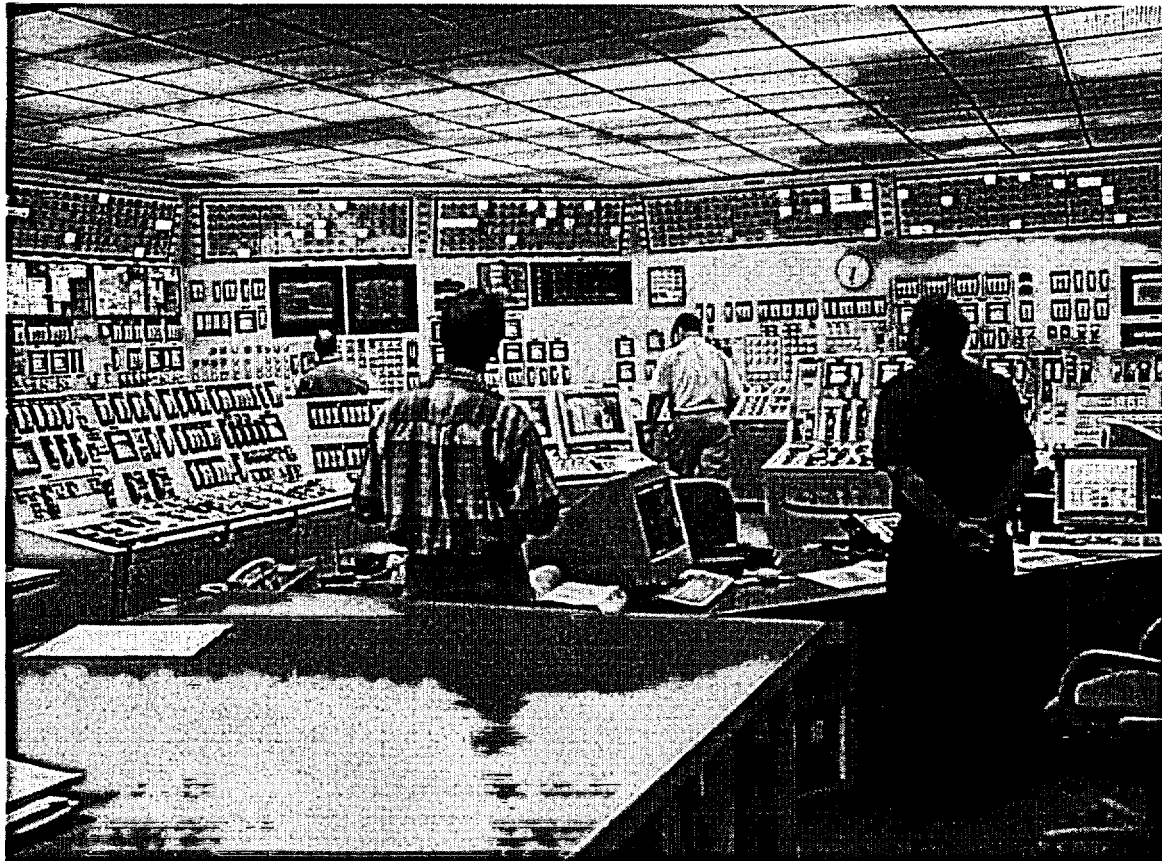


November 30, 1999

CALLAWAY PLANT SIMULATOR

4 YEAR REPORT

**Callaway Plant Simulator**  
**SIMULATOR CERTIFICATION**  
**Four Year Report**  
**(1999)**



CALLAWAY PLANT SIMULATOR4 YEAR REPORT**I. Introduction**

The Callaway Plant Simulator Four Year Report (1999) is a supplement to the Simulation Facility Certification form (NRC Form-474), the Simulator Annual Reports and Simulator operating procedures. This report briefly provides a description of the simulator, the Certification Checklist and the current status of the Configuration modifications. Additional information concerning specific tests is available upon request.

**II. Simulator Information**

Simulator Type:	Reference Plant Simulator
Manufacturer:	Westinghouse Electric Corp.
Owner/Operator:	Union Electric Company
Reference Plant:	Callaway Plant
Plant Location:	Fulton, Missouri
Plant Type:	Pressurized Water Reactor
Plant Rating:	3565 Megawatts thermal
Date available for training:	February 1982
Type of report:	Four Year Report (1999)

**III. Simulator Procedures**

The Simulator is controlled, operated, tested and modified utilizing the following Callaway Plant procedures:

APA-ZZ-00021	Conduct of Operations - Training
TDP-IS-00001	Callaway Plant Simulator Operation and Maintenance
TDP-IS-00002	Simulator Configuration Management
	Callaway Plant Training Department, Training Guide

**CALLAWAY PLANT SIMULATOR****4 YEAR REPORT****IV. Simulator Database**

Controlled plant drawings and procedures are used as a basis for handler logic and system flow calculations. The Callaway Equipment list, the Plant Engraving list, and Plant computer logs are also used as inputs for the Simulator data base. Plant logs are used whenever possible to compare Callaway Plant data to Simulator response to ensure that the Simulator data base closely matches the plant. Feedback from plant operators is also an essential part of maintaining the Simulator up-to-date with the Plant. The plant data retrieval system called WinData is also used for historical retrieval of past data.

**V. Major Changes Since Last Four Year Report**

The following are the major items that were changed on the simulator:

1. The Encore RSX computer system was replaced with a Dell PowerEdge 2300 Dual 450 MHz Pentium compute node and a Gateway Pentium server and a Gateway Pentium Instructor client workstation.
  - a. Conversion of ASSEMBLY code to first Microsoft FORTRAN and then to DIGITAL FORTRAN.
  - b. Conversion of Encore FORTRAN to first Microsoft FORTRAN and then to DIGITAL FORTRAN.
  - c. Replacement of the SIMMAIN Task with the RNI Instructor Station written in Microsoft C++.
  - d. DATAPOOL was replaced by an SQL database.
  - e. Replacement of the four ADI Boards with the SIM2000 Master Controller to connect the computer system to the control room panel I/O system controllers.
  - f. Replacement of the display generator driven RM11 with a personal computer connected via Ethernet.
  - g. Replacement of the HSD link to the stimulated plant process computer system with a connection via Ethernet.

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2. Model Replacements and additions
  - a. Replacement of the core model with an advanced 2250 node core model from CAE.
  - b. Replacement of the reactor coolant system model with an advanced two-phase flow model from CAE.
  - c. Replacement of the containment model with an advanced containment model from CAE.
  - d. Addition of ROSE developed ventilation models from CAE.
  - e. Addition of the radiation transport model, contained within all models from CAE.
3. Replacement of the VAX-3800 with a VAX-4000 plant process computer system as part of the Y2K upgrade process.
4. Control room modification
  - a. Replacement of all control room furnishings.
  - b. Addition of several workstations to the control room.
5. A total of 895 individual SIFT change items were tested from December 1995 through November 1999.

CALLAWAY PLANT SIMULATOR4 YEAR REPORT**VI. Outstanding Plant Modification Items**

All plant modifications completed in the plant prior to the last 24 months have been implemented on the simulator, if a simulator impact was designated during the modification review process.

Pending plant modifications or plant modifications implemented in the plant within the last 24 months but not yet implemented in the simulator include:

SIFT	DESCRIBE	RFR	MOD
97-01-14	Simulator Lighting Changes	RFR-017600A	MP 97-3007A
97-02-20	Replace EG HV-101/102 with "jog" control	RFR-017669A	MP 97-1014
97-04-02	Simulator Room Changes	RFR-017568A	MP 97-1009
97-04-03	Add annunciator for KA PV-11	RFR-17024A	MP 97-1015A
97-04-10	OTDT alarm change	RFR-02408	NA
97-04-17	Timer for Immediate Borate additions	RFR-17915	MP 97-1019
97-04-18	GK HIS-30 indications	RFR-16150	NA
97-04-22	MCB accum pressure labels	RFR-18142	NA
97-05-03	Stator Cooling Water leak detection	RFR-18271	98-2008
97-05-04	Replace FWIV actuator units	RFR-18272	98-1004
97-05-08	S/G AE check valve removal	RFR-18355	97-1004
97-05-10	LSELS change to AFW controls	RFR-18377B	MP 99-1036
97-05-12	Step Counter replacement	RFR-18398	MP 97-1031
97-05-17	MCB trend recorder replacement	RFR-18436	NA
97-05-18	Eval of small LOCA and CTMT param's	RFR-18440A	NA
97-05-25	Retire LE RT-59	RFR-18464A	98-1016
97-06-15	Modify the controls for the Emer Exh Da	RFR-18564A	97-1040
98-01-05	OPDT & OTDT setpoint changes	RFR-18637	NA
98-04-21	Change KA system Comp cooling supply	RFR-18775	NA
98-06-04	RFR 18901A	RFR-18901A	MP 98-1026
98-08-23	Realign EC HV-11 & 12 open	RFR-19190A	
98-09-02	Gaitronics mod removes paging at RL005	RFR-16435B	NA
98-10-14	VDE2002 & VDE3004 Jog Controls	RFR-16228A	MP 95-2018
98-11-20	Replace RM11	RFR-71816	MP 97-1018
98-12-16	Meter scale & Overflows	RFR-18885	NA
99-01-02	ANLI00003 meter scale green band	RFR 19384A	NA
99-01-03	Add green band to several meters	RFR-10700A	NA
99-01-09	CHANGE ALARM SETPOINTS OF GTRE59/60	RFR-19274	MP 99-1001
99-01-10	WTP MISC TROUBLE ANNUN	RFR-16168B	NA

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99-01-11	ESW pump baseline data change	RFR-10632D	NA
99-01-14	CTMT sump indicator changes	RFR-19007	MP 98-1028
99-01-15	Inst Air isolation to MFRV's	RFR-18959	MP 98-2015
99-01-17	Remove EM PI-947 from MCB	RFR-16668B	MP 97-1027
99-04-04	MFRV replacement	RFR-18590	MP 98-2005
99-04-19	Removal of BM HV-5, 6, 7 & 8	RFR-18778	NA
99-04-21	Voltage annunciator 134D	RFR-19321	MP 98-2023
99-04-23	Change MFP block switch lamps to LED	RFR-19399	MP 99-1005
99-04-24	New core - CYCLE 11	RFR-19427	MP 99-1007
99-04-25	SG wide range level calibration	RFR-19566	NA
99-05-01	BTRS mimic and BGHCV0387 changes	RFR-19431	NA
99-05-02	RI015 EDG labels	RFR-19669	NA
99-05-04	Change gears for BG HV-8112	RFR-19831	MP 99-1031
99-05-22	CVCS LTDN valve / flow change	RFR-017677A	MP 97-1011A
99-05-24	GE RE-92 Sensitivity Change	RFR-06693B	MP 95-2020
99-06-09	Setpoint change for bmre25 & sjre02	RFR-19875	NA
99-06-11	EDG governor controls replaced	RFF-16932	
99-06-12	ESW piping changes	RFR-19916	
99-06-13	Replace all meters on RL001 thru RL006	RFR-19949	
99-06-15	Setpoint change Annun 72A	RFR-19961	
99-06-17	CTMT EMERG Sump Level with RCS06 leak	RFR-00317D	NA
99-06-20	STEAM DUMPS MODELING TO COND AREAS	RFR-16356	
99-06-23	MFRV Actuator Replacement	RFR-18590A	MP 98-2005A
99-06-24	GE RE-0092 Sample Tap Locations	RFR 06693A	MP 95-2020A
99-07-14	Spent fuel pool meter scale change	RFR-017932	MP 97-1016
99-07-17	Main Generator Protection Relay	RFR-019793A	MP 99-1030A
99-07-23	ROD INSERTION LO LIMIT BANK "D"	RFR-20113	NA
99-07-25	ADD SOUND SYSTEM TO SIMULATOR	RFR-20129A	NA

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**VII. Certification Testing Checklist**

The attached Callaway Plant Simulator Certification Checklist No. 1, Attachment 1, indicates the completion of the required performance tests. Specific testing data, for each test, is available upon request.

The Callaway Plant Simulator Certification Checklist, Certification Tests and Configuration Control Tests that were performed during the previous four years have been reviewed and accepted, meeting the testing requirements of 10CFR55.45, Reg. Guide 1.149 - 1987 and ANSI/ANS-3.5-1985.

Certification tests are divided into three distinct groups:

- Annual Tests - performed each year
- Yearly Tests - 25% performed during this year
- Random Tests - verify operation of various instructor interface features

**VIII. Simulator Testing Plan**

The projected Callaway Plant Simulator Testing Plan, Attachment 2, indicates the Configuration modification tests and Certification tests to be completed. The plan also identifies the four year testing schedule from January 2000 through December 2003.

**VIX. Documentation**

The summary of all simulator tests that have been performed during any specific year are documented in the Simulator Annual Report. This report is maintained on-site as a QA record. The individual certification tests contain the detailed testing documentation information required in ANSI/ANS 3.5 - 1985 Appendix A, Nuclear Power Plant Simulators for use in Operator training. The individual certification tests are also maintained on-site as QA records.

**X. References**

- Title 10, Code of Federal Regulations, Part 55, "Operator Licenses".
- American National Standard Nuclear Power Plant Simulators for Use in Operator Training, ANSI/ANS-3.5-1985
- U. S. Regulatory Commission Regulatory Guide 1.149, Nuclear Power Plant Simulation, Facilities for use in Operator License Examinations, April 1987

Person(s) Completing Checkoff List (Print)	Initials	CALLAWAY PLANT SIMULATOR
<u>Hustm</u>	<u>QH</u>	CERTIFICATION
① HALVERSON	<u>SM</u>	CHECK LIST
_____	_____	Date/Time Started <u>1999/1/22 2137</u>
_____	_____	Date/Time Completed <u>1999/1/22 220</u>

① VERIFICATION THAT ALL TESTS HAVE BEEN COMPLETED AND ACCEPTED.

- 1. ENVIRONMENTAL EVALUATION
- 1.1 CONTROL ROOM

**NOTE:** These items are reviewed on a 4-year cycle. The performance is required only for the year in which they are scheduled if the control room was modified and an evaluation indicated that the item had a training impact.

- QH 1. Obtained latest revision copy of Reference Plant Control Room floor plan. Obtained drawing of Reference Plant Simulator control room floor plan. A comparison of the floor plans was completed. A list of difference is available for inspection.
- QH 2. Compared lighting in the plant and simulator control rooms. A list of differences is available for inspection.
- QH 3. Communications systems available in the plant and simulator control rooms have been compared. Differences are indicated on the attached list.
- QH 4. Furnishings in the plant and the simulator have been reviewed. A list of differences is attached.

1.2 CONTROL PANELS

**NOTE:** These items are reviewed on a 4-year cycle. The performance is required only for the year in which they are scheduled if the control panels were modified and an evaluation indicated that the item had a training impact.

- QH 1. Pictures of the Reference Plant Main Control Boards have been taken. Pictures of the Reference Plant Simulator Main Control Boards have been taken. A comparison of the pictures was completed. The pictures are available for inspection.



- gr 2. The control panels have been verified to be correct as compared to the plant engraving list. The engraving list is available for inspection.
- gr 3. The simulator will support the plant computer keyboard functions identified on the attached list.
- gr 4. The simulator will support the plant computer displays identified on the attached list.
- gr 5. The simulator will support plant computer trending capabilities identified on the attached list.
- gr 6. The simulator will support the plant computer alarm displays identified on the attached list.

### 1.3 SPECIAL FEATURES

**NOTE:** This item is reviewed on a 4-year cycle. The performance is required only for the year in which it is scheduled.

- gr 1. Special features available on the Callaway Plant Simulator are indicated on the attached list.

### 2. REAL TIME VERIFICATION

**NOTE:** This item is performed on a 4 year cycle. The performance is required only for the year it is scheduled in.

- gr 1. The simulator runs in real time.

### 3. STEADY STATE OPERATIONS

#### 3.1 INITIAL CONDITIONS

- gr 1. For each initial condition to be certified technical specification logs have been taken and are available for both the plant and the simulator.
- gr 2. Heat Balances have been performed at 50%, 80%, and 100% Initial conditions.

#### 3.2 STEADY STATE STABILITY

- gr 1. Stability tests have been performed at 100% Initial conditions.

4. NORMAL OPERATIONS

**NOTE:** These items are performed on a 4 year cycle. The performance is required only for the year they are scheduled in.

- ✓
1. Normal plant operations are performed during the control board certification course. Problems identified via feedback from instructors and students are either corrected or indicated on the attached list.
- g
2. All applicable surveillance procedures were performed on the simulator. Problems identified via feedback from instructors and students are either corrected or indicated on the attached list.

5. TRANSIENTS

- g
1. Transients listed in Appendix B of ANSI/ANS-3.5-1985 have been graphed on the simulator. The tests have been reviewed by the SCRG. Problems identified have either been corrected or are identified on the attached list.

6. SIMULATOR OPERATING LIMITS

**NOTE:** This item is reviewed on a 4-year. The performance is required only for the year in which it is scheduled if the operating limits were modified and an evaluation indicated that the item had a training impact.

- g
1. When parameters monitored on the SPDS panel are exceeding the expected values on amber light is displayed on the panel warning operators that an unusual condition exists and that indications can no longer be relied upon.

7. INSTRUCTOR INTERFACE

7.1 MALFUNCTIONS

**NOTE:** These items are performed on a 4 year cycle. The performance is required only for the year they are scheduled in.

- g
1. 25% of all ANSI 3.1.2 MALFUNCTIONS have been tested. The tests have been reviewed by the SCRG. Problems identified have either been corrected or are identified on the attached list.

7.2 LOCAL OPERATOR ACTIONS

- gr
1. Random selection testing has been conducted to validate the operability of local operator actions. The tests have been reviewed by a committee with members from operations, engineering and training. Problems identified have either been corrected or are identified on the attached list.

7.3 PLANT PARAMETERS

- gr
1. Random selection testing has been conducted to validate the operability of local operator actions. The tests have been reviewed by a committee with members from operations, engineering and training. Problems identified have either been corrected or are identified on the attached list.

7.4 BISTABLES

- gr
1. Random selection testing has been conducted to validate the operability of local operator actions. The tests have been reviewed by a committee with members from operations, engineering and training. Problems identified have either been corrected or are identified on the attached list.

7.5 ANNUNCIATORS

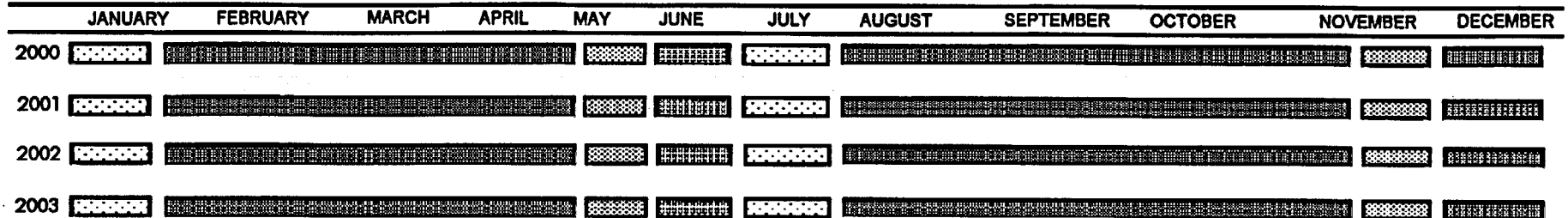
- gr
1. An automatic testing sequence has been conducted to validate the operability of the annunciators. The tests have been reviewed by a committee with members from operations, engineering and training. Problems identified have either been corrected or are identified on the attached list.

7.6 COMPONENT OVERRIDE

- gr
1. Random selection testing has been conducted to validate the operability of local operator actions. The tests have been reviewed by a committee with members from operations, engineering and training. Problems identified have either been corrected or are identified on the attached list.

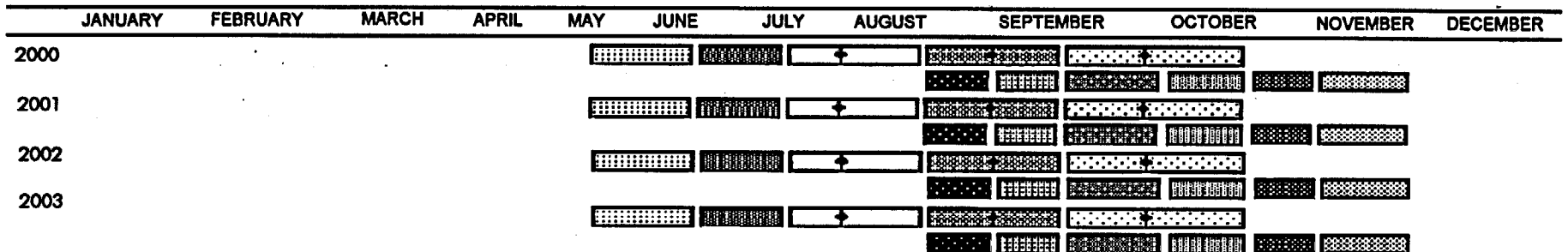
# CALLAWAY PLANT SIMULATOR TESTING PLAN

JANUARY 2000 - DECEMBER 2003



## CONFIGURATION TESTING SCHEDULE 4 YEAR \*

[dots] Shift Development to Training    [dots] Modification testing    [dots] Major hardware changes    [dots] initial conditions snapshots



## CERTIFICATION TESTING SCHEDULE 4 YEAR \*

[dots] snapshot & log testing    [dots] steady state & heat balance testing    [ ] normal operations & transient testing    [dots] instructor interface testing  
 [dots] corrections testing    [dots] control room evaluation    [dots] plant slide review    [dots] engraving list review    [dots] plant computer capabilities  
 [dots] special features    [+ ] real-time testing    [dots] prepare simulator Annual Certification report

\* NOTE: The actual schedule may vary due to Plant outages, however, all required testing will be performed prior to submittal of the Simulator Annual Certification Report.