SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO FIRE PROTECTION, APPENDIX R TO
10 CFR PART 50, SECTIONS III G AND III L
CAROLINA POWER AND LIGHT COMPANY
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261

1 INTRODUCTION

On February 17, 1981, the fire protection rule for nuclear power plants, 10 CFR 50 and Appendix R to 10 CFR Part 50, became effective. This rule required all licensees of plants licensed prior to January 1, 1979, to submit by March 19, 1981; (1) plans and schedules for meeting the applicable requirements of Appendix R, (2) a design description of any modifications proposed to provide alternative safe shutdown capability pursuant to Paragraph III.G.3 of Appendix R, and (3) exemption requests for which the tolling provision of Section 50.48(c)(6) was to be invoked. Sections III.G and III.L of Appendix R are retrofit items to all pre-1979 plants regardless of previous SER positions and resolutions.

The licensee's report entitled "Safe Shutdown Capability Assessment and Proposed Modifications" was submitted by letter dated March 16, 1982. This report summarizes all of the work contained in the previous submittals and provides direct answers to the questions contained in the NRC generic letter 81-12.

The licensee has provided a safe shutdown analyses for fire events, and has proposed an alternate safe shutdown system. Our analysis and evaluation of this follows.

2 SYSTEMS USED FOR POST-FIRE SAFE SHUTDOWN

2.1 Systems Required for Safe Shutdown

Safe shutdown of the reactor is initially performed by rod insertion from the control room.

Reactor coolant inventory and the reactor shutdown are maintained by one of three charging pumps taking suction from the concentrated boric acid tanks or the refueling water storage tank (RWST).

Decay heat removal is accomplished by the auxiliary feedwater (AFW) pumps supplying water to the steam generators from the condensate storage tank. The atmospheric dump system (ADS) or the steam generator safety valves will be used to remove heat from the steam generators.

Primary system pressure is maintained by the pressurizer heaters and spray or the charging pumps taking suction from the boric acid tanks combined with letdown.

For cold shutdown, shutdown is maintained by increasing primary coolant boration using one of the three charging pumps taking suction from the boric acid tanks or the RWST.

Primary system cooling is done by the use of a LPSI pump to circulate water through the shutdown cooling heat exchanger where component cooling water is used as the heat sink. The component cooling water in turn is cooled by service water in the component cooling water heat exchanger.

2.2 Areas Where Alternative Safe Shutdown is Required

The separation criteria applied in developing the original H. B. Robinson plant design were not consistent with the separation requirements of 10 CFR 50, Appendix R. Consequently, an evaluation was required to determine whether to extensively reroute existing circuits to establish separation or to provide an alternate/dedicated shutdown capability. Particular problem areas include the control room, cable spreading room/relay room, battery room, and emergency switchgear room. Virtually all existing shutdown-related control and instrumentation circuits interface with one or more of these areas, and the highly congested equipment and raceway installations make it infeasible to establish adequate train separation within the areas. Therefore, the licensee in his submittal of March 16, 1982 has committed to provide an alternative control location, using a dedicated control panel to allow for safe shutdown operation in the event of a fire in any of the above areas. Additionally, the possibility of loss of offsite power concurrent with a fire in critical fire areas has necessitated the installation of a dedicated shutdown (DS) power generation and distribution system. The licensee's alternate safe shutdown system compliance is dicussed later on in this SER.

2.3 Section III.G.2 of Appendix R

The licensee has made a thorough analysis of all fire zones containing safety and shutdown related equipment and cabling. Of the total of 21 zones affected, five meet the requirements of Section III.G.2 of Appendix R. These are the two diesel rooms, the safety injection room, and the charging pump room. An additional three will not meet Section III.G.2 of Appendix R and exemptions have been requested for these areas. They include the component cooling pump room, the residual heat removal (RHR) pump pit, the pipe alley, and the service water pump (SWP) area.

The remaining 13 zones will be modified by a combination of alternate and dedicated shutdown systems as defined by 10 CFR 50, Appendix R. These modifications are listed in Section 6.0 of the licensee's report entitled "Safe Shutdown Capability Assessment and Proposed Modifications" of March 1982.

2.4 Alternate Safe Shutdown System

The major addition to the plant which will enable alternate shutdown is a dedicated on site power system, including a diesel (in addition to the two existing diesel units), a new shutdown bus (DS), and new 125 volt AC and 125 volt DC systems. The routing of the power and control cables for these

new power systems will insure that at least the following equipment is available for shutdown in case of fire in the areas mentioned in Paragraph 2.3 above.

- Charging Pump A
- Service Water Pump D
- Component Cooling Pump A
- Control Group of Pressurizer Heaters
- Primary Air Compressor
- RHR Pump (Repair including power cable installation required see Section 3.3)
- Specfic Valves required for shutdown
- Steam driven auxiliary feed pump lube oil pump

In addition a new control panel will be installed in the charging pump room for use if the main control room is affected by the fire. Instrumentation required for shutdown is available or will be re-added at the charging pump room panel, as follows:

- Reactor coolant temperature (both hot and cold legs)
- Nuclear instrumentation (source-range)
- Steam generator 1 level
- Steam generator 2 level
- Steam generator 3 level
- Pressurizer relief tank level (new)
- Pressurizer level
- Pressurizer pressure
- Pressurizer relief line power operated valves 455c and 456 position display
- Volume control tank level (new)
- RHR Flow (new)
- RHR relief line temperature (new)
- Letdown relief line temperature monitor (New)
- Incore temperature display (new)

Additional instrumentation displays will be provided at the turbine deck control panel to enable auxiliary feedwater pump and steam dump control. Displays are as follows:

- Steam generator levels 1, 2 and 3
- Pressurizer level and pressure
- Condensate storage tank level
- Reactor coolant system temperatures (3 loops hot and cold leg) (2 loops are new)

In addition, steam generator pressure is presently available at turbine deck control panel (gauges), which will be manned during shutdown, and in communication with the operator at the charging pump room control panel.

3 EVALUATION

3.1 Performance Goals

The alternate shutdown systems proposed will enable the achievement of the performance goals outlined in Paragraph III.L of Appendix R as follows:

3.1.1 Subcritical Reactivity Conditions and Reactor Coolant Inventory

The control rods will be inserted either manually or automatically (on loss of power). At least one charging pump (A) powered by the DS bus, or one safety injection pump (either A or C on emergency diesel(s)), using water from the normal charging system or the refueling water storage tank, will insert borated water to maintain subcritical reactivity conditions.

3.1.2 Heat Removal

Heat removal will be accomplished by natural circulation to the steam generators. The manually operated dumps or the code safeties will discharge steam to the atmosphere. The steam generator inventory (level) will be maintained by the steam drive auxiliary feed pump, or the motor driven auxiliary feed pumps on the emergency diesel buses.

3.1.2 Process Monitoring

The instrumentation listed in Section 2.4 will be provided and is capable of giving the direct readings required for control of the functions described in 3.1.1 and 3.1.2 above.

3.1.4 Supporting Functions

At least one component cooling pump (A) and one service water pump (D) will be capable of being powered from the DS bus (dedicated power supply as described in Section 2.4). The others are on the emergency diesel buses. The lube oil pump for the steam driven auxiliary feed pump will be powered by the DS bus.

3.2 72 Hour Requirement

By letter dated March 11, 1981, the licensee has requested an exemption to the requirements for achieving cold shutdown within 72 hours with loss of offsite power. The licensee's final design of achieving cold shutdown (repair to RHR Cabling) is dependent on the NRC approval or disapproval of this exemption request. The licensee objects to a requirement to place the plant in cold shutdown without off-site power. The rule does not require this. The rule requires that this capability be provided, but whether the plant is taken to shutdown or not after the occurrence of a fire is a decision that the operating staff at the plant would have to make based on the conditions at the time. The licensee has not established a need for this exemption. Cooldown using natural circulation, although not a preferred method, is an option that should be available to the operators. Therefore, the exemption request is denied and the licensee is required to furnish a plan for achieving and maintaining cold shutdown with 72 hours.

3.3 Repairs

In case of fire involving the RHR pumps or cables, the licensee proposes to make repairs by running a power cable from an available breaker on the DS bus to the pumps. Plans for this repair have not been completed but the licensee has committed to provide a procedure for such repairs and to maintain material for the repairs on site. Therefore, the licensee should effect repairs in a

time frame that will allow the plant to be brought to cold shutdown condition within 72 hours using onsite power only.

3.4 Associated Circuits and Isolation

The licensee conducted an extensive review of the present electrical installation to determine the plant's capability to meet the criteria as stated in Appendix R relating to safe shutdown. They concluded that the existing constraints made the necessary modifications impractical in general and impossible in some areas. Particular problem areas include the control room, cable spreading room/relay room, battery room, and emergency switchgear room. The licensee intends to provide safe shutdown capability consisting of a dedicated control panel and a dedicated DS power generation and distribution system and alternate power and control from the existing emergency buses E1 and E2.

The licensee intends to make the necessary modifications, which when completed will satisfy concerns for common bus, common enclosure and spurious signals as outlined in the clarification of generic letter of February 20, 1981.

As a result of a conference call with CP&L staff, NUS, BNL, and NRC staff which took place on July 28, 1982, it was confirmed that the licensee intends to reroute redundant or alternate trains wherever both were found to be housed in the same fire zone.

In addition to fuses and circuit breakers, switches are to be used to transfer loads and to isolate devices. Transfer to local control is annunciated in the control room. The licensee indicated that the switches are not NEMA, and or UL rated. However, the rating of these switches is not of a lesser quality than similar electrical devices presently used in the plant.

The licensee has provided two sets of control fuses in control circuitry of all the safe shutdown equipment such that a single hot short in the control circuitry will not jeopardize the availability of the safe shutdown equipment.

The licensee's analysis to satisfy the associated circuit concern is as follows:

3.4.1 Common Bus

Coordinated circuit breaker protection is provided for power and control circuits which are powered from the Dedicated Shutdown (DS) E1 and E2 buses.

3.4.2 Spurious Signal

To prevent inadvertent operation due to spurious signals, power and control cables to valves and safe shutdown equipment will be disabled during normal operation.

3.4.3 Common Enclosure

The licensee has installed a dedicated shutdown system, in which the dedicated/alternate trains are rerouted and run in physically separated conduits containing only dedicated/alternate shutdown cables and will meet III.G requirements. When the dedicated/alternate trains cannot be separated from the

redundant trains, fire barrier protection is provided. Fire suppression system is provided except in the areas where exemptions have been requested.

3.5 High/Low Pressure Interface

The licensee has identified a number of high/low pressure interfaces for which modifications will be made in order to protect against uncontrolled operation.

The interfaces and modifications are as follows:

INTERFACES	MODIFICATION
RHR suction link - Valve 750	Lockout circuit break to valve
RHR suction from containment - 860 A	Lockout circuit breaker to valve
Pressurizer relief block- V535 and V536	Provide capability to transfer power supply from 480V MCC-6 to 480V MCC DS. Alternate control located at the charging pump shut-down panel.
Chemical and volume control - system letdown orifice valves V200A and letdown isolated valve 460A	Reroute critical actuation circuits for valves 200A, 460A. Provide remote control switches at charging pump room shutdown panel. Provide transfer of power from normal plant power to DS bus.
Letdown inlet to non-regen; HTX, valves 204A, 204B	Provide capability to operate manually
Letdown inlet to regen; HTX, valves 460A, 460B	Provide capability to operate manually
Reactor heat vent solenoid valves 567, 568	Provide disconnect switches

Pressurizer vent solenoid valves 569, 570	Provide disconnect switches
Common Reactor heat/pressurizer vent solenoid valves 571, 572	Provide disconnect switches

3.6 Safe Shutdown Procedures and Manpower

The personnel available, as outlined in the licensee's submittal of March 1982, will include three operators plus five men available for the fire brigade. This manpower commitment is considered adequate. The procedures for cold shutdown repairs have not been finalized by the licensee. Therefore, licensee should have procedures available to effect RHR pumps and cables repairs in a time frame that will allow the plant to achieve cold shutdown within 72 hours.

4 CONCLUSION

In order to comply with the requirements of Appendix R the licensee had proposed alternative shutdown capability as discussed in Section 2.2. The alternative shutdown systems will enable the licensee to meet the performance goals of Paragraph III.L of Appendix R, 10 CFR 50, except for the requirement to achieve cold shutdown within 72 hours. The licensee has requested an exemption for this requirement but did not state a reason why the plant could not be provided with such a design capability. Therefore, the exemption is denied. In light of staff denial of the above discussed exemption request the licensee should provide the capability to achieve cold shutdown within 72 hours in accordance with Section III.L requirement of Appendix R.

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