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SUBJECT: Forwards Rev 1 to util response to station blackout rule.

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Iowa Electric Light and Power Company
March 30, 1990

NG-90-0757

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
10 CFR 50.63, "Loss of All Alternating Current Power"
Information Submittal, Revision 1
Reference: (1) Letter, D. Mineck (Iowa Electric) to T. Murley (NRC),
dated April 17, 1989 (NG-89-0923), "10 CFR 50.63,
'Loss of All Alternating Current Power' Information
Submittal"
(2) Letter, Byron Lee, Jr. (NUMARC) to NUMARC Board of
Directors, dated January 4, 1990, "Station Blackout
(SBO) Implementation: Request for Supplemental SBO
Submittal to NRC"
File: A-106a, A-107c, R-10

Dear Dr. Murley:

Our initial Station Blackout Information Submittal (Reference 1) indicated that a more detailed review would be performed to validate the baseline assumptions set forth in NUMARC 87-00, Section 2 for the DAEC. Additionally, it stated that we would advise the Commission of unforeseen plant modifications needed to cope with a station blackout.

Revision 1 to our previous submittal is attached for your review. Changes to the original submittal were necessary to document: (1) the impact of analyses to validate baseline assumptions; (2) the impact of refinements to our previous coping assessment; (3) proposed enhancements to the RCIC System and to Control Room lighting; (4) deviations from the accepted NUMARC 87-00 guidance; and (5) minor editorial changes.

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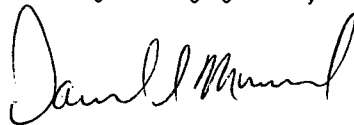
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Dr. Thomas E. Murley
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A vertical line in the right margin of the attachment was used to indicate where our revised submittal differs from our initial submittal.

It is our understanding that the target EDG reliability of 0.95, determined by our coping assessment, is to be maintained or exceeded. It is also our understanding that the NRC and NUMARC will soon issue guidance concerning Generic Safety Issue B-56, "Diesel Generator Reliability," which will address plant actions in the event that actual EDG reliability falls below the established target.

Very truly yours,



Daniel L. Mineck
Manager, Nuclear Division

DLM/BHJ/pjv+

Attachment

cc: B. Johnson
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L. Root
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A. Bert Davis (Region III)
NRC Resident Office
Commitment Control 900004

Iowa Electric Light and Power Company

Duane Arnold Energy Center

Response to Station Blackout Rule

(Revision 1)

Effective July 21, 1988, the Nuclear Regulatory Commission (NRC) amended its regulations by adding a new section 50.63 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 available for NRC review the baseline assumptions, analyses and related information used in their coping evaluation. Section 50.63 requires that the plant be capable of maintaining core cooling and appropriate containment integrity during an SBO of a specified duration and identifies the factors that must be considered in determining that duration. 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 (LOOP), 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 of modifications to equipment and associated procedures necessary to withstand the specified SBO duration and a proposed schedule for implementing these modifications.

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 C.F.R. 50.63. RG 1.155 states that the NRC Staff has concluded 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.

Iowa Electric Light and Power Company (IELP) has evaluated the Duane Arnold Energy Center (DAEC) against the requirements of the SBO rule using guidance from NUMARC 87-00 except: (1) where use of RG 1.155 is required; (2) where plant-specific transient analyses were performed to determine the temperature response in the Control Room and all dominant areas of concern during an SBO; and (3) where weather data was collected at the Cedar Rapids/Iowa City airport and analyzed using NUMARC 87-00 methodology to determine the frequency of severe and extremely severe weather at the DAEC site.

The results of our evaluation are detailed below. (Reference to NUMARC 87-00 Sections are shown in the parentheses.)

A. Proposed Station Blackout Duration

NUMARC 87-00, Section 3 was used to determine the proposed SBO duration of four hours. No modifications were required to attain this proposed coping duration category.

Thirty-one years of tabulated weather observations, recorded at the Cedar Rapids/Iowa City airport approximately 15 miles from the DAEC, were obtained from the National Weather Service and National Severe Storms Forecast Center. These observations were statistically evaluated, using guidance contained in NUREG/CR-2890 and NUREG/CR-4492, to establish the plant-specific parameters used with the NUMARC 87-00 methodology for determining the correct ESW and SW group for the DAEC.

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

1. AC Power Design Characteristic Group is P1 based on:
 - a. Expected frequency of grid-related 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 places the plant in ESW Group 2 (Section 3.2.1, Part 1B, p. 3-4);
 - c. Estimated frequency of LOOPS due to severe weather 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).
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 EDG reliability is .95.

A target EDG reliability of .95 was selected based on having a nuclear unit average EDG reliability for the last 100 demands greater than 0.95 consistent with NUMARC 87-00, Section 3.2.4.

B. Procedure Description

An analysis has been performed to determine DAEC's plant-specific response to an SBO. The results of this analysis indicate that equipment operability concerns inside the primary containment can be alleviated by depressurizing the reactor vessel to between 200 and 400 psi within 30-minutes of the onset of an SBO. Depressurization of the reactor vessel will be directed by plant procedures as appropriate.

Plant procedures have been reviewed and will be modified to meet the guidelines in NUMARC 87-00, Section 4 in the following areas.

1. Station blackout response per NUMARC 87-00, Section 4.2.1:
 - a. DAEC Emergency Operating Procedures (EOPs).
 - b. DAEC Abnormal Operating Procedure (AOP) 301 - Loss of Essential Electrical Power.
 - c. DAEC Annunciator Response Procedure (ARP) 1C08A/B/C - Electrical Power Distribution System Alarms.
2. AC power restoration per NUMARC 87-00, Section 4.2.2:
 - a. DAEC Operating Instruction (OI) 304.2 - 4160v/480v Essential Electrical Distribution System.
3. Severe weather per NUMARC 87-00, Section 4.2.3:
 - a. DAEC Abnormal Operating Procedure (AOP) 903 - Tornado.

C. Proposed Modifications

The ability of DAEC to cope with a station blackout for four hours in accordance with NUMARC 87-00, Section 3.2.5 and as determined in Section "A" above was assessed using NUMARC 87-00, Section 7, unless otherwise noted.

Insulation will be installed around the Reactor Core Isolation Cooling (RCIC) turbine to reduce the temperature of the RCIC room below 150°F during an SBO.

Also, Control Room lighting conditions will be improved to support operations during an SBO.

IELP will ensure that the Commission is advised of unforeseen plant modifications necessary for coping with an SBO of the proposed four hour duration in a timely manner.

The coping assessment was completed with the following results:

1. Condensate Inventory For Decay Heat Removal (Section 7.2.1 and plant-specific analysis)

An analysis has been performed to determine DAEC's plant-specific response to an SBO. It has been determined from Section 7.2.1 of NUMARC 87-00 and this plant-specific analysis that 63,390 gallons of water are required for decay heat removal for the required coping duration of four hours. By design, the condensate storage tanks maintain an approximate total reserve of 75,000 gallons of water for use under emergency conditions, which exceeds the required quantity for coping with a four

hour station blackout. No plant modifications or procedure changes are needed to utilize this water source.

2. Class 1E Battery Capacity (Section 7.2.2)

A battery capacity calculation has been performed pursuant to NUMARC 87-00, Section 7.2.2, to verify that the Class 1E batteries have sufficient capacity to meet station blackout loads for four hours.

3. Compressed Air (Section 7.2.3)

Air-operated valves relied upon to cope with a station blackout for four hours can either be operated manually or have sufficient backup sources independent of the preferred and blacked out unit's Class 1E power supply. Valves requiring manual operation or that need backup sources for operation will be identified in plant procedures.

4. Effects of Loss of Ventilation (Plant-specific thermal transient analysis)

The effects of loss of ventilation in the Control Room and in each dominant area of concern was determined using a plant-specific thermal transient analysis in lieu of the steady-state methodology of Section 7.2.4 of NUMARC 87-00.

- a. Plant-specific thermal transients have been calculated for the following dominant areas of concern:

| <u>Area</u> | <u>Temperature</u> |
|---------------------------|--|
| HPCI Room | 150°F (Peak) 139°F (following operator action to open HPCI Room doors after 30-minutes) |
| RCIC Room | 129°F (with proposed insulation of RCIC turbine) |
| Steam Tunnel | 240°F |
| Essential Switchgear Room | 115°F |

- b. The assumption in NUMARC 87-00, Section 2.7.1 that the control room will not exceed 120°F during a station blackout has been assessed.

The control room at DAEC will not exceed 120°F during a station blackout. Therefore, the control room is not a dominant area of concern.

Reasonable assurance of the operability of station blackout response equipment in the above dominant areas of concern has been assessed using Appendix F to NUMARC 87-00, the Topical Report, NUREG/CR-4942, and the DAEC Equipment Qualification Program.

5. Containment Isolation (Section 7.2.5)

The plant list of containment isolation valves has been reviewed to verify that valves which must be capable of being closed or that must be operated (cycled) under station blackout conditions can be positioned (with indication) independent of the preferred and blacked-out unit's

Class 1E power supplies. No plant modifications and/or associated procedure changes were determined to be required to ensure that appropriate containment integrity can be provided under SBO conditions.

6. Reactor Coolant Inventory (Section 2.5)

An analysis has been performed to determine DAEC's plant-specific response to an SBO. The ability to maintain adequate reactor coolant system inventory to ensure that the core is cooled has been assessed for the required four hour coping duration using this analysis. The expected rates of reactor coolant inventory loss under SBO conditions do not result in more than a momentary core uncover during an SBO of four hours. Therefore, makeup systems in addition to those currently available under SBO conditions are not required to maintain core cooling under natural circulation.

D. Schedule for Implementation

After receipt of the notification provided by the Director, Office of Nuclear Reactor Regulation as required by 10 CFR 50.63(c), IELP will advise the NRC in accordance with the Integrated Plan of the schedule for implementation of the aforementioned modifications and procedure changes.