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 AUTH. NAME AUTHOR AFFILIATION
 MINECK, D.L. Iowa Electric Light & Power Co.
 RECIP. NAME RECIPIENT AFFILIATION
 MURLEY, T.E. Office of Nuclear Reactor Regulation, Director (Post 870411 R

SUBJECT: Provides response to Generic Ltr 91-06, "Resolution of
 Generic Issue A-30, 'Adequacy of Safety-Related DC Power
 Supplies,' per 10CFR50.54(f)." I
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Iowa Electric Light and Power Company

October 28, 1991

NG-91-3151

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
NRC Generic Letter 91-06, "Resolution of Generic
Issue A-30, 'Adequacy of Safety-Related DC Power
Supplies,' Pursuant to 10 CFR 50.54(f)," dated
April 29, 1991
File: A-101b, R-42

Dear Dr. Murley:

NRC Generic Letter 91-06, "Resolution of Generic Issue A-30, 'Adequacy of Safety-Related DC Power Supplies,' Pursuant to 10 CFR 50.54(f)," requires licensees to provide information regarding safety-related dc systems. The information is to be provided in the form of responses to a questionnaire attached to the Generic Letter.

This letter and attachment provide our response to Generic Letter 91-06. The attachment follows the format of the questionnaire and our response is provided immediately following each question. For those instances where further explanation is appropriate, notes are used. These notes are located immediately following questions 5 and 9 as appropriate.

As suggested in the Generic Letter, we have implemented many of the recommendations contained in NRC communications (i.e., IEN 85-74 and IEB 79-27) and industry standard documents (e.g. IEEE-450). Also, extensive modifications have been made to the DAEC safety-related dc systems as part of our response to Regulatory Guide 1.97.

We consider our safety-related dc power supplies to be of good design and high reliability. If there are any questions regarding this letter or the attachment, please contact this office.

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Dr. Thomas E. Murley
October 28, 1991
NG-91-3151
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This letter is true and accurate to the best of my knowledge and belief.

IOWA ELECTRIC LIGHT AND POWER COMPANY

By *Daniel L. Mineck*
DANIEL L. MINECK
Manager, Nuclear Division

State of Iowa
(County) of Linn

Signed and sworn to before me on this 28th day of October, 1991,
by *Daniel L. Mineck*.

Kathleen M. Furman
Notary Public in and for the State of Iowa
September 28, 1992
Commission Expires

DLM/SRC/pjv+

Attachment: DAEC Response to 10 CFR 50.54(f) Request for Information
to Resolve Generic Issue A-30 "Adequacy of Safety-Related
DC Power Supplies"

cc: S. Catron
L. Liu
L. Root
R. McGaughy
C. Shiraki(NRC-NRR)
A. Bert Davis (Region III)
NRC Resident Office
Commitment Control No. 910128

DAEC Response to 10 CFR 50.54(f) Request for Information to Resolve Generic Issue A-30
"Adequacy of Safety-Related DC Power Supplies"

1. Unit

RESPONSE: Duane Arnold Energy Center (DAEC)

2. a. The number of independent redundant divisions of Class 1E or safety-related dc power for this plant is _____. (Include any separate Class 1E or safety-related dc, such as any dc dedicated to the diesel generators.)

RESPONSE: 2 independent, redundant divisions of 125 vdc
2 independent, redundant divisions of ± 24 vdc
1 division 250 vdc (dedicated to High Pressure
Coolant Injection System)

- b. The number of functional safety-related divisions of dc power necessary to attain safe shutdown for this unit is

RESPONSE: 1

3. Does the control room at this unit have the following separate, independently annunciated alarms and indications for each division of dc power?

a. alarms

1. Battery disconnect or circuit breaker open?

RESPONSE: Yes

2. Battery charger disconnect or circuit breaker open (both input ac and output dc)?

RESPONSE: No (see Note 1)

3. dc system ground?

RESPONSE: Yes (see Note 2)

4. dc bus under voltage?

RESPONSE: Yes

5. dc bus over voltage?

RESPONSE: No (see Note 3)

6. Battery charger failure?

RESPONSE: Yes

7. Battery discharge?

RESPONSE: No (see Note 4)

b. Indications

1. Battery float charge current?

RESPONSE: No (see Note 5)

2. Battery circuit output current?

RESPONSE: No (see Note 5)

3. Battery discharge?

RESPONSE: No (see Note 5)

4. Bus voltage?

RESPONSE: No (see Note 5)

c. Does this unit have written procedures for response to the above alarms and indications?

RESPONSE: Yes

4. Does this unit have indication of bypassed and inoperable status of circuit breakers or other devices that can be used to disconnect the battery and battery charger from its dc bus and the battery charger from its ac power source during maintenance or testing?

RESPONSE: Yes (see Note 6)

5. If the answer to any part of question 3 or 4 is no, then provide information justifying the existing design features of the facility's safety-related dc systems.

RESPONSE:

NOTE 1 Annunciators are provided to alert operators when the battery charger is disconnected for all but the ± 24 vdc system. There is, however, annunciation on loss of dc voltage from the charger. This annunciator would alert operators to the loss of the charger and subsequent investigation would discover the root cause.

NOTE 2 DC system ground annunciators are provided to alert operators of grounds detected on all the dc systems except for the ± 24 vdc systems. The ± 24 vdc systems have a center ground, so that any ground on either bus would be detected by other means (i.e., breaker trip and loss of power to respective load or possible low voltage on bus which would result in bus undervoltage annunciator)

NOTE 3 The design of the DAEC predates IEEE-484-75 which recommends that each battery installation should have a high battery voltage alarm. However, the designs of the ± 24 vdc and 125 vdc power supplies include overvoltage trips for certain equipment which, in turn, would result in Control Room Annunciation. The 250 vdc battery has no such trips or alarms for overvoltage conditions. However, the loads on the 250 vdc

bus are critical to safe plant operation and it would not be desirable for them to trip on high voltage. The 250 vdc bus voltage is checked once per shift by operators so that an overvoltage condition, while of low probability, would be detected and acted upon promptly.

NOTE 4 There is no alarm or annunciator in the Control Room for discharge of any battery. In our reviews of the DAEC safety-related dc systems and industry guidance documents we have not identified the need for such annunciation.

NOTE 5 The subject indications are all located in the essential switchgear rooms along with the associated equipment. Although the indications are not available in the Control Room, they are in the Control Building. The essential switchgear rooms are included in the Control Room/Control Building envelope such that access to the indications is available to operators during normal and post-accident conditions. The location of these indications, although adequate to supply operators with necessary information, is the subject of a study as part of our Regulatory Guide 1.97 Program. If the results of that study indicate that Control Room indications are necessary to support our post-accident monitoring capabilities, a modification will be initiated as part our Regulatory Guide 1.97 Program.

NOTE 6 The 125 vdc and 250 vdc systems are provided with the requested annunciators , but the ± 24 vdc system is not. The ± 24 vdc system is provided with same annunciations, except that there is no annunciator for the battery charger output circuit breaker. There is, however, annunciation on loss of output voltage from the charger, and this annunciator would provide the same information to the operators. Also, any maintenance or testing which would necessitate circuit breaker operations is first approved by the Control Room operators, so that the operators would be aware of the unavailability of the affected components.

6. (1) Have you conducted a review of maintenance and testing activities to minimize the potential for human error causing more than one dc division to be unavailable? _____ and (2) do plant procedures prohibit maintenance or testing on redundant dc divisions at the same time?

RESPONSE: No (see Note 7)

RESPONSE: Yes

If the facility Technical Specifications have provisions equivalent to those found in the Westinghouse and Combustion Engineering Standard Technical Specifications for maintenance and surveillance, then question 7 may be skipped and a statement to that effect may be inserted here. N/A

7. Are maintenance, surveillance and test procedures regarding station batteries conducted routinely at this plant? Specifically:

- a. At least once per 7 days are the following verified to be within acceptable limits:
1. Pilot cell electrolyte level?
RESPONSE: Yes
 2. Specific gravity or charging current?
RESPONSE: Yes
 3. Float voltage?
RESPONSE: Yes
 4. Total bus voltage on float charge?
RESPONSE: Yes
 5. Physical condition of all cells?
RESPONSE: No (see Note 8)
- b. At least once per 92 days, or within 7 days after a battery discharge, overcharge, or if the pilot cell readings are outside the 7-day surveillance requirements are the following verified to be within acceptable limits:
1. Electrolyte level of each cell?
RESPONSE: Yes (see Note 9)
 2. The average specific gravity of all cells?
RESPONSE: Yes (see Note 9)
 3. The specific gravity of each cell?
RESPONSE: Yes (see Note 9)
 4. The average electrolyte temperature of a representative number of cells?
RESPONSE: Yes (see Note 9)
 5. The float voltage of each cell?
RESPONSE: Yes (see Note 9)
 6. Visually inspect or measure resistance of terminals and connectors (including the connectors at the dc bus)?
RESPONSE: Yes (see Note 10)
- c. At least every 18 months are the following verified:
1. Low resistance of each connection (by test)?
RESPONSE: Yes

2. Physical condition of the battery?

RESPONSE: Yes

3. Battery charger capability to deliver rated ampere output to the dc bus?

RESPONSE: No (see Note 11)

4. The capability of the battery to deliver its design duty cycle to the dc bus?

RESPONSE: Yes

5. Each individual cell voltage is within acceptable limits during the service test?

RESPONSE: Yes

d. At least every 60 months, is capacity of each battery verified by performance of a discharge test?

RESPONSE: Yes

e. At least annually, is the battery capacity verified by performance discharge test, if the battery shows signs of degradation or has reached 85% of the expected service life?

RESPONSE: Yes

8. Does this plant have operational features such that following loss of one safety-related dc power supply or bus:

a. Capability is maintained for ensuring continued and adequate reactor cooling?

RESPONSE: Yes

b. Reactor coolant system integrity and isolation capability are maintained?

RESPONSE: Yes

c. Operating procedures, instrumentation (including indicators and annunciators), and control function are adequate to initiate systems as required to maintain adequate core cooling?

RESPONSE: Yes

9. If the answer to any part of question 6, 7, or 8 is no, then provide your basis for not performing the maintenance, surveillance and test procedures described and/or the bases for not including the operational features cited.

RESPONSE:

NOTE 7 No systematic, formal review of maintenance and testing procedures has been performed to minimize potential for human

error. However, ongoing use and direction to users to identify potential problems has resulted in improvements being made in the human factors of our procedures. While a review such as the one suggested would undoubtedly identify some improvements to the procedures, such a review would also present a tremendous burden on the staff of the facility. The management philosophy toward such procedural improvements has been to take a cautious, orderly approach to the ongoing periodic reviews and to the ongoing use of the procedures. As stated, these ongoing reviews have resulted in some useful improvements with reasonable expenditure of resources.

NOTE 8 Procedures require that the physical condition of all cells be checked once per month. However, a general visual check is performed in each battery room on a daily basis by the operators. It is not expected that any significant cell degradation would occur between the monthly inspections that would not be detected by either the daily visual check in the battery rooms or by changes in other battery parameters which would also be detected during performance of the weekly surveillances in the battery rooms.

NOTE 9 The question asks whether each parameter is checked 1) once each 92 days, 2) 7 days after a discharge, 3) 7 days after an overcharge and 4) if the pilot cell parameter is outside its 7 day surveillance requirement. Each of these cases is discussed here separately: 1) Each parameter is checked each quarter (once per 92 days) 2) Each parameter is checked within 7 days following completion of an equalizing charge, which is required after any emergency discharge of 15 minutes or longer. 3) There is no procedure to identify when an overcharge has taken place or to direct any specific maintenance activities afterward. However, the existing procedures for charging the batteries would prevent an overcharge. 4) If any of the parameters, other than electrolyte level, of the pilot cell is out of the required range during the weekly surveillance, the procedure directs that an equalizing charge be applied to restore the parameter. As stated previously, all cell parameters are checked within 7 days of completion of an equalizing charge. If, however, the electrolyte level of the pilot cell is out of the required range during the weekly surveillance, the procedure directs that the level be restored and that the Maintenance Supervisor be notified. The Maintenance Supervisor and Maintenance Engineering may direct that the level of all the cells be checked based on the severity of the electrolyte loss, or other factors; however, it is expected that the pilot cell level will decline between the quarterly checks as some of the electrolyte is being removed each week to test the specific gravity. It is not expected that the other cells electrolyte level would decrease enough between the quarterly checks to warrant additional inspections based on the pilot cell level since the

batteries are of the lead-calcium type which do not typically lose electrolyte rapidly.

- NOTE 10 Visual inspection of individual cell connections is performed as part of monthly surveillance. Connections at the dc bus are inspected every other refuel outage.
- NOTE 11 The capability of the battery charger to deliver its rated ampere output to the dc bus is not routinely verified. It was tested as part of the acceptance tests for design and installation. As part of the battery service test, which is performed once per 18 months, the charger is checked to verify proper operation of the current limiter. This test ensures that the charger is not supplying more than its rated output under the severe conditions of recharging the battery and supplying the associated bus.