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April 17, 1989

10 CFR 50.63

Director of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Generic Response to Station Blackout Rule
For Plants Using Alternate AC Power

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR, Part 50. A new section, 50.63, was added which requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Utilities are expected to have the baseline assumptions, analyses and related information used in their coping evaluation available for NRC review. It also identifies the factors that must be considered in specifying the station blackout duration. Section 50.63 requires that, for the station blackout duration, the plant be capable of maintaining core cooling and appropriate containment integrity. Section 50.63 further requires that each licensee submit the following information:

1. A proposed station blackout duration including a justification for the selection based on the redundancy and reliability of the onsite emergency AC power sources, the expected frequency of loss of offsite power, and the probable time needed to restore offsite power;

2. A description of the procedures that will be implemented for station blackout events for the duration (as determined in 1 above) and for recovery therefrom; and

3. A list and proposed schedule for any needed modifications to equipment and associated procedures necessary for the specified SBO duration.

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The NRC has issued Regulatory Guide (RG) 1.155 "Station Blackout" which describes a means acceptable to the NRC Staff for meeting the requirements of 10 CFR 50.63. RG 1.155 states that the NRC Staff has determined that NUMARC 87-00 "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout At Light Water Reactors" also provides guidance that is in large part identical to the RG 1.155 guidance and is acceptable to the NRC Staff for meeting these requirements.

Table 1 to RG 1.155 provides a cross-reference between RG 1.155 and NUMARC 87-00 and notes where the RG takes precedence.

Wisconsin Public Service Corporation (WPSC) has evaluated the Kewaunee Nuclear Power Plant (KNPP) against the requirements of the SBO rule using guidance from NUMARC 87-00 except where RG 1.155 takes precedence. The results of this evaluation are detailed below. (Applicable NUMARC 87-00 sections are shown in parentheses.)

A. Proposed Station Blackout Duration

NUMARC 87-00, Section 3 was used to determine a proposed SBO duration of four hours for the Kewaunee Nuclear Power Plant.

The following plant factors were identified in determining the proposed station blackout duration:

1. AC Power Design Characteristic Group is P1 based on:

   a. Expected frequency of grid-related loss of off-site power events (LOOPs) does not exceed once per 20 years (Section 3.2.1, Part 1A, p. 3-3);

   b. Estimated frequency of LOOPs due to extremely severe weather (ESW) places the plant in ESW Group 1 (Section 3.2.1, Part 1B, p. 3-4). Although NUMARC 87-00 places the KNPP in the ESW Group 4 a preliminary review of weather data for the Green Bay area from 1947-1988 supports an ESW Group 1. Additional information will be collected during the next several months with a final report due by the end of August 1989. Should the results of this report indicate that an ESW Group 1 was incorrect this submittal will be modified.

   c. Estimated frequency of LOOPs due to severe weather (SW) places the plant in SW Group 2 (Section 3.2.1, Part 1C, p. 3-7);

   d. The offsite power system is in the I1/2 group (Section 3.2.1, Part 1D, p. 3-10). The KNPP is in the I1/2 group because of its switchyard configuration and power transfer schemes when the normal source of AC power is lost.

   e. The KNPP is not susceptible to a hurricane induced LOOPs and therefore this design characteristic group is not applicable.

2. The emergency AC power configuration group is C based on: (Section 3.2.2, Part 2C, p. 3-13)

   a. There are two emergency AC power supplies not credited as alternate AC power sources. (Section 3.2.2, Part 2A, p. 3-15);

   b. One emergency AC power supply is necessary to operate safe shutdown equipment following a loss of offsite power (Section 3.2.2, Part 2B, p. 3-15).

3. The target emergency diesel generator (EDG) reliability is 0.95.

   a. A target EOG reliability of 0.95 was selected based on having a nuclear unit average EOG reliability for the last 50 demands greater than 0.94 consistent with NUMARC 87-00, Section 3.2.4.

4. An alternate AC (AAC) power source will be utilized at KNPP. The AAC power source will be available within ten minutes of the onset of the station blackout event and have sufficient capacity and capability to operate systems necessary for coping with a station blackout for the required SBO duration of four hours to bring and maintain the plant in safe shutdown. It is noted that Class 1E battery(ies) capacity, compressed air and containment isolation need not be addressed.

   A description of the AAC source is provided in Attachment A. A conceptual one-line diagram of the AAC power source is provided in Figure 1.

B. Procedure Description

Plant procedures have received a preliminary review against the guidelines in NUMARC 87-00, Section 4, in the following areas:

1. Operating procedure guidelines per NUMARC 87-00, Section 4.2.1.

The applicable KNPP procedures that verify proper AC power restoration response include the following:

ECA-0.0 LOSS OF ALL AC POWER
A-DGM-10 DIESEL GENERATOR LOCAL MANUAL OPERATION

These procedures address the guidelines identified in NUMARC 87-00, Sections 4.2.1, which have been determined to be applicable to the KNPP.

2. AC power restoration per NUMARC 87-00, Section 4.2.2

The System Operating department at WPSC is aware of the proper course of action for restoring AC power to the KNPP in the event of a station blackout. The following concerns are addressed by specific WPSC procedures or guidance:

- System Operators will give the highest possible priority to restoring power to KNPP. Procedures are written and training has been conducted which provide several methods of transmitting power from blackstart capable units to the KNPP.

- Should incoming transmission lines to KNPP be damaged, high priority should be assigned to repair and restoration activities to at least one line capable of feeding shutdown equipment.

- Repair crews engaged in power restoration activities for KNPP should be given high priority for manpower, equipment, and materials.

Once power becomes available, station procedures specify the sequence of circuit breaker operations to restore AC power to shutdown equipment.

3. Severe weather per NUMARC 87-00, Section 4.2.3

The following plant procedure identifies the necessary site-specific actions to be taken in the event of an earthquake, or in anticipation of flooding or tornado.

E-0-05 Natural Disaster

Additional procedure reviews and changes will be made as required upon completion of installation of the AAC modifications.

C. Proposed Modifications and Schedule

The proposed modifications to comply with the SBO rule involve locating a diesel generator onsite as an AAC power source. This AAC source will have the capacity and capability to power the equipment necessary to cope with a SBO in accordance with NUMARC 87-00, Section 7 for the required coping duration determined in accordance with NUMARC 87-00, Section 3.2.5. The AAC power source will have the capability for starting and loading required shutdown equipment on either safeguards bus from the KNPP control room. The incoming power cables, and associated metering and instrumentation cabling will not be routed through the KNPP substation. Additional details concerning the AAC power source are included in Attachment A.

1. Condensate Inventory For Decay Heat Removal (Section 7.2.1)

It has been determined from Section 7.2.1 of NUMARC 87-00 that 36,531 gallons of water are required for decay heat removal for the four-hour required coping duration category. The minimum permissible condensate storage tank level per technical specifications provides 30,000 gallons of water. The following additional water sources have ~~been identified~~ as being available to provide the total required amount of condensate for decay heat removal for 4 hours:

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° 1A Condensate storage tank 75,000 gallons
° 1B Condensate storage tank 75,000 gallons

NOTE: The initial 30,000 gallons required by KNPP Technical Specifications is being supplied by these tanks.

Except for brief periods during plant startup, each condensate storage tank is typically 100% filled and available to supply water for decay heat removal. Piping with normally open valves connect the two tanks together. Each condensate storage tank has a separate supply valve to the auxiliary feedwater pump suction line. There are no plant modifications or procedure changes needed to utilize either of these water sources.

2. Effects of Loss of Ventilation (Section 7.2.4)

The AAC power source provides power to HVAC systems serving dominant areas of concern. Therefore, the effects of loss of ventilation were not assessed.

No modifications and/or procedures are required to provide reasonable assurance for equipment operability.

3. Reactor Coolant Inventory (Section 2.5)

The AAC source powers the necessary make-up systems to maintain adequate reactor coolant system inventory to ensure that the core is cooled for the required coping duration.

The modifications and associated procedure changes identified in Parts A, B and C above will be completed by the end of our scheduled refueling outage in 1992 or 2 years after the notification provided by the Director, Office of Nuclear Reactor Regulation in accordance with 10 CFR 50.63(c)(3), whichever comes later.

Sincerely,

C. R. Steinhardt
Manager - Nuclear Power

DJM/jms

cc - Mr. Robert Nelson, US NRC
US NRC, Region III

ATTACHMENT A

The AAC power source is a 2000 kW, 4160 V, 3-phase General Motors Electromotive Division diesel generator (model 16-567D4). This is not a class 1E diesel generator, although it is similar to the KNPP safeguards diesel generator with the exceptions of the engine bore and number of cylinders.

- The engine and associated subsystems will be protected against the effects of likely weather-related events.
- Failure of AAC components will not adversely affect class 1E AC power systems. Electrical isolation of AAC power shall be provided by two circuit breakers in series with at least one of the breakers being a class 1E breaker.
- The AAC power system will not normally be directly connected to the onsite emergency AC power system, nor be capable of automatic loading of shutdown equipment.
- The AAC power system will be equipped with a DC power source that is independent from the plants class 1E power system.
- The AAC power system will be equipped with a start system that is independent from the plants class 1E start system.
- The AAC power system will be provided with a fuel oil supply that is separate from the fuel oil supply for the onsite emergency AC power system.
- The AAC power system will be capable of operating during and after a station blackout without any support system.
- The AAC power system will be sized to carry the required shutdown loads for the 4-hour coping duration and will be capable of maintaining voltage and frequency within limits that will not degrade the performance of any shutdown system or component.
- Appropriate surveillance and/or maintenance procedures will be written using the manufacturer's recommendations and previous operating experience as a guideline.
- Prior to declaring the system operational, an initial test will be performed to demonstrate the capability of powering the required shutdown equipment.

The design will allow for the engine to be started from the control room and manually loaded onto the class 1E safeguards bus.

FIGURE 1

CONCEPTUAL AAC CONFIGURATION