

October 14, 1982

Docket No. 50-409
LS05-82-10-043

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Mr. Frank Linder
General Manager
Dairyland Power Cooperative
2615 East Avenue South
LaCrosse, Wisconsin 54601

Dear Mr. Linder:

SUBJECT: LACROSSE BOLING WATER REACTOR (LACBWR)

- (1) Degraded Grid Voltage Protection; and
- (2) SEP Topic VIII - 1.A, Potential Equipment Failures Associated with Degraded Grid Voltage

By letters dated November 3 and 19, 1976, you responded to our letter dated August 12, 1976, pertaining to degraded grid voltage conditions at LACBWR. Our generic letter dated June 3, 1977 provided you and all other licensees of power reactors, the NRC's staff positions pertaining to this issue. You responded to our June 3, 1977 letter by your submittals dated July 22, 1977, March 13, 17 and 28, 1980, May 22 and September 9, 1980 and December 8, 1981.

In these submittals you proposed the following electrical system design modifications and Technical Specification changes:

- a. The set points of the existing first level undervoltage relays on the 480V essential buses will be raised to a nominal bus voltage of 372 volts (353 lower limit, 390 upper limit) with a time delay of 1.9 to 2.1 seconds on a complete loss of power.
- b. Installation of second level undervoltage relays on each 480V essential bus which will consist of a two-out-of-three logic for each essential bus with a setpoint of 400 (± 20) volts with a time delay of 9 (± 0.9) seconds. Actuation of these relays will start the diesel generator and transfer the bus to the diesel generator when satisfactory voltage and frequency are obtained.

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Mr. Frank Linder

- 2 -

October 14, 1982

- c. Revised Technical Specifications which include the surveillance requirements, allowable limits for the setpoint and time delay, and the limiting conditions for operation.

We have reviewed these proposed changes and find them to be acceptable. Enclosed is our related Safety Evaluation and the supporting technical report prepared by our consultant, E.G.&G. Idaho, Inc. Formal changes to the LaCrosse Technical Specifications for degraded grid voltage protection proposed by your December 8, 1981 submittal will not be issued until we complete our review of other proposed electrical technical specification changes requested by that same letter.

On November 5, 1981 my letter to you approved the adequacy of station electric distribution voltage at the LaCrosse plant. That approval, combined with today's resolution of degraded grid voltage protection, completes SEP Topic VIII.1.A, "Potential Equipment Failures Associated with Degraded Grid Voltage" at LaCrosse.

Sincerely,

Original signed by TVWambach for/

Dennis M. Crutchfield, Chief
 Operating Reactors Branch #5
 Division of Licensing

Enclosures:

- 1. Safety Evaluation
- 2. EC&G Report dated January 1982

cc w/enclosures:
 See next page

*See previous concurrence page.

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Mr. Frank Linder

- 2 -

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Dennis M. Crutchfield, Chief
 Operating Reactors Branch #5
 Division of Licensing

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- 1. Safety Evaluation
- 2. EG&G Report dated January 1982

cc w/enclosures:
 See next page

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- 3 -

October 14, 1982

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ENCLOSURE

SAFETY EVALUATION LACROSSE BOILING WATER REACTOR DOCKET NO. 50-409 DEGRADED GRID VOLTAGE PROTECTION THE CLASS 1E SYSTEM

INTRODUCTION AND SUMMARY

The criteria and staff positions pertaining to degraded grid voltage protection were transmitted to Dairyland Power Corporation by NRC generic letter dated June 3, 1977. In response to this by letters dated November 19, 1976, July 22, 1977, March 17, 1980, March 13, 1980, March 28, 1980, May 22, 1980 and September 9, 1980, the licensee proposed certain design modifications and changes to the Technical Specifications. A detailed review and technical evaluation of these proposed modifications and changes to the Technical Specifications was performed by EG&G, under contract to the NRC, and with general supervision by NRC staff. This work is reported by EG&G in "Degraded Grid Protection for Class 1E Power Systems LaCrosse Boiling Water Reactor" (attached). We have reviewed this technical evaluation report and conclude in conclusion that the proposed electrical design modifications and the proposed Technical Specification changes are acceptable.

The licensee, in a letter dated December 8, 1981, formally submitted the Technical Specification changes associated with the degraded grid protection. We have reviewed this information; it meets the staff requirements and is therefore acceptable.

EVALUATION CRITERIA

The criteria used by EG&G in its technical evaluation of the proposed changes include GDC-17 ("Electric Power Systems") of Appendix A to 10 CFR 50; IEEE Standard 279-1971 ("Criteria for Protection Systems for Nuclear Power Generating Stations"); IEEE Standard 308-1974 ("Class 1E Power Systems for

Nuclear Generating Stations"); ANSI Standard C84.1-1977 ("Voltage Ratings for Electrical Power Systems and Equipment - 60 Hz"); and staff positions defined in NRC generic letter to DPCo dated June 3, 1977.

PROPOSED CHANGES, MODIFICATIONS AND DISCUSSION

The following electrical system design modifications and Technical Specification changes were proposed by DPCo:

- a. The setpoints of the existing first level undervoltage relays on the 480V essential buses will be raised to a nominal bus voltage of 372 volts (353 lower limit, 390 upper limit) with a time delay of 1.9 to 2.1 seconds on a complete loss of power.
- b. Installation of second level undervoltage relays on each 480V essential bus. The second level degraded grid voltage relaying will consist of a two-out-of-three logic for each essential bus with a setpoint of 400 (± 20) volts with a time delay of 9 (± 0.9) seconds. Actuation of these relays will start the diesel generator and transfer the bus to the diesel generator when satisfactory voltage and frequency are obtained.
- c. The proposed additions and changes to the plant Technical Specification include the surveillance requirements, allowable limits for the setpoint and time delay, and the limiting conditions for operation. The additions and changes have been reviewed and they meet staff's requirements for the degraded grid protection and are therefore acceptable.

- d. The LaCrosse Class 1E buses do not shed any essential loads therefore the staff position on blocking of loading shedding and reinstatement of this feature is not applicable to this plant.

CONCLUSIONS

We have reviewed the EG&G Technical Evaluation Report and concur in its findings that:

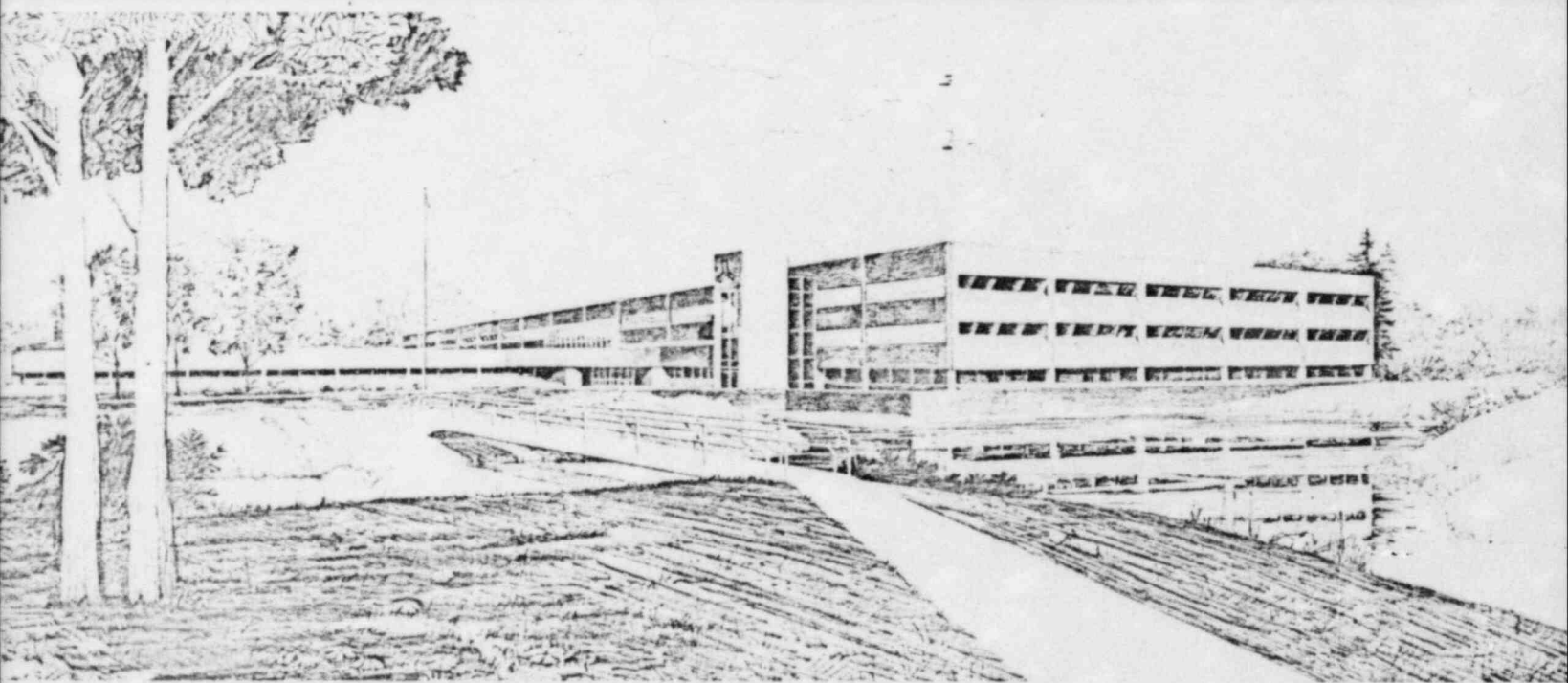
- (1) The proposed degraded grid modifications will protect the Class 1E equipment and systems from sustained degraded voltage within the expected range of grid voltage analyzed.
- (2) The proposed Technical Specification changes meet staff requirements for degraded grid protection and are therefore, acceptable.

DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS,
LA CROSSE BOILING WATER REACTOR

A. C. Udy

U.S. Department of Energy

Idaho Operations Office • Idaho National Engineering Laboratory

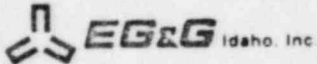


This is an informal report intended for use as a preliminary or working document

Prepared for the
U.S. Nuclear Regulatory Commission
Under DOE Contract No. DE-AC07-76ID01570
FIN No. A6429



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FORM EG&G-398
(Rev. 11-81)

INTERIM REPORT

Accession No. _____

Report No. EGG-EA-5674

Contract Program or Project Title:

Selected Operating Reactors Issues Program (III)

Subject of this Document:

Degraded Grid Protection for Class 1E Power Systems,
La Crosse Boiling Water Reactor

Type of Document:

Informal Report

Author(s):

A. C. Udy

Date of Document:

January 1982

Responsible NRC/DOE Individual and NRC/DOE Office or Division:

R. L. Prevatte, Division of Systems Integration, NRC

This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

EG&G Idaho, Inc.
Idaho Falls, Idaho 83415

Prepared for the
U.S. Nuclear Regulatory Commission
Washington, D.C.
Under DOE Contract No. DE-AC07-76ID01570
NRC FIN No. A6429

INTERIM REPORT

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DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

LA CROSSE BOILING WATER REACTOR

Docket No. 50-409

A. C. Udy
Reliability and Statistics Branch
Engineering Analysis Division
EG&G Idaho, Inc.

January 1982

1-25-82
TAC No. 10031

CONTENTS

1.0	INTRODUCTION	1
2.0	DESIGN BASE CRITERIA	1
3.0	EVALUATION	1
3.1	Existing Undervoltage Protection	2
3.2	Modifications	2
3.3	Discussion	2
4.0	CONCLUSIONS	4
5.0	REFERENCES	5

DEGRADED GRID PROTECTION FOR CLASS 1E POWER SYSTEMS

LA CROSSE BOILING WATER REACTOR

1.0 INTRODUCTION

On June 3, 1977, the NRC requested the Dairyland Power Cooperative (DPCo) to assess the susceptibility of the safety-related electrical equipment at the La Crosse Boiling Water Reactor (LACBWR) to a sustained voltage degradation of the offsite source and the interaction of the offsite and onsite emergency power systems.¹ The letter contained three positions with which the current design of the plant was to be compared. After comparing the current design to the staff positions, DPCo was required to either propose modifications to satisfy the positions and criteria or furnish an analysis to substantiate that the existing facility design has equivalent capabilities.

By letter dated July 22, 1977,² DPCo responded to the NRC letter, deferring the submittal of a report on the subject. DPCo sent information to the NRC on March 17, 1980,³ and March 28, 1980.⁴ On September 9, 1980,⁵ DPCo submitted proposed technical specifications for this review. Additional information and voltage analyses were obtained in the letters dated November 19, 1976,⁶ March 13, 1980,⁷ and May 12, 1980.⁸ A formal request for changing the technical specifications was made on December 8, 1981.⁹ This request contained changes besides those related to this review.

2.0 DESIGN BASE CRITERIA

The design base criteria that were applied in determining the acceptability of the system modifications to protect the safety-related equipment from a sustained degradation of the offsite grid are:

1. General Design Criterion 17 (GDC 17), "Electrical Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," of 10 CFR 50.¹⁰
2. IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."¹¹
3. IEEE Standard 308-1974, "Class 1E Power Systems for Nuclear Power Generating Stations."¹²
4. Staff positions as detailed in a letter sent to the licensee, dated June 3, 1977.¹
5. ANSI Standard C84.1-1977, "Voltage Ratings for Electrical Power Systems and Equipment (60 Hz)."¹³

3.0 EVALUATION

This section provides, in Subsection 3.1, a brief description of the existing undervoltage protection at La Crosse; in Subsection 3.2, a

DPCo has provided voltage and time setpoints per the NRC requirement.¹ The degraded voltage relays trip on undervoltage (400+20V). The diesel generator will start after a time delay. Transfer from the degraded offsite grid to diesel generator power will occur after the diesel generator voltage and frequency are adequate. The voltage setpoint was chosen utilizing a separate voltage analysis that determined the voltage requirements of the safety related loads.⁸

2. "The voltage protection shall include coincidence logic to preclude spurious trips of the offsite power sources."

The proposed modification incorporates two-out-of-three logic that satisfies this guideline.

3. "The time delay selected shall be based on the following conditions:

- a. "The allowable time delay, including margin, shall not exceed the maximum time delay that is assumed in the FSAR accident analysis."

DPCo has proposed a time delay of $9 + 0.9$ s.³ This is within the 20-s time delay assumed in the FSAR accident analysis, including 10 s for the diesel generators to be started and available.

- b. "The time delay shall minimize the effect of short-duration disturbances from reducing the unavailability of the offsite power source(s)."

This time delay is sufficiently long that the effect of short-duration disturbances will not reduce the availability of the offsite power sources.

- c. "The allowable time duration of a degraded voltage condition at all distribution system levels shall not result in failure of safety systems or components."

DPCo has shown that equipment operation at reduced voltage levels for this time period will not result in the failure of safety systems or their components.

4. "The voltage monitors shall automatically initiate the disconnection of offsite power sources whenever the voltage setpoint and time-delay limits have been exceeded."

The DPCo design meets this requirement.

5. The voltage monitors shall be designed to satisfy the requirements of IEEE Standard 279-1971."

5.0 REFERENCES

1. NRC letter to DPCo, dated June 3, 1977.
2. DPCo letter, J. P. Madgett, to Director of Nuclear Reactor Regulation, NRC, "Emergency Power Systems for Operating Reactors," July 22, 1977, LAC-4793.
3. DPCo letter, F. Linder, to Director of Nuclear Reactor Regulation, NRC, "Onsite Emergency Power System," March 17, 1980, LAC-6824.
4. DPCo letter, F. Linder, to Director of Nuclear Reactor Regulation, NRC, "Onsite Emergency Power System," March 28, 1980, LAC-6841.
5. DPCo letter, R. M. Brimer, to C. Cleveland, EG&G Idaho, September 9, 1980, LAC-7130.
6. DPCo letter, J. P. Madgett, to Director of Nuclear Reactor Regulation, NRC, "Evaluation of Degraded Grid Voltage Condition," November 19, 1976, LAC-4350.
7. DPCo letter, F. Linder, to Division of Operating Reactors, NRC, "Adequacy of Station Electric Distribution System Voltage for La Crosse Boiling Water Reactor," March 13, 1980, LAC-6822.
8. DPCo letter, F. Linder, to Division of Operating Reactors, NRC, "Adequacy of Station Electric Distribution System Voltage for the La Crosse Boiling Water Reactor," May 12, 1980, LAC-6912.
9. DPCo letter, F. Linder to Director of Nuclear Reactor Regulation, NRC, "Application for Amendment to License," December 8, 1981, LAC-7970.
10. General Design Criterion 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
11. IEEE Standard 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations."
12. IEEE Standard 308-1974, "Standard Criteria for Class 1E Power Systems for Nuclear Power Generating Stations."
13. ANSI C84.1-1977, "Voltage Ratings for Electric Power Systems and Equipment (60 Hz)."