Iowa Electric Light and Power Company

July 17, 1992 NG-92-3335

Mr. A. Bert Davis Regional Administrator Region III U. S. Nuclear Regulatory Commission 709 Roosevelt Road Glen Ellyn, IL 60137

> Subject: Duane Arnold Energy Center Docket No: 50-331

Op. License DPR-49

Licensee Event Report #92-01

Gentlemen:

In accordance with 10 CFR 50.73 please find attached a copy of the subject Licensee Event Report.

Very truly yours, David Levildon

David L. Wilson

Plant Superintendent - Nuclear

DLW/JSA/pwj

cc: Director of Nuclear Reactor Regulation

Document Control Desk

U.S. Nuclear Regulatory Commission

Mail Station P1-137

Washington, D. C. 20555

NRC Resident Inspector - DAEC

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On 6/17/92, immediately following a start of the 'D' River Water Supply (RWS) pump, a fire alarm was received. Within six minutes, the auxiliary operator arrived at the intake structure and reported that smoke and flames were coming from the 1820 load center. At this time he began to put out the fire with a local fire extinguisher. The fire was completely extinguished within eight minutes of discovery.

Investigation into the cause of the fire identified that the fit between the 'D' RWS treaker primary disconnects and the associated breaker cubicle stabs was inadequate. The poor fit between the disconnects and the stabs led to arcing in the breaker cubicle when the 'D' pump was started, resulting in the fire. Shortly after identifying the cause of the fire, the remaining RWS breakers, which had recently been replaced along with the 'D' breaker, as part of a design modification package, were found to be susceptible to the same problem. It was later determined that the root cause of the event was a lack of thorough inhouse review of the breaker interface design specifications during the design process.

Corrective actions for this event involve procedural revisions associated with the design change process as well as a presentation of lessons learned from the event.

Failure of the 'D' RWS pump breater had no effect on the safe operation of the plant. The p^{1} ant was operating at 100% power throughout the event.

MRC Form 366A

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

CHPIKES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HRS FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH IP-5300 U.S. NUCLEAR REGULATORY COMMISSION WASHINGTON, DC 20555 AND TO THE PAPERWORK REDUCTION PROJECT (1938-0134), OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, DC 20505

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

I. DESCRIPTION OF EVENT

At 1526 on 6/17/92, the 'D' River Water Supply (RWS) pump was started. Immediately following the pump start, the pump tripped, and within seconds a fire alarm was received for the room in the intake structure which contains the 'D' RWS pump. In addition, a 125 VDC trouble alarm was received. Upon receipt of the alarms, the fire brigade was mustered and the feeder breaker, for the load center (1820) associated with the 'D' RWS pump oreaker, was opened. In response to the announcement of the fire alarm on the plant page system, the auxiliary operator went to the intake structure. Within six minutes, the auxiliary operator arrived at the intake structure and reported that smoke and flames were coming from the 1820 load center. At this time he began to put out the fire with a local fire extinguisher. Within 8 minutes from discovery of the fire, the fire brigade reported that the 'D' RWS breaker had been racked out and the fire had been completely extinguished.

With the 1B20 load center de-energized, the 'B' loop of RWS was declared inoperable and a 7 day Limiting Condition for Operation (LCO) was entered as required by Technical Specifications. Investigation into the cause of the fire identified that the fit between the 'D' RWS breaker primary disconnects and the associated breaker cubicle stabs was inadequate. Specifically, the primary disconnects on the 'D' RWS breaker had a gap of approximately 3/8". The breaker cubicle stabs which the disconnects plug onto have a thickness of approximate'y 1/4". The poor fit between the disconnects and the stabs led to arcing in the breaker cubicle, when the 'D' pump was started, resulting in the fire. As all four RWS breakers had recently been replaced with new breakers, inspection of the 'A' loop RWS breakers ('A' and 'C') was initiated to determine if they were susceptible to the same problem. At 1745, the 'A' loop of RWS was declared inoperable as it had been determined that the 'A' and 'C' breakers had the same disconnect to stab fit as the 'D' breaker. At this time a 12 hour LCO was entered as required by Technical Specifications. At 1750 the old 'C' breaker (which had the proper disconnect to stab fit) was re-installed and the 12 hour LCO was exited. At 1753 the old 'A' RWS breaker was re-installed. Note: The old 'B' breaker had previously been re-installed due to problems with the magnetic latch assembly in the new 'B' breaker and was in place at the time of the fire. As it was located directly above the 'D' breaker in 1B20, it was removed to check for damage. On 6/19/92 following cleanup and inspection of 1B20 and the old 'B' breaker, the 'B' loop of RWS was declared operable and at 1834 the 7 day LCO on the RWS system was exited. Throughout the event on 6/17, the plant was operating at 100% power.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

EXPIRES 4/30/92

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1 - required, use additional NRC Form 3664 s) (17)

HISTORY ASSOCIATED WITH RWS BREAKER REPLACEMENT

the 1989 it was decided that the RWS breakers should be replaced with the reakers which use solid state trip mechanisms to implify an and improve breaker coordination. The original prinstalled are were ITE (now ASEA Brown Boveri (ABB)) model K225. To the 'K' series breakers on site, ABB model K800s breakers were the replacement breakers. During the design process, ABB as ad on 1/22/90 by the responsible Towa Electric design engineer via mone call to determine if K800s breakers would fit into existing the rame cubicles. The answer received back was "yes, with no model." This conversation was documented via an internal phone makes.

or 6/8/92, installation of the new RWS breakers was initiated. The first breaker to be installed was the 'A' RWS pump breaker. While installing the breaker in the cubicle it was identified that it could not be fully inserted due to a small metal tab on the side of the breaker contacting a metal tab within the cubicle. As neither the construction engineer, the quality control inspector, nor the electricians contacted knew the purpose of the tab, a maintenance planner was contacted. The maintenance planner first looked up the purpose of the tab in the vendor manual. It was determined that tab was an interference key put in place so that only to proper and preaker could be inserted into the breaker cubicle. Following review of the vendor manual the maintenance planner recalled that during the 1992 refuel outage, a spare K2000 breaker was to be taken out of the warehouse to install in place of another K2000 breaker which was to be removed from service to allow refurbishment. When installing the space breaker, the interference key would not let the breaker go into tak cubicle completely. At that time the vendor was contacted to determine why the interference key was positioned in this way and if it could be moved. The outcome of the conversation with the vendor was that the key could be repositioned to allow brezker installation. This information received from the maintenance planner along with information in the design package that stated that the new breakers being installed were a direct replacement of the old breakers formed the basis for the construction engineer's conclusion that the interference key on the new breaker could be moved to allow it to fit. At this time the key was repositioned on the new 's breaker and the breaker was installed. Movement of the key was documented in the work package. After installation of the breaker it was tested by starting the pump and running it at full flow conditions. No problems were encountered. On 6/9, 6/10, and 6/11 the 'C', 'B', and 'D' breakers were installed. During each installation, the interference key was repositioned and this action was documented.

NRC Form 166A

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO.3150-0104

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

EXPIRES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 MRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530). U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20585. AND TO THE PAPERWORK REDUCTION PROJECT (1750-3764). 3FFICE OF MANAGEMENT AND BUDGET, WASHINGTOL. DC 20503.

TEXT (If more space is required, use additional NRC Form 366A s) (17)

On 6/15/92 the 'B' loop of the RWS system was declared inoperable due to unexplained breaker trips on the 'B' and 'D' river water supply pumps and a 7 day LCO was entered. At this time the new 'B' breaker was removed to determine why it was tripping. Investigation of mined that the magnetic latch assembly was faulty. On 6/17 the old D' breaker was re-installed and tested satisfactorily and the 7 day LCO was exited at 0948. Investigation into the trips associated with the new 'D' breaker did not identify any problems. The spurious trip could not be recreated. Following inspection and testing of the new 'D' breaker it was reinstalled at approximately 1400 on 6/17. The first start of the 'D' pump after re-instal'ation of the breaker was at approximately 1526 when the fire occurred.

II. CAUSE OF EVENT

The fire was the result of a poor connection between the primary disconnects on the back of the 'D' breaker and the stabs within the breaker cubicle, due to the size discrepancy between these components as identified in the Description of Event section above. The exact cause for the fire to occur when it did could not be determined, however, it is suspected that each time the 'D' breaker was installed in its cupicle, he alignment of the disconnects to the stabs changed slightly. During initial installation on 6/11 the alignment was such that adequate contact between the disconnects and stabs occurred such that the breaker functioned satisfactorily. The alignment after re-installation on 6/17 following inspection of the breaker for trip problems was such that inadequate contact between the disconnects and stabs existed when the pump was started.

The root cause of this event was determined to be a lack of thorough inhouse review of interface design specifications. Specifically, the electrical/mechanical interfaces between the K800s breakers and the ITE 225 series breaker cubicles were not reviewed to ensure compatability. A contributing factor related to this cause was the reliance on the above noted telephone conversation between Iowa Electric and ABB. The phone memo generated, as a result of the conversation, was used as the primary basis, during the design and verification phases and indirectly in the construction phase, for identifying that it was physically acceptable to install a K800s breaker where a K225 breaker had been.

In addition to the abo a cause and contributing factor, the root cause analysis team identified potential areas of weakness in the design and construction process. The design verification process questioned the use of a K800s breaker in place of a K225, however, verification of interchangeability of the two breakers was based on the phone memo and not technical documentation.

NRC Form 366A

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

EXPIRES 4/30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 56.6 HRS. FOHWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-\$30). U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTOK, DC 26565, AND TO THE PAPERWORK REDUCTION PROJECT (2156-0164), OFFICE OF MANAGEMENT AND BUDGET, WASHING: 10.7 26503

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TEXT (f. more space is required, use additional NRC Form 366A's, (f7)

The 1990 material request (MR) written to buy K800s circuit breakers stated: "These breakers will be like-for-like replacements of ITE type K-225 breakers for installation in existing ITE 480v load center unit substations". In addition, the MR stated the specific part number for a K800s circuit breaker. These two statements from the MR are mutually exclusive as a K800s breaker is not a Greet replacement for a K225 breaker. This discrepancy was not identified during to procurement process for this modification. The breaker received with the above wording in the purchase order was the K800s model number specified.

During the construction phase of the design, the interference keys on the K800s breakers were relocated to allow the breakers to fit into the RWS load center cubicles, following disrussions with plant personnel. A formal documented process was not used in authorizing interference key relocation.

III. ANALYSIS OF EVENT

Failure of the 'D' RWS pump breaker had no effect on the safe operation of the plant. The fire was quickly extinguished and throughout the event the 'A' and 'C' RWS pumps were available to perform the function of the RWS system. To determine the ability of the 'A' and 'C' RWS breakers to continue functioning during a seismic event, design basis seismic effects for the intake structure were reviewed. Tr. vertical seismic force that would be placed on the breakers is less than the force recuired to overcome gravity. Therefore, if the breaker disconnects were making adequate contact prior to a seismic event, adequate contact would be maintained during a seismic event. As the 'A' and 'C' breakers had exhibited good disconnect-to-stab contact via pump starts and runs following initial rack-in and the breakers had not been re-racked, it is reasonable to conclude that they would have remained functional during a seismic event.

IV. CORRECTIVE ACTIONS

Immediate actions following determination of the cause of the breaker fire on 6/17 were to determine if the remaining RWS breakers could be susceptible to the same problem. After the determination was made that they were susceptible, the new breakers were immediately removed and the old breakers were re-installed. Late on 6/17 preparations were made to form a root cause analysis team to review the event. On the morning of 6/18 the RCA team began investigation of the event.

NRC Form 386A (6-89) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

EXPIRES: A'30/92

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HRS FURWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND PEPORTS MANAGEMENT BRANCH (P-\$30) U.S. NUCLEAR IN GULATORY COMMISSION, WASHINGTON, DC 20503, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), DEFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

As a previous design modification (unrelated to the RWS system) had upgraded existing K600 breakers to K800s breakers, a review was initiated to determine if those K800s breakers could be susceptible to the problem identified with the RWS breakers. This review determined that the primary disconnects on the K800s breakers are the same size as those on K600 breakers therefore they were not susceptible to the problem encountered when replacing a K225 breaker with a K800s breaker.

In parallel with the event review, repairs to the 'D' breaker cubicle were initiated. Currently, parts to repair the cubicle are expected to be on site in late July or early August. Long term actions to allow install on of K800s breakers for RWS will be to upgrade the 189 and 1820 RWS load centers to make them compatible.

As a result of the root cause analysis findings, the following corrective actions have been/will be taken:

- The applicable Engineering Department modification procedures were reviewed and revisions have been made to ensure modification packages contain detailed documentation, such as drawings and specifications, which reflect that new equipment interfaces are compatible with existing plant equipment interfaces.
- 2. A revision to the Engineering Department modification verification procedure has been submitted to ensure that the verification process checks for adequate detailed documentation, such as drawings and specifications, of new equipment interfaces with eisting plant equipment. This revision will be implemented by 7/24/92.
- The applicable Engineering Department modification procedures will be reviewed and revised as appropriate to provide guidance on vendor communications during the design process. This action will be completed by 10/1/92.
- 4. The current Design Change Package (DCP) procurement process will be reviewed with respect to the RWS breaker purchase in 1990 to determine if enhancements should be made. This review and a finalized course of action to prevent recurrence will be completed by 12/1/92.
- 5. Guidance has been issued to appropriate personnel re-emphasizing that altering equipment/materials for fit during the construction of a modification, beyond that specified in the design, shall not be done without the use of a formal revision process. The appropriate construction procedures will be reviewed and clarified as necessary by 10/1/92.

NRC Form 366A

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

LICENSEE EVENT RUPORT (LER) TEXT CONTINUATION

EXPIRES 4/10/82

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST 50.0 HRS. FORWARD COMMENTS REGARDING SURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P. 930). U.S. NUCL EAR REGULATORY COMMISSION, WASHINGTON, DC 2055S, AND TO THE PAPERWORK. REDUCTION PROJECT (3150-0104). OFFICE OF MANAGEMENT AND BUDGET WASHINGTON, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A's) (17)

In addition the following actions will be implemented as a result of lessons learned from this event:

1. A list of design modification packages which may be susceptible to problems similar to those which occurred during the preparation of the RWS breaker package has been determined. This list of packages was selected from packages initiated since 9/1/91. Packages completed prior to 9/1/91 are considered to have had adequate run-in time to identify if a design problem exists.

The criteria for selecting packages for review was any package which replaced existing equipment with upgraded equipment and those packages which have involved plug-in connections which could not be observed. Review of these packages will consist of a review of the electrical and mechanical interfaces as well as plug-in connections which weren't witnessed or tested. Review of these packages will be completed by 10/1/92.

- 2. A brief discussion of lessons learned from this event has been disseminated to all plant personnel. As a followup action, a formal presentation of the lessons learned from this event will be incorporated into the 4th quarter of Technical Staff/Technical Manager continuing training.
- To enhance engineering and maintenance training, additional material on circuit breakers will be incorporated into appropriate training programs. This training will be implemented during the fourth quarter of 1992.

V. ADDITIONAL INFORMATION

A. Previous Similar Events

A review of DAEC Licensee Event Reports since 1984 did not identify similar events in which a breaker failure was the result of implementation of a modification package.

NRC Form 366A (8-89)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO 3150-0104

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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ESTIMATED BURDEN PER RESPONSE TO _OMPLY WITH THIS INFORMATION COLLECTION REQUEST \$0.0 HRS FORWARD COMMENTS RECARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-536) J. F. LERR REGULATORY COMMISSION, WASHINGTON, DC 205. J. TO THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE OF MANAGEMENT AND BUDGET WASHINGTON DC 20503

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Duane Arnold Energy Center

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REVISION NUMBER 010 00 8 OF 8

TEXT (If more space is required, use additional NRC form 366A s) (17)

B. EIIS SYSTEM AND COMPONENT CODES

Systems: ED - Low Voltage Power System - Class 1E

BS - Ultimate Heat Sink

Components: BKR - Circuit Breaker

This event is being reported cursuant to 10 CFR 50.73(a)(2)(v)(B) and 50.73(a)(2)(vii)(B)

To:

L. Liu

L. Root

J. Franz

R. McGaughy

Safety Committee

K. Peveler

B. Mick

S. Swails

C. Bleau

P. Bessette

A. Binder

K. Shea (N&H)

INPO

GDS Associates, Inc.

Central Iowa Power Cooperative Corn Belt Power Cooperative

DAEC Commitment Control

FROM:

D. Wilson

Plant Superintendent - Nuclear

FILE:

A-118a

lears find attached one copy of a Licensee Event Report that has been transmitted to the NRC.

LICENSEE EVENT REPORT NO. 92-010

Notification Letter No. NG-92-3335

DR NUMBERS: 92-216, 92-217

/pwj

(6.91)

Copied via PROFS Note: R. Baldyca

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