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JPN-89-018

U. S. Nuclear Regulatory Commission
Mail Station P1-137
Washington, D.C. 20555

Attn: Document Control Desk

Subject: James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
Response to 10 CFR Part 50.63
"Loss of All Alternating Current Power" - Station Blackout

References:

1. U. S. Nuclear Regulatory Commission, Regulatory Guide 1.155, "Station Blackout", August 1988.

2. Nuclear Management and Resources Council Report No. 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors."

Dear Sir:

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR Part 50 to include a new section, 10 CFR 50.63 "Loss of All Alternating Current Power." 10 CFR 50.63 requires that each light-water-cooled nuclear power plant be able to withstand and recover from a station blackout (SBO) of a specified duration. Regulatory Guide (RG) 1.155 (Reference 1) provides guidance acceptable to the NRC Staff for satisfying the requirements of 10 CFR 50.63. RG 1.155 states that the NRC staff has determined that NUMARC 87-00 (Reference 2) is also acceptable to the NRC staff for meeting these requirements.

The Authority has evaluated the James A. FitzPatrick plant against the requirements of the SBO rule using the guidance from NUMARC 87-00. Detailed results of this evaluation are in the Attachment to this letter. As a result of this evaluation, the FitzPatrick plant is required to be able to withstand a station blackout of four hours. This four hour duration is a result of analyses conducted in accordance with Section 3 of NUMARC 87-00 and is discussed in Section A of the attachment to this letter.

Section C of the attachment to this letter describes the modifications to be installed to ensure the capability to withstand a four hour SBO. A schedule for implementing the modifications and associated procedure changes described in the Attachment will be submitted within 30 days after notification is received from the Director, Office of Nuclear Reactor Regulation, in accordance with the requirements of 10 CFR 50.63 (c) (3).

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Should you or your staff have any questions regarding this matter, please contact Mr. J. A. Gray, Jr. of my staff.

Very truly yours,

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Enclosure

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ATTACHMENT TO JPN-89-018

RESPONSE TO 10 CFR 50.63
"LOSS OF ALL ALTERNATING CURRENT POWER"
STATION BLACKOUT

INTRODUCTION

On July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations in 10 CFR Part 50. A new section, 10 CFR 50.63 "Loss of All Alternating Current Power", 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. It also identifies the factors that must be considered in specifying the station blackout duration. §50.63 requires that, for the duration of the station blackout, the plant be capable of maintaining core cooling and containment integrity. Furthermore, this section 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 alternating current (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 time duration as determined in 1 above and for recovery from a SBO; and

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

The NRC has issued Regulatory Guide 1.155 which describes a means acceptable to the NRC Staff for meeting the requirements of 10 CFR 50.63. Regulatory Guide (RG) 1.155 states that the NRC Staff has determined that NUMARC 87-00 (Reference 2) provides guidance that is in large part identical to the RG 1.155 guidance and is, therefore, also 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 preference.

The Authority has evaluated the James A. FitzPatrick plant against the requirements of the SBO rule using the guidance from NUMARC 87-00 except where RG 1.155 takes precedence. The results of this evaluation follow.

A. STATION BLACKOUT (SBO) DURATION CATAGORY

The five step procedure outlined in NUMARC 87-00, Section 3, was used to determine FitzPatrick's SBO duration category of four hours. No modifications were required to attain a four hour coping duration category.

The following plant factors were used to determine the proposed station blackout duration:

1. Alternating current Power Design Characteristic Group is "P2". P2 is defined as:

   Sites whose offsite power sources are less redundant or independent, or that are more susceptible to extended off-site power losses due to weather-initiated events or more frequent losses due to plant centered events.

   This Group for FitzPatrick is based on:

   a. Expected frequency of grid-related loss of off-site power (LOOPs) events does not exceed once per 20 years.

      Grid-related LOOPs are strictly associated with the loss of the transmission and distribution system due to insufficient generating capacity, excessive loads, or dynamic instability. Although grid failure may also be caused by other factors, such as severe weather conditions or brush fires, these events are not considered grid-related since they were caused by external events.

      The industry average frequency of grid-related events is approximately 0.020 per site-year, with most events isolated to a few systems. According to NUREG-1032, the average occurrence for the majority of systems is about once per 100 site-years. NUREG-1032 notes sites having a frequency of grid-related events at the once per 20 site-year frequency are limited to St. Lucie, Turkey Point, and Indian Point. Accordingly, other sites including FitzPatrick, have an average frequency of grid-related loss of off-site power occurrence of less than once per 20 site-years.

   b. Estimated frequency of LOOPs events due to extremely severe weather (ESW) places the plant in ESW Group 1.

      The estimated frequency (1×10^{-4}) LOOPs due to extremely severe weather was determined by the annual expectation of storms at the site with wind velocities greater than or equal to 125 mph. These events are normally associated with the occurrence of great hurricanes where windspeeds may cause widespread transmission system unavailability for extended periods. Since electrical distribution are not designed for these conditions, it is assumed that the occurrence of such windspeeds will directly result in the LOOPs.

A LOOP frequency for ESW was based on data provided by the NRC (which is obtained from the National Oceanic and Atmospheric Administration). The data indicates that the FitzPatrick plant is a Group 1 with an annual windspeed expectation less than 3.3×10^{-4}.

c. Estimated frequency (f) of LOOPs, due to severe weather (SW), places the plant in SW Group 3.

Four factors were used to calculate the estimated frequency of loss of off-site power due to severe weather. These factors were combined in the relationship outlined in NUMARC 87-00 §3.2.1 to yield $f = 1.236 \times 10^{-2}$.

Based on NUMARC 87-00, Table 3-4 "Severe Weather Groups", FitzPatrick is in severe weather Group "3" ($1.0 \times 10^{-2} \leq f \leq 3.3 \times 10^{-2}$).

d. The independence of offsite power system places the FitzPatrick plant in the I1/2 Group. The I1/2 group is characterized by features associated with greater independence and redundancy of off-site power sources, and a more desirable transfer scheme.

Both off-site power sources are connected to the plant through separate incoming transmission lines, and are electrically independent of each other. After loss of the normal AC source, there is an automatic transfer of all safe-shutdown buses to a separate preferred alternate power source.

e. The loss of off-site AC power characteristic group (P Group) is a function of three plant characteristics: b) extremely severe weather potential; c) severe weather potential; and d) independance of off-site power.

Plant-specific, pre-hurricane shutdown requirements and procedures which meet the guidelines of §4.2.3 of NUMARC 87-00 are not required for the FitzPatrick plant nor are such procedures credited in the determination of the AC power design characteristic group. Therefore, using parts b, c, & d of this calculation, and NUMARC 87-00 Table 3-5a "Off-site Power Design Characteristic Group Matrix" FitzPatrick had been assigned a P2 Power Design Characteristic group.

2. The Emergency AC Power Configuration Group for FitzPatrick is "A". Group A is characterized by:

   Highly redundant and independent EAC sources to safe shutdown equipment.

   This Group for FitzPatrick is based on:

   a. No credit was taken for Four emergency AC power supplies as alternate AC power sources.

   b. One emergency AC power supply is sufficient to operate the minimum required safe shutdown equipment following a LOOP event. Each of the FitzPatricks EDGs is rated at 2,600 kw compared to a "station blackout" load requirement of 2,500 kw.

3. The Emergency Diesel Generator (EDG) target reliability for FitzPatrick is 0.95. This target reliability was determined using the evaluation criteria in NUMARC 87-00, §3.2.4; which is based on having a nuclear unit average EDG reliability for the last 100 demands greater than 0.95.

4. To determine the FitzPatrick's required station blackout coping duration category requirement, Table 3-8 of NUMARC 87-00 was used along with three factors:

   - Off-site power design characteristic (P2)
   - EAC configuration (Group A)
   - FitzPatrick EDG reliability (0.95)

   From Table 3-8, the required coping duration category for FitzPatrick is <u>four</u> hours.

B. PROCEDURE DESCRIPTION

Plant procedures have been reviewed and modified, as necessary, to meet the guidelines in NUMARC 87-00, Section 4 in the following areas:

1. Procedure No. AOP-49 "Station Blackout." conforms to NUMARC 87-00, §4.2.2; and

2. Procedure No. AOP-13, "Tornadoes and High Winds," conforms to NUMARC 87-00, §4.2.3.

Plant procedures have been reviewed and changes necessary to meet NUMARC 87-00 will be implemented in the following areas:

1. Station Blackout response (Procedure No. AOP-49 "Station Blackout") will conform to NUMARC 87-00, §4.2.1;

2. Procedure changes required to reflect modifications necessary after assessing coping capability with NUMARC 87-00, Section 7.

C. PROCEDURE MODIFICATIONS AND SCHEDULE

The ability of the FitzPatrick plant to cope with a four hour station blackout event was assessed using the guidance described in Section 7 of NUMARC 87-00. The results of this assessment are summarized below:

1. Using the procedure outlined in §7.2.1 of NUMARC 87-00, the Authority has determined that approximately 54,000 gallons of water are required for decay heat removal during the four hour SBO duration. The minimum permissible condensate storage tank level as defined by the FSAR is 200,000 gallons, which exceeds the required quantity.

2. Calculations have verified that the Class 1E batteries (71SB-1 and 71SB-2) have sufficient capacity to meet station blackout loads for four hours provided that certain loads not needed to cope with a station blackout are stripped. These loads are identified in plant procedure No. AOP-49 "Station Blackout."

3. No air-operated valves are relied upon to cope with a station blackout. Air-operated valves which provide a containment isolation function are designed to fail-closed, except for the Reactor Building Close Loop Cooling Water (RBCLCW) system isolation valves which fail-open. It is preferred that the RBCLCW containment isolation valves fail-open upon loss of instrument air or nitrogen and DC power supply. This assures an uninterrupted cooling water supply during normal conditions and allows Emergency Service Water to supply drywell equipment with cooling service water during accident conditions. Each RBCLCW containment isolation valve is equipped with a Seismic I, QA Class I air accumulator to permit up to two full cycles of valve operation in the event of loss of instrument air or nitrogen.

4. Steady-state ambient temperature has been calculated for the following dominant areas:

Area	Temperature (°F)
RCIC Pump/Turbine Room	130
HPCI Pump/Turbine Area	130

The requirement in NUMARC 87-00, §2.7.1, that the control room not exceed 120° F during a station blackout has been assessed for the FitzPatrick plant. As a result, it has been determined by conservative calculations that the control room will exceed 120° F during a postulated four hour station blackout (assuming no compensatory measures are taken). Based on good engineering judgement, the Authority does not consider a temperature of greater than 120° F to be plausible. Therefore, the control room temperature will be recalculated. If the results of the recalculation indicate that the temperature will exceed 120° F, the Authority will provide portable ventilation equipment to enhance control room ventilation during an SBO event.

Reasonable assurance of the operability of station blackout response equipment in the above dominant areas has been assessed using Appendix F to NUMARC 87-00. The RCIC system enclosure ventilation system will be modified to eliminate the potential for system isolation on high ambient temperature within the enclosure. This modification will effectively eliminates the enclosure as a dominant area of concern. Procedural action to defeat "high ambient temperature" isolation logics for HPCI and RCIC eliminates the steam line routes as dominant areas of concern.

5. The containment isolation valves listed in the FSAR have been reviewed to determine which valves must be operated during a SBO. Valves may be required to either close to effect containment isolation or to operate (cycle) under station blackout conditions. All of these valves can be operated and provide position indication independent of AC power. No plant modifications are necessary to assure containment integrity under SBO conditions.

6. The ability to maintain adequate reactor coolant system inventory to ensure that the core is cooled has been assessed for four hours. The generic analyses listed in §2.5.2 of NUMARC 87-00 were used for this assessment and are applicable to the specific design of the FitzPatrick plant. The expected rate of reactor coolant inventory loss during a four hour SBO will result in only a momentary core uncovery. Therefore, the existing makeup systems are adequate to maintain core cooling under SBO conditions.

7. Modifications are necessary to provide power to selected instrumentation under SBO conditions.

Schedule

A schedule for implementing the modifications and associated procedure changes identified in Parts B and C above will be submitted within 30 days after notification is received from the Director, Office of Nuclear Reactor Regulation, in accordance with the requirements of 10 CFR 50.63 (c) (3).