UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION

ALTERNATIVE SHUTDOWN CAPABILITY

APPENDIX R TO 10 CFR 50

TURKEY POINT PLANT UNITS 3 AND 4

I Introduction

On February 17, 1981, the fire protection rule for nuclear power plants, 10 CFR 50.48 and Appendix R to 10 CFR 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 Section III.G.3 of Appendix R and (3) exemption requests for which the tolling provisions of Section 50.48(c)(6) were to be invoked. Section III.G of Appendix R, "Fire Protection of Safe Shutdown Capability" was retrofit to all pre-1979 plants regardless of previous SER positions and resolution.

The licensee in its October 7, 1983 submittal proposed modifications to provide alternate shutdown capability in accordance with Sections III.G.3 and III.L of Appendix R for the control room, cable spreading room and north-south breezeway. For all other plant areas the licensee has proposed modifications and/or exemptions such that the safe shutdown capability is in accordance with Sections III.G.1 and III.G.2 of Appendix R. This safety evaluation report is only for the alternate shutdown capability proposed to meet Sections III.G.3 and III.L of Appendix R. Our review is based on the information and commitments of the October 7, 1983 submittal. Previous submittals submitted by the licensee had maintained that the alternate shutdown capability did not have to be provided for any plant areas.

II Evaluation

A. Systems Used for Post-Fire Safe Shutdown

In the event of a fire concurrent with a loss of offsite power, the following systems are used to provide the shutdown capability for one unit. Reactor shutdown is initiated from the control room by a manual scram of the control rods, if an automatic scram has not occurred. Reactor coolant inventory and reactor shutdown reactivity are maintained by one of three centrifugal charging pumps taking suction from the refueling water storage tank. Primary system pressure is maintained by use of the pressurizer heaters and auxiliary spray. Overpressurization protection for the primary system is provided by the pressurizer safety-relief valves.

For hot standby/shutdown, decay heat removal is accomplished by the auxiliary feedwater system supplying water to the steam generators from the condensate storage tanks. One auxiliary feedwater pump is needed for decay heat removal. The atmospheric dump valves or the code safety valves are used to remove heat from the steam generators. For cold shutdown, decay heat removal is accomplished by the residual heat removal (RHR) system. The alternate shutdown methods have the capability of achieving cold shutdown within 72 hours without credit for repairs except for replacement of fuses.

The above systems are supported by the component cooling water (CCW) system and the intake cooling water (ICW) system. The CCW system provides cooling for the charging pumps, the RHR pumps and heat exchangers and the reactor coolant pump thermal barrier heat exchangers. The CCW system for each unit consists basically of two trains using three pumps and three heat exchangers. Each pump and/or heat exchanger can be lined up to supply either train. The ICW system consists of three pumps supplying two main headers for each unit. The ICW system provides cooling to the CCW heat exchangers. The air-cooled diesel generators and associated electrical distribution system supply the essential power for the shutdown systems. One of the two shared diesel generators can supply power for shutdown of both units. The above systems are normally controlled and monitored from the control room. In the event of a fire resulting in loss of the control room, cable spreading room or north-south breezeway, alternative means of controlling and monitoring these systems are provided.

B. Associated Circuit Protection

To assure the availability of the above systems following a fire, the licensee identified associated circuits that could prevent operation or cause maloperation of shutdown systems and equipment. For identified associated circuits, protection for the safe shutdown systems was provided in accordance with NRC guidelines as outlined in the following paragraphs.

1. Power Source Case - The licensee indicated that all circuits in the emergency power system (diesel generators) were reviewed to assure proper coordination of protective breakers and fault interrupting devices. The emergency power system is used to supply the essential power for the post-fire shutdown systems. Coordination of circuit protective devices was part of the original electrical system design of the Turkey Point, Units 3 and 4 plants. Thus, by design of the plants, associated circuits of this type should not exist.

2. Spurious Signal Case - The licensee reviewed a number of circuits where fire-induced failures may adversely affect the safe shutdown capability or violate the primary or secondary pressure boundary. As a result of this review, new isolation devices and/or procedures were proposed to prevent the spurious operation or to provide indication of a spurious operation with subsequent operator action.

   To ensure isolation of the steam generators, isolation switches have been provided to prevent spurious opening of the main steam isolation valves (MSIVs), steam generator blowdown control valves, and the atmospheric dump valves. These switches are located on the alternate shutdown panel.

   Spurious opening of the normal letdown path or the excess letdown path has been prevented by providing an isolation transfer switch for the letdown stop valve (LCV-460) and for the excess letdown control valve (CV-387). With these valves closed no spurious letdown can occur through the normal letdown or excess letdown.

There are redundant parallel power operated relief valves (PORVs) on the pressurizer, each with an isolation block valve. If a block valve and its respective PORV were to spuriously open inadvertent blowdown of the primary system could occur. In one of the flow paths the PORV has an isolation transfer switch and control switch while in the other flow path the block valve has isolation transfer and control switches. To provide indication of a possible spurious blowdown, isolated position indication of the block valve and PORV without the isolated control power has been provided on the auxiliary shutdown panel. Local control of the block valve, without isolation capability on the auxiliary shutdown panel, will also be available. Therefore, indication and isolation capability for both blowdown paths will be available following a fire.

Indicators with isolation devices for the containment spray pumps and the high head safety injection pumps have been provided on the auxiliary shutdown panel. The spurious starting of any of these pumps will be indicated on the panel, and local operator action can secure these pumps.

To prevent a blowdown of the reactor coolant system (RCS) through the RHR system which is not designed for RCS pressure, power will be locked out to one of the two normally closed motor operated RHR suction isolation valves, thereby preventing spurious opening of both these valves.

Power is also removed from all of the reactor coolant gas vent system valves to prevent spurious operation resulting in an RCS blowdown.

3. Common Enclosure Case - The licensee indicated that coordinated electrical circuit fault protection was provided by design for all cases of common enclosures of associated circuits. Also, for all cases of common enclosure, all penetrations are sealed to the same rating as the barrier, and therefore the spread of fires via associated circuits is not a concern.

C. Areas Where Alternative Safe Shutdown is Proposed

The licensee has proposed the use of alternative shutdown for the control room, cable spreading room and the north-south (N-S) breezeway, each of which is shared between Units 3 and 4. An alternative shutdown panel (ASP) will be installed in the "B" switchgear rooms of each unit. One train (train B) of essential functions (control and/or indication) will be rerouted through these panels. Adequate controls and instrumentation will be provided to reach and maintain hot standby from these panels. Additional controls and instrumentation to achieve cold shutdown are provided on the panels supplemented by some manual actions at local stations.

D. Alternative Shutdown Capability

The alternate shutdown panel (ASP) for each unit provides a central point to control and monitor plant shutdown in the event of a fire in the control room, cable spreading room or N-S breezeway. The design of each panel includes the capability to electrically isolate the control functions for the shutdown systems from each of the three fire areas identified above. The alternate shutdown panels and associated cabling are located outside the three fire areas. Each ASP has isolable controls and indications for operation of Train B of the essential functions that are required to bring the plant to hot standby. Transfer of control to either of the ASPs is alarmed in the control room. The isolation transfer switches are located on the ASPs which are located in security, controlled access rooms.

We reviewed the design of the alternate shutdown panels to determine compliance with the performance goals outlined in the requirements of Section III.L of Appendix R to 10 CFR 50. Reactivity control is accomplished initially by a manual scram before the operator leaves the control room and subsequently by boron addition via the chemical and volume control system (charging pumps). Reactor coolant (RC) makeup is provided by the charging pumps and borated water supply of the chemical and volume control system to compensate for leakage through RC pump seals and cooldown volume shrinkage. Primary pressure control is provided by operation of the back-up heater group B from the ASP and overpressure protection is

provided by operation of the PORVs from the ASP or by the code safety valves. Reactor decay heat removal in hot standby and hot shutdown is provided through the steam generators by the auxiliary feedwater (AFH) system (Pump B for Unit 3 and Pump C for Unit 4) in conjunction with safety relief valves for hot standby and the atmospheric dump valves for hot shutdown. Boration of the RCS to cold shutdown requirements is performed by the boric acid addition system via the charging pumps in conjunction with the normal letdown path. During cooldown, pressurizer auxiliary spray will be operated from the ASP to cooldown the pressurizer and depressurize the RCS. The following direct readings of process variables are provided at the alternate shutdown panels:

Steam generator level

Steam generator pressure

RCS cold leg and hot leg temperatures for each loop

Pressurizer pressure

Pressurizer level

Position indication of PORV (POV-456)

Position indication of block valve for PORV (POV-455C)

Source range neutron flux

Diesel generator 4 voltmeter and wattmeter

Instrument air pressure indicators

Local indication of condensate storage tank level, refueling water storage tank level, boric acid tank level and temperature, and component cooling water temperature and pressure will also be available following a fire in the control room, cable spreading room or N-S breezeway.

Isolation transfer switches and control switches are provided on the ASP for the following equipment:

AFW pump (B for Unit 3 and C for Unit 4)

AFW pump steam supply valve

AFH flow control valves to each steam generator

MSIVs

Steam generator blowdown control valves

Atmospheric dump valves for each steam generator

Charging pump B

Charging system control valve (Makeup, RCP seal injection and boration flow path)

RWST to charging pump supply valve

Letdown and Excess letdown stop valves

Charging line isolation valve

PORV (POV-455C)

PORV block valve for POV-456

Pressurizer heater backup group B

Pressurizer auxiliary spray valve

Component cooling water (CCW) pump B.

CCW to containment coolers inlet and return valves

CCW to RCP thermal barrier return isolation valve

Intake cooling water pump B

RHR pump B

Normal containment coolers B and D (on/off)

One diesel generator provides enough electrical power to shutdown both units. Diesel generator 4, has a local control panel in the diesel generator 4 room. A transfer switch in the diesel room isolates all the control from the control room, cable spreading room and N-S breezeway. Alternate control is also be provided for the diesel generator breakers to buses 3B and 4B at the switchgear cubicals.

The licensee has reviewed the manpower needs to perform the shutdown of both units and has confirmed that the tasks to be performed immediately can be performed with existing personnel and sufficient manpower for augmentation is available for transition to long-term shutdown/cooldown.

The licensee has provided a procedual summary of the actions to be taken for alternate shutdown and has identified which operators are to perform the specific actions. The licensee has also committed to revise the present procedures or provide new procedures that identify the actions necessary for hot and cold alternative shutdown. The manpower necessary to perform the shutdown will be independent of the fire brigade.

III Conclusion

Based on our review we conclude that the function of reactivity control, inventory control, decay heat removal and pressure control are met. We further conclude that the systems and support systems to be used for safe shutdown for fires in the control room, cable spreading room and N-S breezeway and the methodology used to assure the availability of

these systems are in accordance with Section III.G.3 of Appendix R to 10 CFR 50. We therefore conclude they are acceptable.

Based on our review of the proposed modifications for alternate shutdown capability we conclude that the proposed design meets the requirements of Section III.L of Appendix R to 10 CFR Part 50 and is, therefore, acceptable.

Principle Contributors:

W. Le Fave

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