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2.C.2.1
FYR 82-88

August 30, 1982

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch No. 5
Division of Licensing

References: (a) License No. DPR-3 (Docket No. 50-29)
(b) USNRC Letter to YAEC, dated April 28, 1982
(c) YAEC Letter to USNRC, dated July 15, 1932

Subject: Response to Request for Additional Information on Appendix R - Alternative Safe Shutdown System

Dear Sir:

The Attachment to this letter has been prepared in response to Reference (b) which requested additional information in support of our proposed modifications regarding Appendix R, Alternative Safe Shutdown System. This information provides further clarification of details previously supplied in response to NRC requirements.

We trust this information is satisfactory; however, if you have any questions, please contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

J. A. Kay
Senior Engineer - Licensing

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ALTERNATE SAFE SHUTDOWN SYSTEM
RESPONSES TO STAFF COMMENTS AND QUESTIONS

1. In response to a staff question regarding a fire in the Alternative Safe Shutdown System (ASSS) area, the licensee, Yankee Atomic Electric Company (YAEC), committed to design the system to prevent problems due to a fire. In this regard, show that in the event of a fire in the ASSS area causing a hot short in the transfer switches located there, hot and cold shutdown can be effected. Alternatively, you should provide a design which deals with this contingency. Also show that in the event of a fire in the ASSS area (without resultant hot shorts in transfer switches) safe shutdown can be effected.

RESPONSE

A fire in the ASSS area, causing hot shorts in the transfer switches will not affect hot and cold shutdown because alternate "normal" equipment is available (see Table 1).

Also, the possibility of a hot short developing at all is extremely remote for the following reasons:

(a) The alternate power source (ASSS Motor Control Center) is normally de-energized,

(b) Most of the 480-volt cables entering the ASSS area are de-energized,

(c) Any 480-volt cable which is normally energized will be separated from all other cables,

(d) Power, control, and instrumentation cables are physically separated to prevent contact,

(e) Power and control transfer switches are physically separated,

(f) There is a very low amount of combustible material in the ASSS area,

(g) The ASSS area is equipped with fire detection equipment, and

(h) Alternate "normal" equipment is available (see below).

Table 1, attached, lists all of the equipment that would be affected by a fire in the ASSS area. The table also lists the redundant equipment or steps that would be taken to assure a safe shutdown. Based on the information in Table 1, a safe shutdown can be accomplished in the event of a fire in the ASSS area.

2. Reference 4 discussed the use of a charging pump to control Primary System pressure in the event the pressurizer heaters are lost. We request that you confirm that procedures will be available before the ASSS is made operational which provide for the maintenance of Primary

System pressure during hot shutdown in the event the pressurizer heaters become inoperable because of a fire which causes a loss of equipment in the fire areas under consideration, i.e., Turbine Building, Control Room, Switchgear Room (hereinafter to be designated as TB) and ASSS area.

RESPONSE

All of the pressurizer heaters will not become inoperable because of a fire in the areas under consideration. There are eight groups of pressurizer heaters, and only one group is required to maintain Primary System pressure during hot shutdown. The ASSS will include the capability to transfer the operation and control of one group of pressurizer heaters to the ASSS area. Therefore, in the event of a fire in the TB, one set of heaters will be operable from the ASSS area. In the event of a fire in the ASSS area, only one set of heaters may be lost, the remaining seven sets would remain operational from their normal control locations. Therefore, procedures for the maintenance of Primary System pressure without pressurizer heaters are not required for operation of the ASSS.

3. We request that you commit to provide procedures for safe shutdown in the event of a fire in either the TB area or the ASSS area. You should also provide summaries of these procedures for staff review at this time.

The staff will review these summaries to ascertain whether safe shutdown can be accomplished with a total of three shift crew members and with the equipment outlined in your previous submittals.

RESPONSE

After the completion of the detailed design, procedures for the operation of the ASSS will be prepared. These procedures will detail the steps to reach a safe shutdown condition in the event of a fire in either the TB area or the ASSS area. These procedures will be available in 1983. When they are available, copies will be sent for staff review.

4. Your response regarding single failures (Reference 2, Item C) requires further clarification. The staff is concerned that, in the design of new installations to provide safe shutdown in the event of a fire, which are also to be used for other safe shutdown contingencies, the single failure criterion for safety systems will be abrogated. Therefore, you should provide assurance that the ASSS design will not permit a single failure to cause loss of redundant safety systems; e.g., control circuits for both RHR Systems should not pass through one transfer switch, thus allowing loss of redundant safety systems by a single failure. Such a design does not comply with the criteria contained in Reference 6.

RESPONSE

As shown in the response to Question 1 and in Table 1, redundant equipment or means of operation are available for all equipment being used in the ASSS. Therefore, in the event of a failure in the ASSS that disables any of the ASSS equipment, the necessary safety functions can still be accomplished.

5. Reference 2 reported three high-low pressure interfaces which use redundant electrically controlled devices to isolate the primary coolant boundary:

(a) The Shutdown Cooling System;

(b) The Main Coolant Drain and Sampling System; and

(c) The pressurizer power-operated relief valves.

You further stated that the Shutdown Cooling System (SCS) contained two high-low pressure interfaces which employed redundant electrically-controlled motor-operated valves in each of the two interfaces; two in the suction, and in the discharge of the SCS to the Primary System. You committed to modify the existing arrangement for these valves since it appeared that all were in close proximity and could be damaged in the event of a fire in the Switchgear Room; you also stated that the other systems required no modifications.

We request that you review the three interfaces noted above with regard to a possible fire in the Auxiliary Safe Shutdown System area in order to assure us that these interfaces are safe in the event of such a fire or commit to provide suitable modification to protect these interfaces.

RESPONSE

Main Coolant Drain and Sampling System Valves:
Cables for these valves are not routed through the ASSS area. Consequently, these high-low pressure interface valves are unaffected by a fire in the ASSS area.

Power-Operated Relief Valve:
Cables for this valve are not routed through the ASSS area. Consequently, this high-low pressure interface valve is unaffected by a fire in the ASSS area.

Shutdown Cooling System Valves:
Although their power and control cables are routed through the ASSS area, a fire in that area will not adversely affect these high-low pressure interface valves. Since both the normal and alternate power sources for these valves are kept de-energized, a fire which damages the control and/or power transfer switches cannot cause the valves to open. These valves may be manually operated if required under these circumstances.

6. Describe how communications will be affected between the three operators conducting safe shutdown.

RESPONSE

Communications could be by either sound-powered telephones, dedicated intraplant communication channel, or by portable transceivers. These are some of the options available. This detail will be resolved during the detailed design.

7. Reference 2, Table 2, provided a list of instrumentation required for safe shutdown. With regard to this list, we have the following comments:

(a) The list notes some instrument locations as "containment." Show how these, as well as all other instruments necessary for safe shutdown, are accessible to the operators conducting safe shutdown operations after a fire in the TB or ASSS.

(b) The staff interpretation of instrumentation required for safe shutdown includes the following for PWRs:

i. Pressurizer pressure and level;

ii. Reactor coolant hot leg temperature and either cold leg temperature or TAVG;

iii. Steam generator pressure and level (wide range);

iv. Source range flux monitor;

v. Actual flow measurements for all pumps used; and

vi. Level indication for all tanks used.

Your list differs in that you specify the use of either incore thermocouples or loop thermocouples, and you do not include either flow measurements or the measurement of tank levels which provide fluid for the systems involved.

We request that you either commit to provide the omitted instrumentation required in Items ii, v and vi above or provide acceptable alternatives to permit suitable operational surveillance of the systems involved in proceeding to hot and then to cold shutdown after a fire in the TB or ASSS area. In this, you should follow the guidance of Appendix R, to 10CFR50, Section III.L.2.

RESPONSE

(a) In the table of instruments referenced, the designation of "containment" indicates the location of the sensors and transmitters; indication, however, will be available on the ASSS console. There are some indications that will not be within the ASSS area as noted on the referenced table.

Other instrumentation is located as follows:

(1) Indication of steam generator pressure will be at the non-return valve platform. An operator will be stationed there, as necessary, to monitor steam generator pressure and control the steam release rate for decay heat removal.

(2) Diesel water temperature and oil pressure will be at the diesel generator. The diesel cubicle is adjacent to the ASSS area. Intermittent monitoring of these indications will be provided by the ASSS operators.

(3) Shutdown cooling and component cooling temperatures will be read locally in the Primary Auxiliary Building (PAB). The ASSS area is adjacent to the PAB, and these systems are not required until cooldown below 330°F. These systems will be put into service locally, and local indication is all that is required.

(b) Section III.L.2 of Appendix R to 10CFR50 states that, "The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the [shutdown] functions." Yankee believes that the instrumentation supplied meets this requirement.

Indication of incore thermocouple readings or hot leg temperature will be adequate to indicate if core temperature is rising, dropping or being maintained for the function of monitoring decay heat removal. It is necessary to maintain core temperature at acceptable levels to prevent core damage, and to lower core temperature for plant cooldown. The indications provided will adequately monitor core temperatures to allow the control of these functions.

Actual flow measurements of the pumps being used are not required to monitor the necessary functions as described below:

(1) The function of the charging pump is to maintain Primary System inventory. The necessary indication is pressurizer level. If pressurizer level is being maintained, charging flow is adequate. Pressurizer level indication is available at the ASSS console.

(2) The function of the safety injection pumps in the event of a TB fire is to supply emergency feedwater to the steam generators. If steam generator levels are being maintained, then emergency feed flow to the steam generators is adequate. Level indication for all four steam generators will be provided at the ASSS console.

(3) The function of the shutdown cooling and component cooling pumps is to remove decay heat and lower core temperature during the final phase of plant cooldown. Incore thermocouples or hot leg temperature indications will monitor the progress of the plant cooldown. Shutdown cooling and component cooling heat

exchangers inlet and outlet temperatures will be used to control the rate of cooldown. Though not included in the referenced table, shutdown cooling pump flow indication will be available locally in the PAB. With these indications, the cooldown function can be adequately monitored and controlled.

So, for all pumps being used, adequate means are available to monitor and control the shutdown functions.

Local level indication for all tanks utilized will be available. The tanks being used are within the PAB or in the yard area adjacent to the PAB. With the expected slow changes in tank level, local indication and intermittent monitoring will be adequate.

8. Discuss the steps to be taken to assure satisfactory control of plant reactivity as it proceeds to hot shutdown and then to cold shutdown.

RESPONSE

Before evacuating the TB area, the operators will ensure that the reactor has scrammed and all control rods are inserted. Borated water will be available for primary system makeup. During cooldown, the plant will be borated with the strong boric acid solution from the boric acid mix tank, the source normally used. Also, a neutron detector will be available with indication at the ASSS console to monitor core power levels.

9. Provide design information to show that the isolation devices intended for use in the ASSS area are in compliance with the criteria outlined in Enclosure 2 of this letter or provide suitable alternate means of isolation.

RESPONSE

The only link of the ASSS to normal Shutdown Systems is at the transfer switches. These switches will be fully qualified to perform their intended function without degrading existing plant safety systems. Also, the switches will be located in a dedicated enclosure, thus minimizing any interaction. Design information is currently unavailable but will be provided as the detailed engineering progresses.

10. It is anticipated that a Control Room fire could cause spurious signals resulting in undesirable operation of some of the equipment for safe shutdown which will be controlled in the ASSS area. Show that this will not prevent safe shutdown from the ASSS area.

RESPONSE

A Control Room fire causing spurious signals resulting in undesirable operation of ASSS equipment is averted by removing power to all but the ASSS equipment. This removal of power was discussed in our March 19,

1981 and June 15, 1981 submittals. Also, the operation of the transfer switches will disconnect all related circuitry in the fire area from the ASSS equipment. Spurious signals will therefore not have any affect on the ASSS equipment.

11. Please ensure that you have provided responses to all items required by Reference 6, or Enclosure 2, to this letter.

RESPONSE

Yankee's June 15, 1982 letter supplied responses to all items required by Reference 6.

TABLE 1

Equipment Powered and/or Controlled from ASSS	Alternate Equipment Powered and/or Controlled from CR
1. Required for Safe Shutdown	
o No. 1 Charging Pumps	o No. 2 or 3 Charging Pumps
o CH-MOV-523 and 524 (normal charging path)	o CH-MOV-522 (alternate charging path)
o CH-MOV-525, 527 and Vari-Orifice (primary letdown)	o VD-MOV-506 through 510 (pressurizer and loop drains)
o 1 Group Pressurizer Heaters	o Remaining 7 Groups of Pressurizer Heaters
o No. 3 HPSI and LPSI Pumps (emergency SG feed)	o No. 1 or 2 EFW Pump
2. Required for Cooldown	
o CH-MOV-191 and 613 (pressurizer spray)	o Containment Entry and Manual Operation of PR-HCV-205 or CH-MOV-191 or CH- V-613
o Shutdown Cooling Pump	o LPST Cooling Pump
o No. 1 Component Cooling Pump	o No. 2 Component Cooling pump
o SC-MOV-551 through 554	o Containment Entry and Manual Operation of These Four Valves