM A S/G PRESSURE CHANNEL FAILURE (HIGH)

RECOVER FROM A STEAM FLOW CHANNEL FAILURE (LOW)

RECOVER FROM A S/G LEVEL CHANNEL FAILURE (HIGH)

RECOVER FROM A S/G FEED FLOW CHANNEL FAILURE (HIGH)

RECOVER FROM A S/G STEAM FLOW CHANNEL FAILURE (HIGH)

RECOVER FROM A S/G STEAM PRESSURE CHANNEL FAILURE (LOW)

RECOVER FROM A S/G FEED FLOW CHANNEL FAILURE (LOW)

DRAIN THE ACCUMULATORS

ADJUST ACCUMULATOR PRESSURE

FILL THE ACCUMULATORS USING THE HHSI PUMPS

PERFORM REQ ACTIONS/OPERATE THE S/G WITH EXCESSIVE TUBE LEAKAGE

PERFORM REQ ACTIONS/RECOVER FROM A HEATER DRAIN PUMP TRIP

PERFORM REQ ACTIONS/RECOVER FROM A FAILURE OF THE 1ST STAGE PRESS INSRT LOW

STARTUP THE TURBINE

SYNCHRONIZE THE UNIT TO THE GRID

CHANGE UNIT LOAD

SHUTDOWN THE UNIT

PERFORM REQ ACTIONS/RECOVER FROM A FAILURE OF THE 1ST STAGE PRESS INSTR HIGH

EXCITE THE MAIN GENERATOR

TRANSFER THE EXCITER FROM DC TO AC CONTROL

PERFORM REQUIRED ACTIONS FOR EXCESSIVE LOAD DECREASE

STARTUP THE TURBINE LUBE OIL SYSTEM

PERFORM REQ ACTIONS/RECOVER FROM A LOSS OF CONDENSER VACUUM

STARTUP THE CONDENSATE SYSTEM

SHUTDOWN THE CONDENSATE SYSTEM

PERFORM REQ ACTIONS/RECOVER FROM A TRIP OF A CONDENSATE PUMP

PERFORM REQUIRED ACTIONS FOR CONDENSATE SYSTEM HIGH SALINITY

SHIFT OPERATING MODES OF THE MBFP SPEED CONTROLLER

STARTUP THE MBFP

SHUTDOWN THE MBFP

PERFORM REQ ACTIONS/RECOVER FROM MBFP SPEED CONTROLLER MAL-FUNCTIONS

PERFORM REQ ACTIONS/RECOVER FROM A MBFP TRIP

PERFORM REQ ACTIONS/RECOVER FROM A FEED SYSTEM LEAK

PERFORM REQUIRED ACTIONS FOR LOSS OF FEEDWATER (FRV CLOSURE)

LINEUP THE AFW SYSTEM FOR NORMAL PLANT OPERATIONS (STANDBY)

LINEUP CITY WATER TO THE AFW SYSTEM

CONTROL STEAM GENERATOR LEVELS FROM THE CCR USING THE #22 ABFP

TRANSFER FROM AUXILIARY FEED TO BYPASS FEED IAW SOP-21.1

ENERGIZE 6.9 KV FROM 138 KV SYSTEM

PERFORM REQUIRED ACTIONS FOR LOSS OF OFFSITE POWER

STARTUP THE CIRCULATING WATER SYSTEM

PERFORM REQ ACTIONS/RECOVER FROM THE LOSS OF A CIRCULATING WATER PUMP

PERFORM REQ ACTIONS/RECOVER FROM A LOSS OF SERVICE WATER

PERFORM REQ ACTIONS/RECOVER FROM A LOSS OF INSTRUMENT AIR

TRANSFER THE 6.9 KV BUSES TO THE UNIT AUX. TRANSFORMER

TRANSFER THE 6.9 KV BUSES TO THE STATION AUX. TRANSFORMER

PERFORM REQ ACTIONS/RECOVER FROM A LOSS OF A 480 VAC BUS

PERFORM THE REQUIRED ACTIONS/RECOVER FOR LOSS OF VARIOUS MCC'S

PERFORM REQUIRED ACTIONS FOR LOSS OF CONTAINMENT INTEGRITY

PERFORM REQUIRED ACTIONS FOR LEAK IN VESSEL HEAD O-RING

PERFORM REQUIRED ACTIONS FOR NARROW RANGE HOT LEG TEMP CHANNEL FAILS HIGH

PERFORM REQUIRED ACTIONS FOR NARROW RANGE HOT LEG TEMP CHANNEL FAILS Low

PERFORM REQUIRED ACTIONS FOR NARROW RANGE COLD LEG TEMP CHANNEL FAILS HIGH

PERFORM REQUIRED ACTIONS FOR NARROW RANGE COLD LEG TEMP CHANNEL FAILS Low

[END OF LIST]