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

TERA

July 10, 1980

Docket No. 50-409

Mr. Frank Linder
General Manager
Dairyland Power Cooperative
2615 East Avenue South
La Crosse, Wisconsin 54601

Dear Mr. Linder:

RE: SEP TOPICS III-10.A, V-11.A, VI-7.C.1, and III-3.B
(La Crosse Boiling Water Reactor)

Enclosed is a copy of our current evaluation of Systematic Evaluation Program Topics III-10.A, Thermal-Overload Protection for Motors of Motor-Operated Valves; V-11.A, Electrical, Instrumentation, and Control Features for Isolation of High and Low Pressure Systems; VI-7.C.1, Independence of Redundant Onsite Power Systems; III-3.B, DC Power System Bus Voltage Monitoring and Annunciation. This assessment compares your facility, as described in Docket No. 50-409 with the criteria currently used by the regulatory staff for licensing new facilities. Please inform us if your as-built facility differs from the licensing basis assumed in our assessment within 90 days of receipt of this letter.

These evaluations will be basic inputs to the integrated safety assessments for your facility unless you identify changes needed to reflect the as-built conditions at your facility. The topic assessments may be revised in the future if your facility design is changed or if NRC criteria relating to the topics is modified before the integrated assessments are completed.

Sincerely,

Dennis M. Crutchfield

Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
Division of Licensing

Enclosures:
Completed SEP
Topics III-10.A, V-11.A,
VI-7.C.1, and III-3.B

cc w/enclosure:
See next page

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cc w/enclosures:

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SEP TECHNICAL EVALUATION
TOPIC III-10.A

THERMAL-OVERLOAD PROTECTION FOR MOTORS
OF MOTOR-OPERATED VALVES

LACROSSE

TOPIC III-10.A Thermal-Overload Protection for Motors of Motor-Operated Valves

The objective of this review is to provide assurance that the application of thermal-overload protection devices to motors associated with safety-related motor-operated valves do not result in needless hindrance of the valves to perform their safety functions.

In accordance with this objective, the application of either one of the two recommendations contained in Regulatory Guide 1.106, "Thermal-Overload Protection for Electric Motors on Motor-Operated Valves," is adequate. These recommendations are as follows:

(1) Provided that the completion of the safety function is not jeopardized or that other safety systems are not degraded, (a) the thermal-overload protection devices should be continuously bypassed and temporarily placed in force only when the valve motors are undergoing periodic or maintenance testing, or (b) those thermal-overload protection devices that are normally in force during plant operation should be bypassed under accident conditions.

(2) The trip setpoint of the thermal-overload protection devices should be established with all uncertainties resolved in favor of completing the safety-related action. With respect to those uncertainties, consideration should be given to (a) variations in the ambient temperature at the installed location of the overload

protection devices and the valve motors, (b) inaccuracies in motor heating data and the overload protection device trip characteristics and the matching of these two items, and (c) setpoint drift. In order to ensure continued functional reliability and the accuracy of the trip point, the thermal-overload protection device should be periodically tested.

In addition, the current licensing criteria require that:

(3) In MOV designs that use a torque switch to limit the opening or closing of the valve, the automatic opening or closing signal should be used in conjunction with a corresponding limit switch.

## DISCUSSION

Review of LaCrosse drawings shows that the only motor-operated valves supplied power from ESF buses are the alternate core spray valves.[4] All of these valves have thermal-overload protection devices which are not bypassed; there is no docketed information to indicate that TOL trip setpoints have been set to comply with Criterion 2, above. Additionally, automatic valve operate commands are terminated by torque switches rather than limit switches.

## EVALUATION

Thermal-overload protection for motor-operated valves at LaCrosse does not comply with current licensing criteria. Thermal-overload devices are not bypassed, no information is available to support adequacy of trip setpoints, and torque switches rather than limit switches are used to terminate valve travel.

## REFERENCES


1. IEEE Standard 179-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."

2. Branch Technical Position EICSB-27, "Design Criteria for Thermal Overload Protection for Motors of Motor-Operated Valves."

3. Regulatory Guide 1.106, "Thermal Overload Protection for Electric Motors on Motor-Operated Valves."

4. LaCrosse Drawing 503775, Revision 10, dated 5-2-78.

TOPIC V-11.A

SEP TECHNICAL EVALUATION REPORT
ELECTRICAL, INSTRUMENTATION, AND CONTROL FEATURES FOR
ISOLATION OF HIGH AND LOW PRESSURE SYSTEMS

LACROSSE 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 Plant (SRP), Section 6.3.

## 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 is one system at the LaCrosse Nuclear Station which has a direct interface with the RCS and has a lower design pressure rating for all or part of the system than RCS design pressure. This system is the Core Spray (CS) system.

3.1 Core Spray System. The CS system consists of a high pressure subsystem and two low pressure systems for providing emergency core cooling. One low pressure subsystem provides water by gravity feed from an overhead tank to the high pressure core spray line, while the other subsystem provides water from diesel-driven pumps to the core through a separate line.

Isolation of the line from the overhead tank to the high pressure core spray line is provided by a check valve in series with an air-operated valve (AOV). A solenoid valve controls the air to the AOV which has position indicated in the control room. The AOV cannot be opened unless reactor pressure is below system design pressure and two low level sensors indicate low reactor water level. The AOV will automatically shut if either reactor pressure increases increases above system design pressure or either of the low level indications are cleared. The valve fails open upon loss of power to the solenoid valve.

Isolation of the line from the diesel-driven core spray pumps to the RCS is provided by two series check valves at the point where the piping changes from a high pressure to a low pressure system. The check valves are not individually testable since there are no connections between the valves to determine leakage from the inboard (closest to RCS) valve or to pressurize the outboard check valve.

The CS system is in compliance with current licensing requirements for isolation of high and low pressure systems except for the non-testability of the two series check valves in the spray line from the diesel-driven core spray pumps required by SRP 6.3.

## 4.0 SUMMARY

The LaCrosse Nuclear Station has one system with lower design pressure rating than the RCS which is directly connected to the RCS. The CS system meets current licensing criteria contained in SRP 6.3 for isolation of high and low pressure systems except for the testability requirements for the series check valves in the line from the diesel-driven core spray pumps.

## 5.0 REFERENCES


1. NUREG-075/087, Branch Technical Positions EICSB-3, RSB-5-1; Standard Review Plan 6.3.
2. LACBWR Drawings 410200-237, 41-300-080, and 41-503-770.
3. Safeguards Report for Operating Authorization, LaCrosse Boiling Water Reactor.

TECHNICAL EVALUATION

TOPIC VI-7.C.1

INDEPENDENCE OF REDUNDANT ONSITE POWER SYSTEMS

LA CROSSE

## 1.0 INTRODUCTION

The objective of this review is to determine if the onsite electrical power systems (AC and DC) are in compliance with current licensing criteria for electrical independence between redundant standby (onsite) power sources and their distribution systems.

General Design Criterion 17 requires that the onsite electrical power supplies and their onsite distribution systems shall have sufficient independence to perform their safety function assuming a single failure. Regulatory Guide 1.6, "Independence Betwen Redundant Standby (Onsite) Power Sources and Between Their Distribution System," and IEEE Standard 308-1974, "IEEE Standard Criteria for Nuclear Power Generating Stations" provide a basis acceptable to the NRC staff for meeting GDC 17 in regards to electrical independence of onsite power systems.

## 2.0 CRITERIA

2.1 AC Supplies. When operating from standby sources, redundant load groups and redundant standby sources should be independent of each other at least to the following extent.

(1) The standby sou e of o load group should not be automati ily pa lele with the standby source of another load gro und accident conditions

(2) No provisions should exist for automatically transferring one load group to another load group or loads between redundant power sources

(3) If means exist for manually connecting redundant load groups together, at least one interlock should be provided to prevent an operator error that would parallel their standby power sources.

2.2 DC Supplies. Each DC load group should be energized by a battery and charger. The battery-charger combination should have no automatic connection to any other redundant DC load group.

## 3.0 DISCUSSION AND EVALUATION

### 3.1 AC Supplies

3.1.1 Discussion. The La Crosse onsite AC power system consists of two redundant diesel generator (DG) supplied power trains. During LOCA conditions DG 1A supplies the 480-V essential (ESS) bus 1A, the "Turbine Building 480-V MCC 1A," and the "Turbine Building 120-V bus." The "Turbine Building 120-V Regulated Bus" is supplied from the "Turbine Building 120-V bus" through an isolation transformer. The DG 1B supplies the "480-V ESS bus 1B," the "Reactor Building 480-V MCC 1A," and the "Diesel Building 480-V MCC."

There is no automatic paralleling of the two power sources or transfers of loads or load groups between the sources.

Essential buses 1A and 1B may be manually connected by closing breaker 452 TBA on bus 1A and 452 TBB on bus 2B. There are no interlocks to prevent paralleling the two diesel generators when utilizing this manual connection.

It is also possible to parallel the two DGs through the "120 V AC Non-Interruptable Bus 1B." This bus is normally supplied power from DC AC inverter 1B. Upon the failure of the inverter, a static switch in the inverter automatically transfers the bus to a 480/120 Volt transformer supplied from the "Diesel Building 480 V Motor Control Center" (DG 1B). The "120 V AC Non-interruptable Bus 1B" can be simultaneously connected to the "Turbine Building 120 V Regulated Bus" (DG 1A) if a normally-open circuit breaker on the regulated bus is also closed. No interlocks are provided to prevent paralleling the two sources. However, as described above, the "Turbine Building 120-V Regulated Bus" is isolated from DG 1A through the use of an isolation transformer.

3.1.2 Evaluation. There are no automatic paralleling of sources or automatic transfers of loads and/or load groups between the redundant sources. This complies with the single failure criteria. However, the design allows the manual tying of essential 480-Volt bus 1A to 1B, and the connection of two trains through the "120 V AC Non-interruptable Bus 1B" without interlocks to prevent paralleling of the redundant onsite sources. Therefore, the independence of the La Crosse onsite AC power trains do not comply with the recommendations of R.G. 1.6.

### 3.2 DC Supplies

3.2.1 Discussion. The La Crosse onsite DC systems consists of three 125 V DC trains. The Diesel Building (D.B.) standby bus, the Reactor Plant (RX) bus, and the Generator Plant (Gen.) bus are all supplied from separate battery-charger sources. The charger for the RX bus is supplied from the DG1A through motor control center (MCC)1A; the Gen. bus is supplied from the offsite power through MCC1D; and the D.B. standby bus charger is supplied from DG 1B through the D.B. 480-V MCC.

There are no automatic connections between the three buses. The Gen. bus may be tied to the RX bus by manually closing the normally open bus tie circuit breaker which is located on the RX bus. The RX and D.B. standby buses may be connected by manually closing of normally open bus tie circuit breakers located on the D.B. standby and on the RX buses. The Technical Specifications, Section 4.2.3.2.3, require as a "Limiting Condition for Operation" that the tie breakers be open during operating modes 1, 2, 3, 4, and 5.

3.2.2 Evaluation. Each of the three DC load groups are energized by a battery and charger. There are no automatic connections between battery-charger combinations and other redundant DC load groups. The DC systems comply with present licensing requirements.

## 4.0 SUMMARY

In two cases, as described in Section 3.1, the design of the La Crosse onsite AC power systems allow the manual connection of redundant load groups without interlocks to prevent paralleling of redundant AC sources. This does not comply with the staff recommendations included in R.G. 1.6.

The review of referenced information and drawings indicates that, with the above exceptions, the La Crosse onsite AC and DC redundant power sources and their distribution systems comply with the single failure criteria as outlined in R.G. 1.6.

## 5.0 REFERENCES


1. Letter DPC (Shimshak) to NRC (Shea) dated July 25, 1974.

2. Letter DPC (Madgett) to NRC (Giambusso) dated January 21, 1975.

3. Letter DPC (Madgett) to NRC (Reid) dated December 23, 1975; Attached Sargent and Lundy Report No. SL-3232, "Description of Diesel Generator Building and Secondary Emergency On-Site Electrical Power System, LACBWR – Genoa Station Unit 2," dated December 12, 1975.

4. Letter DPC (Madgett) to Zieman, LAC-3554, dated December 18, 1975; Attached Report No. NES 81A0019, "Single Failure Analysis of the La Crosse Boiling Water Reactor Emergency Core Cooling Systems," Revision 2, dated November 24, 1975.

5. Sargent and Lundy drawings:

   (a) #503678, "Wiring Diagram RX Plant 125 V DC MCC, Revision B, dated March 2, 1976

   (b) #503679, "Wiring Diagram Gen. Plant 125 V DC MCC, Revision 7, dated April 21, 1978

   (c) #503627, "Single Line Diagram Unit 1 - Part 2," Revision D, dated November 11, 1977

   (d) #503628, "Key Diagram Diesel Building 480 V ESS. Swgr Bus 1B," Revision E, dated November 9, 1977

   (e) #503753/pg AP01, "Schematic Diagram Auxiliary Power System (AP)," Revision A, dated October 10, 1975. PCo, Big Rock Point, dated May 26, 1976, page 9

   (f) #503753/pg AP02, "Schematic Diagram Auxiliary Power System (AP)," Revision C, dated May 7, 1976

   (g) #503837, "Wiring Diagram D.B. 125 V DC Non-Iter. Power Supply MCC," Revision D, dated February 28. 1978

   (h) #503629, "Key Diagram Dies. Bldg. 480 V AC MCC and 125 V DC Dist. Bus," Revision H, dated February 28, 1978.

6. General Design Criterion 17, "Electrical Power System," of Appendix A, "General Design Criteria of Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."

7. "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems," Regulatory Guide 1.6.

8. "IEEE Standard Criteria for Nuclear Power Generating Stations," IEEE Standard 308-1974, The Institute of Electrical and Electronic Engineers, Inc.

SEP TECHNICAL EVALUATION
TOPIC VIII-3.B

DC POWER SYSTEM BUS VOLTAGE
MONITORING AND ANNUNCIATION

LACROSSE

## 1.0 INTRODUCTION

The objective of this review is to determine if the DC power system bus voltage monitoring and annunciation are in compliance with current licensing criteria for Class IE DC power systems.

The specific requirements for DC power system monitoring derive from the general requirements embodied in Sections 5.3.2(4), 5.3.3(5), and 5.3.4(5) of IEEE Standard 308-1974[1], and in Regulatory Guide 1.47[2]. In summary, these general requirements simply state that the DC system (batteries, distribution systems, and chargers) shall be monitored to the extent that it is shown to be ready to perform its intended function.

## 2.0 CRITERIA

As a minimum, the following indications and alarms of the Class IE DC power system(s) status shall be provided in the control room:[3]

- Battery current (ammeter-charge/discharge)
- Battery charger output current (ammeter)
- DC bus voltage (voltmeter)
- Battery charger output voltage (voltmeter)
- Battery high discharge rate alarm
- DC bus undervoltage and overvoltage alarm
- DC bus ground alarm (for ungrounded system)
- Battery breaker(s) or fuse(s) open alarm

- Battery charger output breaker(s) or fuse(s) open alarm
- Battery charger trouble alarm (one alarm for a number of abnormal conditions which are usually indicated locally).

## 3.0 DISCUSSION AND EVALUATION

3.1 Discussion. Three 125 V batteries, three battery chargers, and three DC buses comprise the LaCrosse Class IE DC power systems. Control room indication consists of bus voltage (one bus only), bus undervoltage and ground alarms (each bus), and charger trouble alarms (each charger).[4] Local indication consists of bus current ammeters, charger output ammeters, bus voltmeters, and charger output voltmeters.

3.2 Evaluation. The LaCrosse control room has no indication of battery current, charger output current, bus voltage (two buses), charger output voltage, battery high discharge rate, bus overvoltage, battery breaker/fuse status, or charger output breaker/fuse status. Therefore, the LaCrosse DC power systems monitoring is not in compliance with current licensing criteria.

## 4.0 SUMMARY

Of 11 parameters currently required to be indicated or alarmed in the control room, only four are indicated or alarmed for one bus and only three for the other two buses in the LaCrosse control room. Therefore, the LaCrosse DC power systems are not monitored in compliance with current licensing criteria.

## 5.0 REFRENCES

1. IEEE Standard 308-1974, "Standard Criteria for Class IE Power Systems for Nuclear Power Generating Stations."

2. Regulatory Guide 1.74, "Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems."

3. NRC Memorandum, PSB (Rosa) to SEPB (Crutchfield), "DC System Monitoring and Annunciation," dated October 16, 1979.

4. Letter, Dairyland Power Cooperative (Linder) to NRR (Ziemann), "SEP Topic VIII-3.B, DC Power System Bus Voltage Monitoring and Annunciation," dated July 11, 1979

## 4.0 SUMMARY

The Yankee Rowe accumulator isolation valve power and control system design does not meet current licensing criteria, in that control room valve position indication is neither redundant nor single-failure free.

## 5.0 REFERENCES


1. IEEE Standard 279, "Criteria for Protection Systems for Nuclear Power Generating Stations."

2. Branch Technical Position ICSB 4, "Requirements of Motor-Operated Valves in the ECCS Accumulator Lines."

3. Branch Technical Position ICSB 18, "Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves."

4. Yankee Atomic Electric Company Drawing 9699-FM-83A, No Revision, dated November 10, 1977.

5. "Yankee Rowe Nuclear Power Station, Technical Specifications," paragraph 4.5.2.b.

6. Yankee Atomic Electric Compnay Drawing 9699-ESK-6AD, Revision 9, dated March 31, 1979.