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SUBJECT: Documents actions taken & future actions to be taken as result of discovering effect of dc power supply failure.

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10 CFR Part 50
Appendix K

Director of Nuclear Reactor Regulation
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MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Effect of a DC Power Supply Failure on ECCS Performance

On September 29, 1988, we informed the NRC Project Manager for Monticello of an error in a May 30, 1980 letter from L O Mayer (NSP) to the Director of NRR (NRC) on the subject, "Effect of DC Power Supply Failure on ECCS Performance." This letter will document the actions taken and future actions to be taken as a result of discovering this error.

The May 30, 1980 letter identified that the following equipment would be available following a loss of 125 VDC:

Postulated Failure	Resulting Configuration
A-125 VDC	1 LPCS + 2 LPCI + HPCI + ADS
B-125 VDC	1 LPCS + 2 LPCI + ADS

In each case, two LPCI pumps will remain energized, however, the loop injection valves may not be energized depending upon the loop selected by the loop selection logic.

The following should have been reported:

Postulated Failure	Resulting Configuration
A-125 VDC	1 LPCS + HPCI + ADS + 2 LPCI (if the loop selection logic selects loop B)
B-125 VDC	1 LPCS + ADS + 2 LPCI (if the loop selection logic selects loop A)

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The unavailability of a 125 VDC bus coincident with a loss of offsite power and a large break loss-of-coolant accident could leave only one core spray pump available to inject into the reactor vessel.

The Monticello Technical Specifications require the plant to shutdown if one 125 VDC bus becomes inoperable. Therefore plant operation is not permitted under circumstances where only one core spray pump could be available. In addition, upon discovery of this condition, a plant procedure was issued to identify manual operator actions to be taken to restore LPCI operability on failure of a 125 VDC bus.

After reviewing the effects of the failure of a 125 VDC bus, we will modify the plant during the next refueling outage so that both divisions of LPCI valves will be available on failure of a 125 VDC bus.

A more detailed discussion of the situation is attached. Please contact us if you have any questions related to this issue or the corrective actions we have described.

David Musolf
Manager Nuclear Support Services

c: Regional Administrator-III, NRC
NRR Project Manager, NRC
Resident Inspector, NRC
G Charnoff

Attachment

MONTICELLO NUCLEAR GENERATING PLANT

Effect of a DC Power Supply Failure on ECCS Performance

Current Configuration

The loss of 125 VDC during a Loss-of-Coolant Accident (LOCA) with loss of offsite power could leave only one low pressure pump available to inject into the reactor vessel.

The Low Pressure Coolant Injection (LPCI) valves and Recirculation system isolation valves are divisionalized and are normally powered from separate sources (MCC 133B and MCC143B) (See Figure 1). Two crosstie breakers (ACB 52-3320 and ACB 52-4320) are normally open and provide the capability to energize the other division's MCC within 10 seconds if power is lost to one MCC and the source breaker (ACB 52-307 and ACB 52-407) is tripped. For example, if Division I AC power is lost, the voltage monitoring logic will automatically trip the source breaker (ACB 52-307) and close the two crosstie breakers (ACB 52-3320 and ACB 52-4320) to reenergize MCC 133B.

Control power for the crosstie breakers and the source breakers is 125 VDC. Loss of 125 VDC will disable the crosstie function. For example, loss of Division I 125 VDC during a normal electrical line-up would electrically disable ACB 52-307 in the closed position and ACB 52-3320 VDC in the open position, leaving the crosstie function inoperable.

If this occurred concurrent with a LOCA with a loss of off-site power, one division of low pressure pumps would be inoperable due to the loss of control power to the associated breakers (the loss of the Diesel Generator breaker itself makes this equipment inoperable) and one set of LPCI valves would be deenergized due to loss of crosstieing capability. For example, loss of Division 1 125 VDC coincident with loss of offsite power and a LOCA would leave #11 Core Spray Pump, #11 & #13 RHR pumps and the Loop A injection valves inoperable. If the loop selection logic selected Loop A to inject into, only #12 Core Spray pump would be available for automatic low pressure injection. If the loop selection logic selected loop B, #12 Core Spray Pump and #12 & #14 RHR Pumps would be available for automatic low pressure injection.

Current LOCA Analysis

The current LOCA analysis was performed assuming the worst single failure to be the active failure of a LPCI injection valve, leaving two core spray pumps available for low pressure injection to the reactor vessel. General Electric Company document titled "Analytical Model for Loss-of-Coolant Analysis in Accordance with 10 CFR 50 Appendix K - Volume 1," NEDO 20566, interprets compliance with 10 CFR Part 50, Appendix K, Section I.D.1: "Single Failure Criterion" as follows:

10 CFR Part 50, Appendix K, Section I.D.1:

> An analysis of possible failure modes of ECCS equipment and of their effects on ECCS performance must be made. In carrying out the accident evaluation the combination of ECCS subsystems assumed to be operative shall be those available after the most damaging single failure of ECCS equipment has taken place.

NEDO-20566 interpretation, page I-302:

> The evaluation of the loss-of-coolant accident will be performed assuming the single active component failure that results in the most severe consequences and assuming no credit for the station's normal auxiliary power. The combination of ECC subsystems assumed to be operating shall be those remaining after the component failure has occurred.
>
> The term "active component" means a component in which physical movement of moving parts must occur in order to accomplish its safety function. "Active component failure" means the failure of a component to accomplish its safety function due to failure of moving parts of the component. A single failure may be the failure of an individual component or it may include the failures of several components resulting from the cascading of the effect of an initial failure.

The passive failure of a 125 VDC bus, leaving only one Core Spray Pump to inject into the reactor vessel, is not accounted for in the current Monticello analysis and is beyond the original design basis for the plant.

Evaluation and Justification for Continued Operation

The probability of a LOCA, loss of offsite power, loss of 125 VDC and the deenergized loop injection valves being selected occurring simultaneous is very low. The probability of a LOCA or a loss of offsite power individually is very low.

The 125 VDC system is also very reliable. The system is an ungrounded system, i.e., two grounds are required to cause a failure of one division. New batteries were installed in 1984. Surveillances, Preventive Maintenance Procedures and periodic testing further increase the batteries' reliability. Annunication of critical parameters is provided for quick operator identification and prompt problem rectification.

If a 125 VDC division is found to be inoperable, the Monticello Technical Specifications require the plant to be below 212 ^{o}F within 24 hours.

Corrective Actions

An interim procedure has been provided to the operators to make them aware of this situation and provide actions necessary to manually restore power to the deenergized LPCI valves in the event of a loss of 125 VDC.

During the next refueling (currently scheduled to begin August 1989), a modification will be made to assure that a failure of one 125 VDC division will not leave either MCC 133B or MCC 143B deenergized upon loss of normal power to that MCC. A description of the modification will be provided to the Monticello NRC Project Manager prior to installation.

A review of other passive electrical failures effect on LOCA analysis will be made to identify if other similar situations exist. In the future, we will consider passive electrical failures as part of the Monticello design basis.

Monticello Nuclear Generating Plant

Figure 1