SEP TECHNICAL EVALUATION

TOPIC VI-7.C.1
INDEPENDENCE OF REDUNDANT ONSITE POWER SYSTEMS
BIG ROCK POINT

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 Between Redundant Stanby (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

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 source of one load group should not be automatically paralleled with the standby source of another group under 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

(4) Each DC load group should be energized by a battery and battery 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. In the Commission Memorandum and Order, dated May 26, 1976[1], Big Rock Point (BRP) was granted a lifetime exemption from the single failure requirements of 10 CRF Part 50 50.46 and Appendix K, Paragraph I.D.1 as applied to a LOCA caused by a break in a core spray line and a concurrent single failure in the remaining core spray system. Included in the order was a plant-life exemption from the requirement that the ECCS short-term and long-term cooling functions be invulnerable to a single failure which disables onsite power assuming offsite power is availabile. This was allowed in view of the high availability of offsite power at BRP, together with improved reliability of the onsite diesel and guaranteed availability of a backup diesel for long-term cooling. The Director's comments note that, in view of the small size of this plant compared with the system capacity, trips of the plant due to internal causes are relatively unlikely to cause a loss of offsite power.

As a result of the above action, BRP has only one onsite diesel generator unit.

The independence between the single onsite AC power source and the offsite sources is considered in this review. With offsite power available, the safety bus, motor control center (MCCC)2B, is supplied power

from plant 480 V MCC2A. Plant 480 V MCC1A is an alternate feed to MCC2B. With loss of offsite power, both tie breakers between the safety bus and plant buses are automatically opened. Interlocks prevent the connection of the diesel generator unit to the safety bus if either of the tie breakers are not open.

Plant procedures and that all MCC1A and/or 2A loads are to be connected to the safety bus when utilizing the diesel generator supply. The procudure to manually connect the plant buses to the safety bus require the following actions:

(1) Open the incoming offsite supply breakers to bus MCC1A and/or 2A

(2) Remove all loads from the plant bus (MCC1A or 2A)

(3) Close appropriate tie breaker between MCC1A and/or 2A and MCC2B.

Synchronization check relays prevent the paralleling of the diesel generator unit with the offsite power sources by opening the appropriate supply breakers to MCC1A and 2A if the diesel generator is connected to the plant bus.

There is no automatic transfer of loads or load groups between the onsite and offsite power supplies.

3.1.2 Evaluation. The onsite and offsite AC power supplies have sufficient independence since there is no automatic transfer of loads between sources and the manual ties have interlocks to prevent paralleling of power sources.

3.2 DC Supplies

3.2.1 Discussion. Big Rock Point Nuclear Station has a single station 125 V DC battery-charger set to supply the plant loads

and a portion of the safety requirements. In addition to the station battery-charger set, there are four uninterruptable power supplies (UPS), each consisting of a battery, battery-charger, and an inverter. Each UPS has outputs for 120 V AC and 125 V DC loads. The diesel fire water pump and the diesel generator have their own battery-charger sets for starting power. The diesel fire water pump battery-charger set also supplies its own control power.

On February 27, 1976, Consumers Power Company (CPCo) provided the NRC a "Report on Evaluation of Adequacy of Emergency Core Cooling System"[1]. Included in this report was a single failure analysis of the effects on ECCS with the loss of the single battery-charger set. It was determined that the failure of the station battery-charger set, with loss of offsite power, would disable the ECCS. This would be due to (a) the loss of 125 V DC power to operate the nozzle spray valves and (b) the disabling of the single onsite AC power supply and, therefore, prevention of the operation of the redundant 480 V AC operating valves. Subsequent to the analysis, to correct the single failures, control power for the diesel generator, the diesel generator tie breaker, and the two plant-to-safety bus tie breakers was removed from the station 125 V DC battery set and placed on the UPS "A" 125 V DC source.

3.2.2 Evaluation. Each DC load group has its own battery-charger set and, therefore, no manual or automatic transfers between battery-charger load groups.

4.0 SUMMARY

A review of drawings and docketed information indicate that the AC and DC power supplies meet the current licensing criteriar for independence of redundant power sources.

Future SEP actions under Topic VI-7.C.2, "Failure Mode Analysis ECCS;" Topic VII-3, "Systems Required for Safe Shutdown;" and Topic VII-1.A, "Potential Equipment Failures Associated with Degraded

Grid Voltage," will review the capabilities of the onsite power systems to meet safety requirements.

5.0 REFERENCES

1. Letter CPCo (R. B. Sewell) to NRC (S. J. Chilk) dated February 27, 1976, attached report, "Report on Evaluation of Adequacy of Emergency Core Cooling System."

2. Memo to S. J. Chilk from D. C. Rusche, dated April 19, 1976, "Staff Views Regarding Consumers Power Company Report on Evaluation of Adequacy of Emergency Core Cooling System for Big Rock Point," pages 15 through 20.

3. Memorandum and Order by the Commissioners, NRC, in the matter of CPCo, Big Rock Point, dated May 26, 1976, page 9.

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

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

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

7. Consumers Power Company Drawings:

   WD740, Sht 1, Revision M, dated 3/29/78
   WD740, Sht 11, Revision M, dated 6/10/77
   WD740, Sht 12, Revision J, dated 10/15/76
   WD740, Sht 13, Revision L, dated 4/18/78
   0740G 30101, Revision S, dated 4/18/78

0740G 30102, Revision M, dated 4/28/77

0740G 30105, Revision K, dated 7/28/77

0740G 301001, Revision B, dated 7/14/76