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TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL CAPABILITY, TURKEY POINT, UNIT NOS. 3 AND 4

NRC Research and/or Technical Assistance Report

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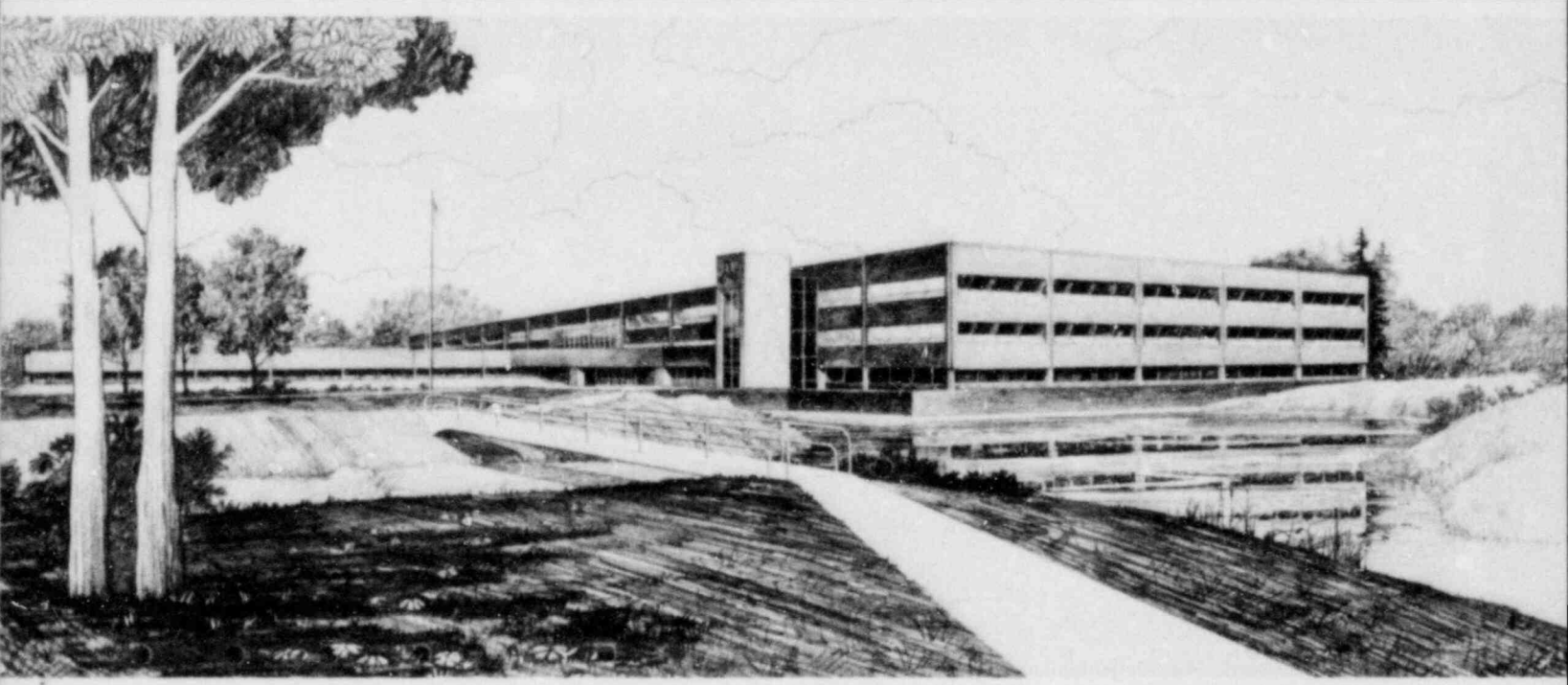
PRELIMINARY

U.S. Department of Energy
Idaho Operations Office • Idaho National Engineering Laboratory



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INTERIM REPORT

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TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL CAPABILITY

TURKEY POINT UNITS 3 AND 4

Docket Nos. 50-250 and 50-251

February 1982

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ABSTRACT

This report reviews the Turkey Point Units 3 and 4, technical specification requirements for redundancy in decay heat removal capability in all modes of operation.

FOREWORD

This report is supplied as part of the "Selected Operating Reactor Issues Program (III)" being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Licensing, by EG&G Idaho, Inc., Reliability and Statistics Branch.

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TURKEY POINT UNITS 3 AND 4

1.0 INTRODUCTION

A number of events have occurred at operating PWR facilities where decay heat removal capability has been seriously degraded due to inadequate administrative controls during shutdown modes of operation. One of these events, described in IE Information Notice 80-20,[1] occurred at the Davis-Besse, Unit No. 1 plant on April 19, 1980. In IE Bulletin 80-12[2] dated May 9, 1980, licensees were requested to immediately implement administrative controls which would ensure that proper means are available to provide redundant methods of decay heat removal. While the function of the bulletin was to effect immediate action with regard to this problem, the NRC considered it necessary that an amendment of each license be made to provide for permanent long term assurance that redundancy in decay heat removal capability will be maintained. By letter dated June 11, 1980,[3] all PWR licensees were requested to propose technical specification (TS) changes that provide for redundancy in decay heat removal capability in all modes of operation; use the NRC model TS which provide an acceptable solution of the concern and include an appropriate safety analysis as a basis; and submit the proposed TS with the basis by October 11, 1980.

Florida Power and Light Company submitted proposed revisions for decay heat removal to their technical specifications (TS) for Turkey Point Units 3 and 4,[4] on December 30, 1980.

2.0 REVIEW CRITERIA

The review criteria for this task are contained in the June 11, 1980 letter from the NRC to all PWR licensees. The NRC provided the model technical specifications (MTS) which identify the normal redundant coolant systems and the actions when redundant systems are not available for a typical

Westinghouse plant (Appendix A). This review will determine if the licensees existing and/or proposed plant TS are in agreement with the MTS.

3.0 DISCUSSION AND EVALUATION

Turkey Point Units 3 and 4 are three loop Westinghouse PWR plants. The TS for these units are of the older variety and are not in the same format as the NRC MTS. The NRC Standard Technical Specifications (STS)[5] define six operational modes, which are based on conditions of reactivity, percent rated thermal power, and average coolant temperature. These modes do not correspond with the Turkey Point TS[6] defined operating modes. Because the licensee's defined operating modes differ from the NRC MTS, this review will compare the proposed Turkey Point TS against the NRC MTS during equivalent reactor operating conditions.

3.1 Power Operation and Startup--MODES 1 and 2.

The Turkey Point TS define POWER OPERATION as: Reactor critical and power greater than 2%. STARTUP is not defined separately.

The Turkey Point proposed TS are in agreement with the NRC MTS, except that they do not use HOT STANDBY as one of their operating modes. With less than three Reactor Coolant Loops in operation, the Turkey Point requirement is to be in HOT SHUTDOWN within one hour. HOT SHUTDOWN is subcritical with average coolant temperature above 540°F.

3.2 Hot Standby--MODE 3.

The Turkey Point TS do not use HOT STANDBY as one of their operating modes.

3.3 Hot and Cold Shutdown--Mode 4 and 5.

The Turkey Point TS define HOT SHUTDOWN as subcritical with T_{ave} above 540°F. COLD SHUTDOWN is defined as subcritical by at least 1% Δk/k and T_{ave} less than 200°F.

The NRC MTS state that at least two Residual Heat Removal (RHR) Loops shall be OPERABLE and at least one of these loops shall be in operation. With less than the above loops OPERABLE, immediately initiate corrective action to return the loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours. Page 3.4.2a, Paragraph I and I.1, of the Turkey Point proposed TS cover the RHR loop requirements; however, nothing is stated that takes the plant to COLD SHUTDOWN within 20 hours with less than the required loops OPERABLE. The Turkey Point proposed TS state that with less than two Reactor Coolant Loops OPERABLE, restore the required Coolant Loops to OPERABLE status within 72 hours or reduce T_{ave} to less than 350°F within the next 12 hours. Table 4.1.2 of the Turkey Point proposed TS SURVEILLANCE REQUIREMENTS is the same as the NRC MTS, except they do not require checking the steam generator(s) OPERABLE by verifying secondary side level to be adequate at least once per 12 hours.

3.4 Refueling--MODE 6.

The Turkey Point TS define REFUELING SHUTDOWN as subcritical by at least 10% Δk/k and T_{ave} below 160°F.

Page 3.4-3, Paragraph f and g, of the Turkey Point proposed TS covers the points of the NRC MTS with the three following exceptions. (1) Turkey Point defines REFUELING SHUTDOWN as being below a T_{ave} of 160°F. The NRC STS defines REFUELING SHUTDOWN as T_{ave} at or below 140°F. (2) The Turkey Point proposed TS allows the removal of the RHR loop from operation during the performance of core alterations as long as the core outlet temperature is maintained below 160°F. The NRC MTS restricts the stopping of the RHR loop to 1 hour out of an 8 hour period. (3) The Turkey Point proposed TS SURVEILLANCE REQUIREMENT is to check every four hours to ensure that the

outlet temperature is below 160°F. The NRC MTS requires checking every four hours that the RHR flow rate is greater than or equal to 2800 gpm.

4.0 CONCLUSION

A comparison of the proposed TS for Turkey Point Units 3 and 4 indicate that, for MODES 1, 2, and 3, the only difference is in terminology, due to the fact that Turkey Point does not use STARTUP and HOT STANDBY as defined operating modes. For MODES 4 and 5 the Turkey Point TS define what to do if less than the required RHR loops are operating. This description is different from that described in the NRC MTS. In addition, the Turkey Point TS surveillance Table 4.1-2 does not say to determine the required steam generator(s) OPERABLE by checking the secondary side level at least once per 12 hours. For MODE 6 there is a difference in the maximum temperature for REFUELING SHUTDOWN. The Turkey Point TS puts no time restriction on removing the single RHR loop from operation for core alteration. The SURVEILLANCE REQUIREMENT to ensure proper operation of the RHR loop every 4 hours is done by checking the core outlet temperature in the Turkey Point TS and by checking the flow rate in the NRC MTS.

5.0 REFERENCES

1. NRC IE Information Notice 80-20, May 8, 1980.
2. NRC IE Bulletin 80-12, May 9, 1980.
3. NRC Letter, D. G. Eisenhut, To All Operating Pressurized Water Reactors (PWR's), dated June 11, 1980.
4. Florida Power and Light Company Letter, Robert E. Uhrig to NRC, Darrell G. Eisenhut, December 30, 1980.
5. Standard Technical Specifications for Westinghouse Pressurized Water Reactors, NUREG-0452, Rev. 3, Fall 1980.
6. Turkey Point Units 3 and 4 Technical Specifications Docket 50250-85, July 1972.

APPENDIX A

MODEL TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL FOR WESTINGHOUSE PRESSURIZED WATER REACTORS (PWR's)

3/4.4 REACTOR COOLANT SYSTEM

3/4.4.1 REACTOR COOLANT LOOPS AND COOLANT CIRCULATION

STARTUP AND POWER OPERATION

LIMITING CONDITION FOR OPERATION

3.4.1.1 All reactor coolant loops shall be in operation.

APPLICABILITY: MODES 1 and 2.*

ACTION:

With less than the above required reactor coolant loops in operation, be in at least HOT STANDBY within 1 hour.

SURVEILLANCE REQUIREMENT

4.4.1.1 The above required reactor coolant loops shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

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* See Special Test Exception 3.10.4.

REACTOR COOLANT SYSTEM

HOT STANDBY

LIMITING CONDITION FOR OPERATION

3.4.1.2 a. At least two of the reactor coolant loops listed below shall be OPERABLE:

1. Reactor Coolant Loop (A) and its associated steam generator and reactor coolant pump,

2. Reactor Coolant Loop (B) and its associated steam generator and reactor coolant pump,

3. Reactor Coolant Loop (C) and its associated steam generator and reactor coolant pump,

4. Reactor Coolant Loop (D) and its associated steam generator and reactor coolant pump.

b. At least one of the above coolant loops shall be in operation.*

APPLICABILITY: MODE 3

ACTION:

a. With less than the above required reactor coolant loops OPERABLE, restore the required loops to OPERABLE status within 72 hours or be in HOT SHUTDOWN within the next 12 hours.

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* All reactor coolant pumps may be de-energized for up to 1 hour provided (1) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.

b. With no reactor coolant loop in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required coolant loop to operation.

SURVEILLANCE REQUIREMENT

4.4.1.2.1 At least the above required reactor coolant pumps, if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.

4.4.1.2.2 At least one cooling loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

REACTOR COOLANT SYSTEM

SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.4.1.3 a. At least two of the coolant loops listed below shall be OPERABLE:

1. Reactor Coolant Loop (A) and its associated steam generator and reactor coolant pump,*

2. Reactor Coolant Loop (B) and its associated steam generator and reactor coolant pump,*

3. Reactor Coolant Loop (C) and its associated steam generator and reactor coolant pump,*

4. Reactor Coolant Loop (D) and its associated steam generator and reactor coolant pump,*

5. Residual Heat Removal Loop (A),**

6. Residual Heat Removal Loop (B).**

b. At least one of the above coolant loops shall be in operation.***

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* A reactor coolant pump shall not be started with one or more of the RCS cold leg temperatures less than or equal to (275)^{o}F unless 1) the pressurizer water volume is less than ____ cubic feet or 2) the secondary water temperature of each steam generator is less than ____ ^{o}F above each of the RCS cold leg temperatures.

** The normal or emergency power source may be inoperable in MODE 5.

*** All reactor coolant pumps and decay heat removal pumps may be de-energized for up to 1 hour provided 1) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and 2) core outlet temperature is maintained at least 10^{o}F below saturation temperature.

REACTOR COOLANT SYSTEM

APPLICABILITY: MODES 4 and 5.

ACTION:

a. With less than the above required loops OPERABLE, immediately initiate corrective action to return the required loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours.

b. With no coolant loop in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required coolant loop to operation.

SURVEILLANCE REQUIREMENT

4.4.1.3.1 The required residual heat removal loop(s) shall be determined OPERABLE per Specification 4.0.5.

4.4.1.3.2 The required reactor coolant pump(s), if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.

4.4.1.3.3 The required steam generator(s) shall be determined OPERABLE by verifying secondary side level to be greater than or equal to ( )% at least once per 12 hours.

4.4.1.3.4 At least one coolant loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

REFUELING OPERATIONS

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

ALL WATER LEVELS

LIMITING CONDITION FOR OPERATION

3.9.8.1 At least one residual heat removal (RHR) loop shall be in operation.

APPLICABILITY: MODE 6

ACTION:

a. With less than one residual heat removal loop in operation, except as provided in b. below, suspend all operations involving an increase in the reactor decay heat load or a reduction in boron concentration of the Reactor Coolant System. Close all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere within 4 hours.

b. The residual heat removal loop may be removed from operation for up to 1 hour per 8 hour period during the performance of CORE ALTERATIONS in the vicinity of the reactor pressure vessel (hot) legs.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENT

4.9.8.1 At least one residual heat removal loop shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to (2800) gpm at least once per 4 hours.

REFUELING OPERATIONS

LOW WATER LEVEL

LIMITING CONDITION FOR OPERATION

3.9.8.2 Two independent Residual Heat Removal (RHR) loops shall be OPERABLE.*

APPLICABILITY: MODE 6 when the water level above the top of the irradiated fuel assemblies seated within the reactor pressure vessel is less than 23 feet.

ACTION:

a. With less than the required RHR loops OPERABLE, immediately initiate corrective action to return the required RHR loops to OPERABLE status as soon as possible.

b. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENT

4.9.8.2 The required Residual Heat Removal loops shall be determined OPERABLE per Specification 4.0.5.

* The normal or emergency power source may be inoperable for each RHR loop.

BASES

3/4.4.1 REACTOR COOLANT LOOPS AND COOLANT CIRCULATION

The plant is designed to operate with all reactor coolant loops in operation, and maintain DNBR above 1.30 during all normal operations and anticipated transients. In MODES 1 and 2 with one reactor coolant loop not in operation this specification requires that the plant be in at least HOT STANDBY within 1 hour.

In MODE 3, a single reactor coolant loop provides sufficient heat removal capability for removing decay heat; however, single failure considerations require that two loops be OPERABLE.

In MODES 4 and 5, a single reactor coolant loop or RHR loop provides sufficient heat removal capability for removing decay heat; but single failure considerations require that at least two loops be OPERABLE. Thus, if the reactor coolant loops are not OPERABLE, this specification requires two RHR loops to be OPERABLE.

The operation of one Reactor Coolant Pump or one RHR pump provides adequate flow to ensure mixing, prevent stratification and produce gradual reactivity changes during boron concentration reductions in the Reactor Coolant System. The reactivity change rate associated with boron reduction will, therefore, be within the capability of operator recognition and control.

The restrictions on starting a Reactor Coolant Pump with one or more RCS cold legs less than or equal to (275)^{o}F are provided to prevent RCS pressure transients, caused by energy additions from the secondary system, which could exceed the limits of Appendix G to 10 CFR Part 50. The RCS will be protected against overpressure transients and will not exceed the limits of Appendix G by either (1) restricting the water volume in the pressurizer and thereby providing a volume for the primary coolant to expand into, or (2) by restricting starting of the RCPs to when the secondary water temperature of each steam generator is less than ( )^{o}F above each of the RCS cold leg temperatures.

3/4.9.8 RESIDUAL HEAT REMOVAL AND COOLANT CIRCULATION

The requirement that at least one residual heat removal (RHR) loop be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140 F as required during the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification.

The requirement to have two RHR loops OPERABLE when there is less than 23 feet of water above the core ensures that a single failure of the operating RHR loop will not result in a complete loss of residual heat removal capability. With the reactor vessel head removed and 23 feet of water above the core, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating RHR loop, adequate time is provided to initiate emergency procedures to cool the core.