ENCLOSURE 1

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SYSTEMATIC EVALUATION PROGRAM, TOPIC V-II.A, ELECTRICAL, INSTRUMENTATION, AND CONTROL FEATURES FOR ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS, BIG ROCK POINT NUCLEAR STATION

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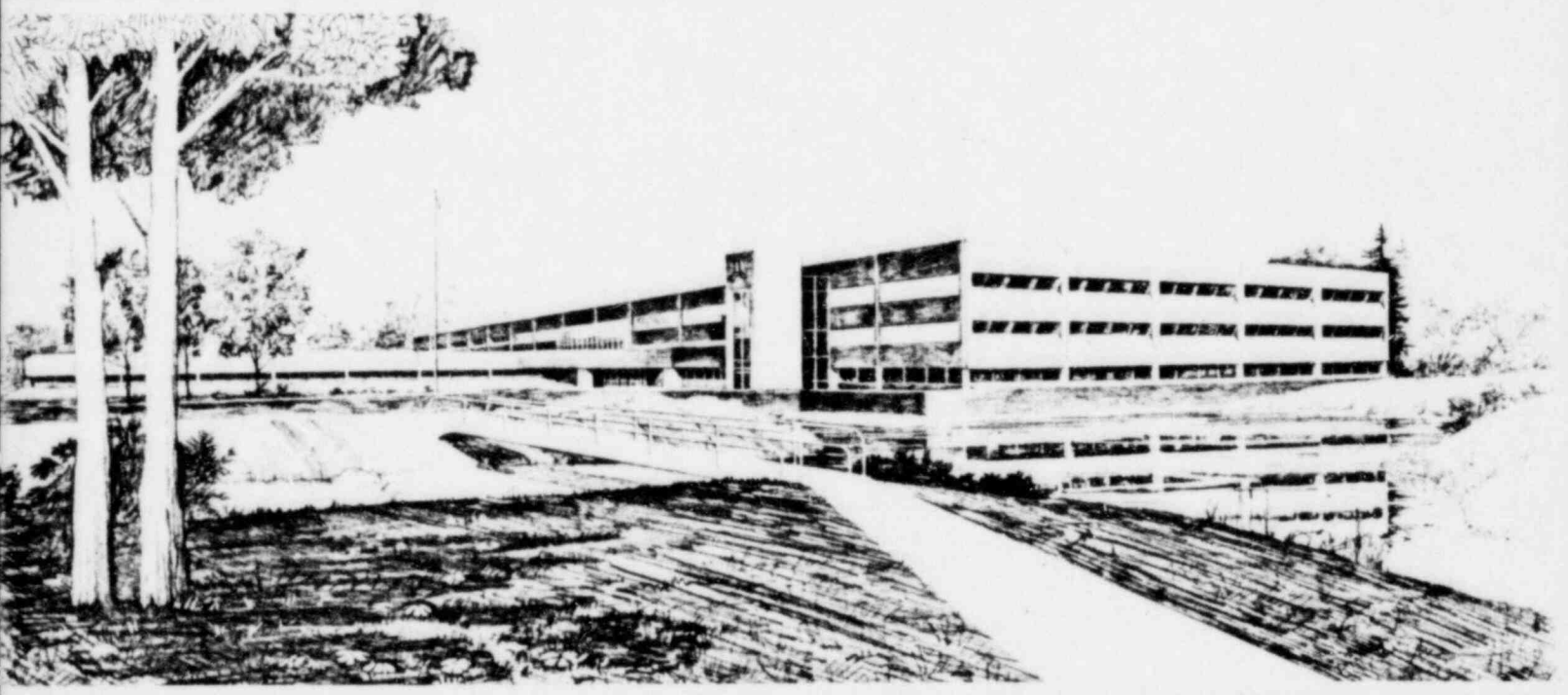

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INTERIM REPORT

SYSTEMATIC EVALUATION PROGRAM

TOPIC V-II.A
ELECTRICAL, INSTRUMENTATION, AND CONTROL FEATURES FOR ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS

BIG ROCK POINT NUCLEAR STATION

Docket No. 50-155

July 1982

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ABSTRACT

This SEP technical evaluation, for the Big Rock Point Nuclear Station, reviews the electrical, instrumentation and control features used to isolate low pressure systems from the reactor coolant primary system.

FOREWORD

This report is supplied as part of the "Electrical, Instrumentation, and Control Systems Support for the Systematic Evaluation Program (II)" being conducted for the U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Licensing, by EG&G Idaho, Inc., Reliability & Statistics Branch.

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ELECTRICAL, INSTRUMENTATION, AND CONTROL FEATURES FOR
ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS

BIG ROCK POINT NUCLEAR STATION

1.0 INTRODUCTION

The purpose of this review is to determine if the electrical, instrumentation, and control (EI&C) features used to isolate systems with a lower pressure rating than the reactor coolant primary system are in compliance with current licensing requirements as outlined in SEP Topic V-11A. Current guidance for isolation of high and low pressure systems is contained in Branch Technical Position (BTP) EICSB-3, BTP RSB-5-1, and the Standard Review Plan (SRP), Section 6.3.[1]

2.0 CRITERIA

2.1 Residual Heat Removal (RHR) Systems. Isolation requirements for RHR systems contained in BTP RSB-5-1 are:

1. The suction side must be provided with the following isolation features:

   a. Two power-operated valves in series with position indicated in the control room.

   b. The valves must have independent and diverse interlocks to prevent opening if the reactor coolant system (RCS) pressure is above the design pressure of the RHR system.

   c. The valves must have independent and diverse interlocks to ensure at least one valve closes upon an increase in RCS pressure above the design pressure of the RHR system.

2. The discharge side must be provided with one of the following features:

   a. The valves, position indicators, and interlocks described in (1)(a) through (1)(c) above.

   b. One or more check valves in series with a normally-closed power-operated valve which has its position indicated in the control room. If this valve is used for an Emergency Core Cooling System (ECCS) function, the valve must open upon receipt of a safety injection signal (SIS) when RCS pressure has decreased below RHR system design pressure.

   c. Three check valves in series.

   d. Two check valves in series, provided that both may be periodically checked for leak tightness and are checked at least annually.

2.2 Emergency Core Cooling System. Isolation requirements for ECCS are contained in SRP 6.3. Isolation of ECCS to prevent overpressurization must meet one of the following features:

1. One or more check valves in series with a normally-closed motor-operated valve (MOV) which is to be opened upon receipt of a SIS when RCS pressure is less than the ECCS design pressure.

2. Three check valves in series.

3. Two check valves in series, provided that both may be periodically checked for leak tightness and are checked at least annually.

2.3 Other Systems. All other low pressure systems interfacing with the RCS must meet the following isolation requirements from BTP EICSB-3:

1. At least two valves in series must be provided to isolate the system when RCS pressure is above the system design pressure and valve position should be provided in the control room.

2. For systems with two MOVs, each MOV should have independent and diverse interlocks to prevent opening until RCS pressure is below the system design pressure and should automatically close when RCS pressure increases above system design pressure.

3. For systems with one check valve and a MOV, the MOV should be interlocked to prevent opening if RCS pressure is above system design pressure and should automatically close whenever RCS pressure exceeds system design pressure.

3.0 DISCUSSION AND EVALUATION

There are two systems at Big Rock Point, with direct interface to the RCS pressure boundary, which have a design pressure rating for all or part of the system which is lower than the RCS design pressure. These systems are the Shutdown Cooling System (SDCS) and Core Spray (CS) system.

3.1 Shutdown Cooling System. The SDCS system takes suction from the RCS, cools the water by circulation through the SDCS heat exchangers, and returns the water to the RCS via the recirc line. The suction side of the system has two motor-operated isolation valves.[2] Isolation on the discharge side is provided by two MOVs. The MOVs cannot open if pressure in the RCS is higher than the SDCS design pressure. They will automatically close on high RCS pressure, and each has position indication in the control room.[3] However, the interlocks for these valves are not diverse, since only one interlock contact and one pressure measuring system are used.[4]

Isolation provisions of the SDCS do not meet the current licensing criteria since the interlocks for the isolation valves are not diverse as required by BTP RSB-5-1.

3.2 Core Spray System. The CS system consists of two lines supplying the reactor vessel through two MOVs and a check valve per line.[5] Each MOV has position indicated in the control room. The MOVs will open upon a CS system initiation signal when RCS pressure has decreased below 200 psig; CS system design pressure is 150 psig. The MOVs will not automatically close upon clearing the initiation signal or on increasing RCS pressure above CS system design pressure. No interlocks exist to prevent opening of the CS system MOVs from the local control station when RCS pressure exceeds CS system design pressure.

The CS system does not meet the isolation criteria of current licensing requirements since no interlocks exist to prevent opening of isolation valves from the local control station when RCS pressure exceeds CS system design pressure.

4.0 SUMMARY

Big Rock Point has two systems with lower design pressure ratings than the RCS which are directly connected to the RCS. The SDCS and CS systems do not meet current licensing criteria contained in SRP 6.3 and BTP RSB-5-1 for isolation of high and low pressure systems as listed below.

1. The SDCS isolation valves do not have diverse interlocks to prevent operation when RCS pressure exceeds SDCS design pressure.

2. The CS system has no interlocks to prevent opening the isolation valves from the local control station when RCS pressure exceeds CS system design pressure.

5.0 REFERENCES

1. NUREG-75/087, Branch Technical Positions EICSB-3, RSB-5-1; Standard Review Plan 6.3.

2. Big Rock Point Piping and Instrumentation Drawing M-107, Rev. Q.

3. Big Rock Point Electrical Drawing E-112, Sheet 1, Rev. M.

4. Letter, Consumers Power (Vincent) to NRR (Crutchfield), dated November 12, 1981.

5. Big Rock Point Piping and Instrumentation Drawing M-123, Rev. AG.

SYSTEMATIC EVALUATION PROGRAM
TOPICS V-11.A AND V-11.B
BIG ROCK POINT

TOPICS: V-11.A, REQUIREMENTS FOR ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS
V-11.B, RHR INTERLOCK REQUIREMENTS

I. INTRODUCTION

Several systems that have a relatively low design pressure are connected to the reactor coolant pressure boundary. The valves that form the interface between the high and low pressure systems must have sufficient redundancy and interlocks to assure that the low pressure systems are not subjected to coolant pressures that exceed design limits. The problem is complicated since under certain operating modes (e.g., shutdown cooling and ECCS injection) these valves must open to assure adequate reactor safety.

II. REVIEW CRITERIA

The review criteria are presented in Section 2 of EG&G Report EGG-EA-5931, "Electrical Instrumentation and Control Features for Isolation of High and Low Pressure Systems."

III. RELATED SAFETY TOPICS AND INTERFACES

The scope of review for this topic was limited to avoid duplication of effort since some aspects of the review were performed under related topics. The related topics and the subject matter are identified below. Each of the related topic reports contain the criteria and review guidance for its subject matter.

V-10.B	RHR Reliability
VI-4	Containment Isolation
VIII-1.A	Degraded Grid Voltage

IV. REVIEW GUIDELINES

The review guidelines are presented in Section 7.3 of the Standard Review Plan.

V. EVALUATION

As noted in EG&G Report EGG-EA-5931, Big Rock Point has two systems with lower design pressure ratings than the RCS which are directly connected to the RCS. The SDCS* and Core Spray (CS) systems do not meet current

* The RHR function for the Big Rock Point Plant is accomplished by the Shutdown Cooling System (SDCS).

licensing criteria contained in SRP 6.3 and BTP RSB 5-1 for isolation of high and low pressure systems as listed below:

1. The SDCS isolation valves do not have diverse and independent interlocks to prevent operation when RCS pressure exceeds SDCS design pressure. However, redundant pressure switches (two in series) and relays (two in parallel) are provided. Relay contacts are segregated with one relay controlling the inboard valves and the other the outboard valves. Because the relays share a common power supply, they are not independent and could, theoretically, be damaged by an overvoltage or underfrequency transient. SEP Topic VIII-1.A examined such transients and found that suitable protection was provided at this plant. The system is designed to close the valves on high pressure (either switch opens) or loss of instrument power. All four valves are powered from the same bus. Power is locked out during power operations. Should the valve power fail during SDCS operation the only source of pressure available is decay heat. The pressure buildup could be controlled by the use of the pressure relief system and the core spray system if the valves could not be closed manually in sufficient time.

   Topics V-10-B, "RHR Reliability" and VII-3, "Systems Required for Safe Shutdown" also have examined the subject of RHR Interlocks and found them to be acceptable.

2. The CS system has no interlocks to prevent opening the isolation valves from the local control station when RCS pressure exceeds CS system design pressure.

   A check valve is provided between the two motor operated valves in each train that is tested monthly. One could argue that the failure of this check valve and the manipulation of the local control station constitute two independent single failures and as such find that the present design satisfies the single failure criterion. This, however, is not true under accident conditions when valve action is desired and there are no suitable provisions to augment administrative controls over the operator's actions. In this event, a check valve failure alone may result in a loss of the low pressure system.

VI. CONCLUSIONS

Because of the severe consequences of a LOCA outside of containment the staff proposes that control of the CS valves should be modified to satisfy the interlock provisions of SRP Section 6.3 and BTP RSB 5-1.

The staff does not recommend modification of the SDCS because the present design satisfies the single failure criterion and further modifications to provide diversity or redundancy will not provide a significant improvement in the protection of the public health and safety.