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MAR. 9, 1972

Babcock & Wilcox
ATTN: Mr. James C. Deddens
Manager, Nuclear Service
Power Generation Division
P. O. Box 1260
Lynchburg, Virginia 24505

Gentlemen:

This is in reply to your letter, dated December 13, 1971 regarding the acceptance of the B&W Nuclear Power Plant Simulator.

As you know, we have never evaluated a NPPS as an entity, but only as part of an overall training program leading to an individual establishing cold eligibility pursuant to Section 55.25(b) of 10 CFR Part 55.

Based on our understanding of the completeness of the simulator, we have determined that its use is acceptable in a training program outlined in our letter to you, dated December 18, 1968.

Enclosed is a copy of a summary of our understanding of the completeness of the B&W NPPS. Mr. Bursey and I will visit your facility on March 27, 1972 to conduct examinations of your most recent trainees, At that time I would like to discuss the above summary and the methods employed by your staff to evaluate the trainees.

Sincerely,

ORIGINAL SIGNED BY
P. F. COLLINS

Paul F. Collins, Chief
Operator Licensing Branch
Division of Reactor Licensing

Enclosure:
Summary - B&W NPPS

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B&W SIMULATOR

I. Major Systems and Components

A. The following systems are simulated in detail, giving ON/OFF and variable changes of parameters with the corresponding plant response.

1. Reactor Core

2. Primary Coolant System

   a. Reactor Coolant Pumps and Seal System

   b. Letdown and Makeup

   c. Pressurizer

   d. Boration/Deboration

3. Secondary Systems

   a. Steam Generators

   b. Turbine - Generator

   c. Condensate/Feedwater

   d. Feedwater Heaters

   e. Emergency Feedwater

   f. Steam Bypass and Reliefs

   g. Main Condenser

   h. Condenser Circulating Water

   i. Cooling Towers

4. ECCS Systems

   a. High Pressure Injection

   b. Low Pressure Injection

   c. Core Flood Tanks

d. Containment Ventilation

e. Reactor Building Spray

f. Recirculation Capability

5. Instrumentation & Control

a. Integrated Control System (Includes Reactor, Steam Generators, Turbine).

b. Ex-core Nuclear Instrumentation - Console display only.

c. Turbine - Generator

d. Primary and Secondary parameters, including operator selected displays and control inputs for multiple detectors.

6. Electrical Systems

a. 230 KV Switchyard

b. Unit Auxiliary, Main and Startup Transformers.

c. 6900V busses

d. 4160V busses

e. 480V busses

f. Diesel Generators

II. The following items are areas of possible weakness in the B&W Simulation:

A. Plant Computer - The on-line computer will be used as an operational aid only. Its program is being improved but it is presently limited to operator call-up of selected parameters. It does not monitor all sensers of a parameter which has several sensers (such as pressurizer level) and will therefore not give an alarm if a non-controlling senser fails.

There are no plans at present to use the computer for calculations such as reactivity balance or flux mapping.

B. In-Core Nuclear Instrumentation - A recorder logs the in-core outputs. There are no back panels or detailed instrumentation for this system. It is not used in the B&W training program to any extent. The instructor can enter a "Xenon Oscillation" condition which will effect the in-core readout but since this is no longer considered a problem on the B&W reactor, it is not stressed during operator training. The in-cores will not respond to a flux perturbation such as would be expected from a malpositioned or dropped control rod.

C. Ex-Core Nuclear Instrumentation - All three channels of nuclear instrumentation are simulated in detail. There is no control room equipment, however, other than console meters and recorders. One complete power range channel has been installed in a classroom for demonstration. Some consideration is being given to moving this equipment into the control room and including it in the simulation.

D. Area and Process Radiation Monitoring - Simulation is limited to the following:

1. Reactor Building High Radiation

2. Air Ejector Activity

These annunciators will accompany a casualty which causes high radiation in these specific areas. There is no breakdown for particulate or gaseous activity. The operator must request additional information from the instructor to evaluate the magnitude and type of radiation problem.

E. Auxiliary Systems - The following is a breakdown of auxiliary systems at the Rancho Seco (SMUD) reactor and the extent to which they are programmed at the B&W Simulator.

1. Nuclear Service Cooling Water & Nuclear Service Raw Water - No heat balance effect is simulated. Pumps ON/OFF will cause immediate temperature alarms on components cooled by the systems if all redundant pumps are stopped.

2. Component Cooling Water - Loss of CCW will not cause temperature alarms on the components (CRD's, RCP's, etc.) cooled. An interlock prevents starting of components unless

the CCW is operating. One exception is the Letdown Heat Exchanger for which the heat balance is simulated. Loss of CCW to this component will cause increasing letdown temperature and eventual isolation of letdown.

3. Turbine Plant Closed Cooling Water - Temperature alarms of associated components cooled by this system are triggered by the OFF position of the pumps.

4. Decay Heat Removal - This system also serves an ESF function and is simulated in greater detail than other auxiliary systems. Flows, temperatures, pressures, and heat balances are programmed.

5. Supervisory Panels - Several multi-point recorders are installed to monitor various secondary and primary parameters. These are usually not control signals, but rather give the operator additional information to help evaluate plant condition and suspected abnormalities. Some attempt is made at simulation but the response is only a gross representation. For example, the turbine supervisory panel is related to turbine speed. The recorder values will be those normal for the turbine speed and don't reflect changes in lubricating or cooling subsystems.

6. Diesel Generators - The diesel generators are simulated to start and load as at the actual reactor plant. Casualties such as trip or failure to start can be simulated. However, they are assumed to handle all loads on the emergency busses and will not show effects of being improperly loaded. Neither can the effects of malfunctions in support systems, such as cooling and lubrication, be simulated.

In none of the closed cooling water systems considered above are components other than pumps and heat exchangers simulated. Surge tanks, makeup and radiation monitors are not simulated. Provisions are not made to demonstrate leakage from the systems. Leakage from the letdown heat exchange into component cooling can be simulated but only to the extent of the effects of such leakage on the Primary Coolant System.

III. The capability of the B&W Simulator to demonstrate casualty conditions and transients of the Rancho Seco (SMUD) reactor was studied by comparing known simulator characteristics with the FSAR Safety Analysis of Rancho Seco.

A. Transients Considered In The Rancho Seco Safety Analysis

1. Core and Coolant Boundry Protection Analysis

a. Uncompensated Operating Reactivity Changes

(1) Boric Acid Depletion

(2) Xenon Transients

b. Startup Accident (Continuous Rod Withdrawal from a Subcritical Condition).

c. Rod Withdrawl Accident at Rated Power Operation

d. Moderator Dilution Accident

e. Cold Water Accident (Startup of Both Pumps in an Idle Loop).

f. Loss of Coolant Flow

g. Stuck-Out, Stuck-In, or Dropped Control Rod Accident.

h. Loss of Electric Power

2. Standby Safeguards Analysis (Accidents in Which One or More of the Protective Barriers are not Effective and Standby Safeguards are Required)

a. Steamline Failure

b. Steam Generator Tube Failure

c. Fuel Handling Accident

d. Control Rod Ejection Accident

e. Loss of Coolant Accident

f. Letdown Line Rupture

B. Simulator Capability

1. The B&W Simulator can demonstrate the plant response to all of the above accidents and transients with the following exceptions:

   a. Loss of Coolant Flow - Full simulation of all combinations of Reactor Coolant Pump trips is provided. The locked rotor accident, with the resultant loss of flow coastdown, is not simulated.

   b. Fuel Handling Accident - This accident involves buildings and equipment outside B&W's scope of simulation.

   c. Control Rod Ejection Accident - Not Simulated.

   d. Letdown Line Rupture - The Safety Analysis considers a rupture of the letdown line outside of the containment due to the radiological consequences of the spilled coolant. The accident is terminated when the leak causes primary pressure to decrease to 1600psig, giving a high pressure injection signal and containment isolation.

      The simulator can demonstrate a leak in the letdown line but the break is inside the reactor building. Response of the reactor plant is the same as that considered in the FSAR. Additionally, the effects of leakage on reactor building pressure and temperature are simulated.

The reactor plant simulation is by no means restricted to the above transients. There are 102 "defined" malfunctions - those which can be originated by the simulator instructor from his console. A wide variety of transients and degradation of control, instrumentation and mechanical systems can be demonstrated at the B&W simulator.