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TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL CAPABILITY, POINT BEACH, UNIT NOS. 1 AND 2

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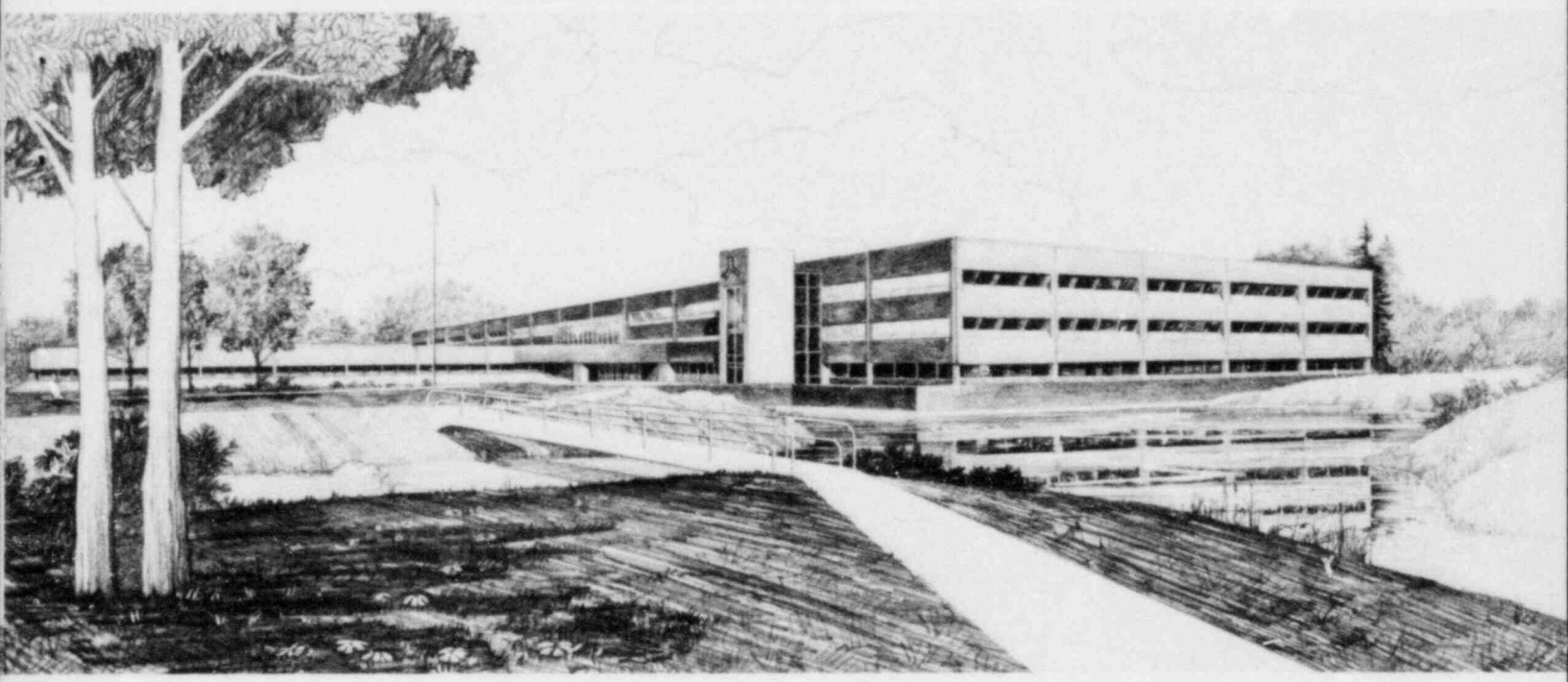

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INTERIM REPORT

TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL CAPABILITY

POINT BEACH, UNIT NOS. 1 AND 2

July 1982

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Reliability and Statistics Branch
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Docket Nos. 50-266 and 50-301
TAC Nos. 42114
and 42115

ABSTRACT

This report reviews the Point Beach, Unit Nos. 1 and 2 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 Reactors 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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TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL CAPABILITY POINT BEACH, UNIT NOS. 1 AND 2

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 the 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.

In response to D. G. Eisenhut's letter dated June 11, 1980,[3] Wisconsin Electric Power Co. submitted a letter to Harold R. Denton, attention: D. G. Eisenhut from Sol Burnstein, dated October 14, 1980,[4] regarding the Point Beach, Unit Nos. 1 and 2. This letter stated, "We have reviewed the proposed model technical specifications provided with your letter and concluded that the present Point Beach Nuclear Plant Technical Specifications already address your concerns and require no changes."

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 identified actions when redundant systems are not available for a typical Westinghouse plant (Appendix A). This review will compare the licensee's existing plant TS[5] to the NRC MTS.

3.0 DISCUSSION AND EVALUATION

Point Beach, Unit Nos. 1 and 2 are two loop Westinghouse plants, Docket No's. 50-266 and 50-301. The technical specifications used at these plants are of the older variety, and are not in the same format as the NRC MTS. The NRC Standard Technical Specifications (STS)[6] identify six modes of operation, which are based on conditions of reactivity, % rated thermal power, and average coolant temperature. These modes do not correspond with the Point Beach TS defined operating modes. Since the licensee's defined operating modes differ from the NRC MTS, this review will compare the existing Point Beach TS against the NRC MTS during equivalent reactor operating conditions.

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

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

Limiting Condition for Operation: The NRC MTS state that in either of these modes all reactor coolant loops shall be in operation. The Point Beach TS Section 15.3.1.c.(1) requires both reactor coolant pumps to be in operation when reactor power is maintained above 10%. This is not in agreement with the NRC MTS.

Action: The NRC MTS state that with less than ALL reactor coolant loops in operation, be in at least HOT STANDBY within 1 hour. Since the Point Beach TS do not define HOT STANDBY as one of their operating modes, the equivalent step would be to go to HOT SHUTDOWN, which is subcritical with average coolant temperature at or above 540°F. However, the Point Beach TS Section 15.3.1.c.(2) states that if either reactor coolant pump ceases operating, immediate power reduction shall be initiated under administrative control as necessary to reduce power to less than 10% of rated power. This implies that the Point Beach plants can lose a primary coolant pump while in MODE 1 or 2 and continue to operate at less than 10% power indefinitely. This is not consistent with the NRC MTS.

Surveillance Requirement: The NRC MTS state that all reactor coolant loops shall be verified to be in operation and circulating reactor coolant at least once per 12 hours. The Point Beach TS do not say to do this.

3.2 Hot Standby--MODE 3.

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

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

The Point Beach TS define HOT SHUTDOWN as reactor subcritical and T_{ave} at or greater than 540°F. COLD SHUTDOWN is defined as reactor shutdown by at least 1% $\Delta k/k$ and coolant temperature at or less than 200°F.

Limiting Conditions for Operation: The NRC MTS state that 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) Residual Heat Removal Loop (A),

(4) Residual Heat Removal Loop (B),

The NRC MTS state that at least one of the above coolant loops shall be in operation.

The Point Beach TS has no specific requirement as to what pumps and loops shall be OPERABLE or in operation while in HOT SHUTDOWN and COLD SHUTDOWN.

Action: The MTS state that with less than the required loops OPERABLE, immediately initiate corrective action to return the required loops to OPERABLE status as soon as possible and be in COLD SHUTDOWN within 20 hours. The Point Beach TS do not say to do this.

Surveillance Requirements: The NRC MTS have four surveillance requirements in this area, 4.4.1.3.1, 4.4.1.3.2, 4.4.1.3.3, and 4.4.1.3.4. The Point Beach TS make no reference to any of these requirements.

3.4 Refueling--MODE 6.

The Point Beach TS define REFUELING SHUTDOWN as reactor subcritical by at least 10% Wk/k and T_{ave} at or less than 140°F.

Limiting Condition for Operation: The NRC MTS states that in MODE 6 at least one Residual Heat Removal (RHR) loop shall be in operation. The Point Beach TS 15.3.8.d states that at least one RHR pump shall be in operation.

Action: The NRC MTS state that with less than one residual heat removal loop in operation, 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. The Point Beach TS require cessation of refueling and initiation of corrective action, and forbids any operations which may increase the reactivity of the core. No mention is made of closing all containment penerations to the outside atmosphere within 4 hours.

Surveillance Requirements: The NRC MTS state that a residual heat removal loop shall be demonstrated 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. There is nothing in the Point Beach TS that requires this check.

Refueling--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.

Limiting Conditions for Operations: The NRC MTS say that under this condition two independent RHR loops shall be OPERABLE. The Point Beach TS do not require two RHR loops OPERABLE with this low level. They do acknowledge the fact that the water over the fuel is a heat sink but make no mention of an operating level limit.

Action: The NRC MTS state that with less than the required RHR loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible. The Point Beach TS do not make this statement in regard to coolant loops.

Surveillance Requirements: The NRC MTS surveillance requirement 4.9.8.2 is not required in the Point Beach TS.

4.0 CONCLUSION

The Point Beach TS in their present format, do not define what loop and pump requirements are necessary for the six modes of operations. They do not define what action is necessary if required conditions are not met and they do not list any surveillance requirements to verify at a specified interval that the requirements are met.

5.0 REFERENCES

1. NRC IE Information Notice 80-20, Enclosure A, Davis-Besse Event of April 19, 1980, May 8, 1980.

2. NRC IE Bulletin 80-12, Decay Heat Removal System Operability, May 9, 1980.

3. D. G. Eisenhut, NRC, letter to All Operating Pressurized Water Reactors (PWRs), dated June 11, 1980.

4. Sol Burnstein, Wisconsin Electric, letter to Harold Denton, NRC, Docket Nos. 50-266 and 50-301, Decay Heat Removal System Operability, Point Beach Nuclear Plant, Units 1 and 2, October 14, 1980.

5. Point Beach Technical Specifications, Docket 50266-58, Amendment 2, July 1971.

6. Standard Technical Specifications for Westinghouse Pressurized Water Reactors, NUREG-0452, Rev. 3, Fall 1980.

APPENDIX A

MODEL TECHNICAL SPECIFICATIONS FOR REDUNDANT DECAY HEAT REMOVAL FOR WESTINGHOUSE PRESSURIZED WATER REACTORS (PWRs)

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.

* 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.

* 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)°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 ____ °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°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.