U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-331/94009(DRS)

Docket No. 50-331

License No. DPR-49

Licensee: IES Utilities Incorporated IE Towers P. O. Box 351 Cedar Rapids, IA 52406

Facility Name: Duane Arnold Energy Center

Inspection At: Palo, Iowa

Inspection Conducted: April 25 through May 12, 1994

Inspectors:

R. Winter

Approved By:

R. N. Gardner, Chief Plant Systems Section

Inspection Summary

Inspection conducted April 25 through May 12, 1994 (Report No. 50-331/94009(DRS))

<u>Areas Inspected</u>: Announced, routine inspection of electrical and instrumentation and control (I&C) modifications conducted in accordance with NRC Laspection Procedure 37700.

<u>Results</u>: The inspectors determined that the electrical modification process was generally acceptable. Two violations were identified concerning: (1) failure to follow procedures (Sections 4.0) and (2) failure to promptly correct a design deficiency (Section 6.0). During the course of the inspection, the following were noted:

 DAEC had initiated a modification improvement assessment and had begun improving the modification process.

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6-27-Date

- The Modification Acceptance Test (MAT) program assured uniform modification test methodology.
- Lack of management oversight was evident for the EWR program and its implementation.

DETAILS

1.0 Persons Contacted

IES Utilities, Incorporated (IE)

* M. McDermott, Manager, Engineering * K. Young, Manager, Nuclear Licensing * N. Sikka, Electrical Engineering Supervisor * C. Bleau, Systems Engineering Supervisor * C. Bock, Systems Engineering Group Leader * M. Fairchild, Electrical Group Leader * B. Clark, Systems Engineering * J. Kinsey, Licensing Supervisor * D. Blair, Quality Assurance Assessment Supervisor * S. Parekh, Principal Engineer * L. Swenzinski, Project Engineer * W. Aldrich, Project Manager * R. Portz, Project Manager * M. Wood, Project Manager * S. Kaller, Project Engineer * D. Lausar, Project Engineering Supervisor * C. Blood, Technical Specialist * J. Quell, Project Engineer * G. Zimmerman, Project Manager * D. Bruner, Project Engineer * J. White, Project Engineer * B. McGluthlin, Project Engineer * S. Huebsch, Project Manager * R. Anderson, Operations Supervisor * A. Steen, Assistant Operations Supervisor * D. Voelker, Project Engineer * R. Baldyga, Maintenance Engineering Supervisor * L. Miller, Systems Engineering * D. Robinson, Regulatory Communications * D. Barta, Regulatory Communications * S. Catron, Licensing Engineer * O. Olson, I & C Engineering/Electrical Engineering

U. S. Nuclear Regulatory Commission (NRC)

* J. A. Hopkins, Senior Resident Inspector

* M. Martino, Reactor Engineer

* Denotes those attending the exit meeting on May 12, 1994.

2.0 Action on Previously Identified Inspection Findings

a. <u>(Closed) Open Item (331/91002-01A & B)</u>: The EDSFI team was concerned that when the Diesel Generator was paralleled with offsite power during testing, the diesel generator could be overloaded in the event of a LOCA followed by a loss of offsite power. In addition, there was a concern that during a loss of offsite power, the 4kV degraded voltage relays could fail to detect the loss of grid voltage possibly damaging the diesel generator.

The licensee evaluated this situation. Although a slight vulnerability existed, sufficient redundancy existed with a second 100% capacity diesel generator. Regarding the degraded voltage concern, in the worst case scenario, all four degraded voltage relays would need to fail to result in a problem. With one of the four relays tripping, the loading configuration should protect that diesel generator. This item is considered closed.

b. <u>(Closed) Violation (331/91002-04A & B)</u>: The EDSFI team identified discrepancies in the setpoint calibration of the diesel generator day tank level switches.

The licensee recalibrated the level indicating switches. The calibration data sheets were changed to clearly designate the upper and lower tolerances. This item is considered closed.

3.0 Review of Electrical and I & C Modifications

The inspectors evaluated the licensee's program and implementation relative to design changes, temporary systems changes and modifications. The areas examined included design inputs, review and approval process, implementation, backlog, post modification testing, 10 CFR 50.59 reviews, training and satisfactory implementation of design requirements.

a. Review of Temporary Modifications

The following temporary modifications were reviewed:

(1)	Modification	93-237 -	Disconnect and jumper around FS8004B because it is blowing power supply fuses in 1C417 and cannot be isolated.
(2)	Modification	94-027 -	Install fuse of lower amperage until the proper size fuse can be obtained.
(3)	Modification	94-038 -	Install jumper across relay A71B-K10C contact 1&2.
(4)	Modification	94-017 -	Deenergize alternate shutdown fuse transfer relay 43-KM106A5 until cable 1KM106A is rerouted.
(5)	Modification	R0-019 -	Lift leads for RI9178 (spent fuel ARM) downscale annunciator at ICOO4 to prevent masking other downscale alarms.

The inspectors considered the licensee's temporary modification program to be adequate. Temporary modifications were well documented, minor in scope, and were assigned targeted installation time limits. There were 27 installed temporary modifications at the time of the inspection. This was not considered an excessive number. b. Review of Permanent Modifications

The following permanent modifications were reviewed:

- Modification 0045 Modify control circuit of MO-4156-0 due to error in original design.
- (2) Design Change Package (DCP) 1415 Design and installation of containment monitoring system (CIMS).
- (3) DCP-1482 Provide indication of the thermal overload trip to the operator.
- (4) DCP-1512 Replacement of RPS scram contactors.
- (5) DCP-1466 Provide EOP3 water level indication in HPCI, RCIC, torus and RHR/CS rooms.
- (6) DCP-1523 Modify RPS power supply by having a selector switch for each RPS power supply bus.
- (7) DCP-1526 Improve HPCI flow instrumentation by changing detectors and setpoints.
- (8) DCP-1544 Provide double ended isolation on LPCI Swing Bus.
- (9) DCP-1460 Upgrade HPCI/RCIC valve motor operator.
- (10) DCP-1543 GEMAC reference leg CRD backfill.

The inspectors concluded that E&TS performance relative to the modifications examined was generally good and a continuing effort toward improvement was noted. Management was involved with all aspects of the modification process and was committed to providing good engineering support. During field walkdowns, the inspectors observed good engineering interface with the operating and maintenance staff. The project and system engineers interviewed were experienced and knowledgeable about the modifications reviewed. Material condition was good in the areas walked down.

The inspectors concluded that the licensee was adequately implementing the design control program for the modifications examined by the inspectors.

c. Licensee Modification Process Assessments

The licensee conducted a modification process assessment at Duane Arnold between July 1992 and July 1993. The assessment was good and identified problems relative to prioritization of modifications, communication between engineers, the modification process and funding. Action items to address the noted deficiencies were established. As a result, the modification team concept was adopted in 1994 to improve the modification process. The team concept involves the same group of engineers assigned to perform a modification from initial planning to completion.

4.0 Modification Acceptance Tests (MAT) Program

The inspectors reviewed the Modification Acceptance Test (MAT) program. The MAT group was tasked with the development of modification testing procedures and methods of testing to ensure the modification design intent and acceptance criteria are met. Overall the MAT program and recently completed packages reviewed were considered good. For example, the RPS MG Set and Alternate Power Source EPA Functional Test/Calibration implemented per surveillance test procedure 41A127, dated March 22, 1994, contained the appropriate instructions, acceptance criteria, test requirements and equipment.

The inspectors noted that some older MATs were not well planned for field implementation, consequently, steps were often changed during the performance of the test. Also, the MAT for DCP-1512, "Scram Relay Contact Replacement," dated March 12,1992, contained the following deficiencies: (1) STP-41A005, channel test steps 7.1.14.8, 7.2.14.4 and 7.3.8.8 were not initialed as completed nor marked with the appropriate DCF number. (2) steps were lined out but not initialed and dated. (3) some N/A steps were initialed while completed steps were N/A'd. Subsequently, the inspectors requested that the licensee review the MAT test steps for DCP-1512 to ensure that all applicable steps were successfully completed in the field. The licensee informed the inspectors that the test steps in question were performed.

Procedure No. 1406.1, Revision 1, "Procedure Use and Adherence," requires in step 6.0 (1) that "When signoffs are required to reflect performance of procedural steps, the worker shall sign/initial each step when the step is completed and prior to beginning the next step." The inspectors informed the licensee that failure to sign/initial steps in test procedures as they were successfully completed was considered an example of a violation of 10 CFR 50, Appendix B, Criterion V, (331/94009-01(DRS)).

5.0 Engineering Work Recuests (EWRs)

Review of selected Engineering Work Requests (EWRs) indicated that engineering concerns received insufficient management attention. EWRs were written to request engineering department assistance in resolving concerns raised relative to safe plant operation and/or personnel safety. Procedure No. 1203.01, Revision 4, "Engineering Work Requests," defined the initiation, processing and control of EWRs.

During this inspection, the inspectors noted that of 219 open EWRs, 55 EWRS were designated priority 2. Priority 2 items were defined in Procedure No. 1203.01 as, "The concern expressed in the EWR must be addressed in an expeditious manner to ensure the continued safe operation of the plant and/or personnel safety but does not represent an immediate risk." The inspectors determined that a number of priority 2 cpen EWRs were initiated in 1983 and 34 priority 2 EWRs were issued prior to 1992.

In addition, LWR priorities were not always classified in accordance with their safety significance as defined in the procedure. Review of selected open priority 2 EWRs identified the following:

(1) EWR 83-298 was issued on September 2, 1983, to replace the analog transmitter unit trip system with digital components. Since no

spare replacement parts were available for these components, continued plant operation could be affected.

- (2) EWR 90-142 was issued in response to a 1988 recommendation from Limitorque that a discharge resistor or varistor be added to DC motor circuits. This was needed to absorb the energy when a shunt field circuit is opened quickly and to prevent long term damage to the motor windings and eliminate transients on the bus. The EWR was originally designated priority 2 in 1990; it was reclassified as a priority 3 during this inspection.
- (3) EWR 90-165 was issued in 1990 to direct attention to a problem associated with the extended range effluent radiation monitoring skids in the offgas stack used to monitor effluent releases. In May of 1989 and August of 1990 lightning strikes caused damage to several integrated circuit boards in these circuits rendering the system inoperable. Subsequent evaluation by engineering indicated that surge line suppression could be installed to resolve this problem. This EWR was rejected twice by the PRB board. It appeared from the engineering evaluation that implementation of this EWR would have improved system reliability.
- (4) EWR 91-051 was issued in 1991 to route larger electrical conductors between panels 1C049 and 1C07 to ensure correct voltage was available at the components. The engineering evaluation determined that present cable installations could prevent possible turbine trip and could affect plant safe operation.
- (5) EWR 91-081 was issued in 1991 to modify the logic of valve CV4378B to correct a design deficiency created during implementation of DCRs-906 and 948 in 1981. With CV4371B override switch in override position and a group 3 isolation not present, CV4378B could not perform its intended design function to close and isolate the containment upon a group 3 isolation. This EWR was submitted twice by engineering to the PRB for funding and was rejected (this issue is further discussed in paragraph 6.0 of this report).

The inspectors reviewed the EWR requirements delineated in Procedure 1203.01, "Engineering Work Request," Revision 4. The following concerns were noted:

Section 3.6 defined the EWR Review Committee as a group comprised of representatives from various areas of the plant staff and the engineering department who periodically review EWRs to ensure that they are receiving appropriate resolution priority. The inspectors determined that the last EWR Review Committee meeting was held in July 1993; subsequently the EWR Review Committee was disbanded.

Section 6.6.3 of the procedure required the safety significance of open EWRs which are significant to a particular system be reviewed and discussed in the System Engineer Quarterly Reports. The inspectors requested that the licensee provide the last four Quarterly reports on four selected systems. The licensee could not locate reports for the last three guarters. Section 7.1 of the procedure stated that original EWRs are kept on file by Systems Engineering and should only be removed for revisions, signatures, or copying and should be immediately returned. When requested, the system engineer could not locate the marked up design drawings associated with EWR 91-081 which was issued in 1991 to modify the logic of CV4378B.

Section 6.3.7 of the procedure required the planner submit the Capital Budget Project Request Form (CBPR) to the PRB for review and determination of priority ranking and funding. The inspectors determined that numerous CBPR forms were never submitted to the PRB for review, consequently, they were not considered for funding and field implementation.

Finally, the inspectors noted that the procedure did not contain engineering guidance or requirements to be followed when an EWR priority level was changed. Engineers stated that they have been changing EWR priority levels even though procedural guidance and approval channels were not established.

The licensee informed the inspectors that the EWR process will be replaced by the newly developed AR process. This issue is considered an open item pending NRC review of the AR process (331/94009-02(DRS)).

6.0 <u>Containment Atmospheric Control System Isolation Valves Bypass Function</u> Deficiency

The inspection identified that corrective actions were neither timely nor appropriate for a 1980 modification (DCR 906, April 28, 1980) which was not installed per the original design.

Modification DCR-906, issued April 28, 1980, was to install circuitry to allow bypassing the containment isolation signal to the ADS valve's nitrogen supply containment isolation valve. The original design modification required a containment Group 3 isolation signal to be present to "arm" the bypass keyswitch. Complication during installation resulted in the "arming" circuit not being installed. Without the "arming" circuit, anytime the bypass switch was placed in the bypass position not only would valve CV4371A not close but one nitrogen compressor suction containment isolation valve, CV4378B, would also be prevented from closing during a group 3 isolation. The licensee evaluated the as installed modification and determined, as indicated in the original design modification package, that administrative controls to prevent bypass switch usage except after an isolation signal was present would be sufficient. However, no actions were taken to positively control the switch's key or ensure procedures addressed the limitations on bypass usage.

Because positive controls were not implemented, valve CV4378B did not close in response to a group 3 isolation during surveillance testing on April 2, 1991. Because the operators were unaware of the ramification of placing the bypass keyswitch in bypass a DR was initiated to review the condition. The licensee's DR evaluation again relied on the notion that the keyswitch would only be placed in bypass after an isolation signal was present. No other action was taken. In 1993, the licensee placed a caution tag next to the bypass keyswitch indicating that it would affect CV4378B; however, no restrictions on the switches use were imposed. Further, in 1994 an operator recognized the design deficiency; however, neither he nor his supervisor took actions to correct the condition.

At the inspectors request, the licensee again reviewed this issue and made appropriate changes to the RPS procedure and are considering a permanent wiring change to fully implement the originally proposed design change.

The inspectors informed the licensee that failure to perfrom timely and appropriate corrective action to prevent placing the bypass switch in the bypass position without a group 3 isolation signal being present, was considered a violation of 10 CFR 50, Appendix B, Criterion XVI (331/94009-03(DRS)).

7.0 Electrical Components Obsolescence Program

The inspectors reviewed the licensee's instrument obsolescence evaluation program initiated in April 1993 by the I&C group of electrical engineering. The purpose of this evaluation was to determine the impact obsolete instruments have on continued plant safe operations and to develop a proactive approach for resolution. The evaluation identified a subset of instruments that require a focused effort to assure dependable plant operation. The evaluation identified that there were 1,008 instruments whose active failure would result in a plant shutdown, LCO, or reduction of power. Of these, 506 instruments were obsolete and only approximately 10% of the obsolete models were available in stock. The licensee developed an action plan to replace and upgrade obsolete instruments and was in the process of resolving the identified instrument obsolescence concerns. The inspectors considered this to be a positive management initiative.

Based on review of engineering design documents such as CMARs, QDRS, and EMAs, the inspectors noted that a large number of the electrical component failure causes identified related to component aging. The inspectors concluded that the licensee did not have as good an understanding in the electrical area as they did in the I&C area because no obsolescence evaluation was performed in the electrical area.

8.0 Electrical and I&C Engineering

The licensee has recently reorganized the engineering staff by creating three engineering groups and by combining the Maintenance and System engineers to enhance teamwork and provide for clear definition of lead responsibility of plant engineering related problem areas.

The inspectors evaluated Duane Arnold's electrical and I&C engineering effectiveness, technical support capability and involvement in their systems and the modification process. Project and system engineers were interviewed and modification related activities were examined. In general, the engineering staff interviewed appeared to be competent and knowledgeable in their area of expertise. Most system engineers were familiar with problem areas in their systems. Project engineers were actively involved in implementing modifications and design changes via the recently adopted "modification project group" concept which was widely accepted by the engineers as an effective modification process. The inspectors noted the following concerns during the review:

 The less experienced system engineers (about 40% of the staff) received very little specific training on their systems/ components; much of their experience was on the job training. Also, until the week of this inspection, system engineers have not had training on root cause analysis techniques. This appeared to hinder timely resolution of system related problems.

- System engineers were not informed of open Quality Deficiency Reports (QDRs) on their systems. The computer network data base used by the engineering staff did not contain a list of open QDRs. Consequently, the engineers were not aware of some identified deficiencies on their systems and were not involved with their resolution.
- Some degreed mechanical system engineers were uncomfortable in addressing electrical design aspects of EWRs and appeared to be reluctant to request expert or peer assistance.
- The unwieldy modification authorization process appeared to contribute to long delays in implementing needed design changes.
- No formal program existed for designating a backup system engineer for each system.

9.0 Trending

The licensee has established a trending program for electrical and I&C components. In general, the Instrument Trending Program (ITP) appeared to be effective in identifying some adverse trends; however, the trends identified by system engineers and I&C trending engineers needed to be addressed in a consolidated manner. Also, a more timely corrective action plan to address instrument deficiencies identified through the trending program was needed.

System engineers performed some trending on components in their systems; however, criteria for trending and responsibilities for trending activities were not clearly defined. The inspectors reviewed trending performed by system engineering to address premature wearout/failure of electrolytic capacitors in various safety related circuits. Recent recommendations to correct this problem included preventive maintenance action requests being developed and considerations for periodic electrolytic capacitor replacement.

The inspectors noted that the electrolytic capacitors installed in the invertors were not included in the preventive maintenance program for periodic replacement as recommended by the vendor. The licensee stated that this concern was being addressed.

The inspectors reviewed the 1&C and Electrical Monthly Component Trending Reports. The I&C monthly component trending report NG-93-2902, dated July 15, 1993, identified root causes and provided corrective action recommendations to address identified problems. This was considered a good trending evaluation. On the other hand, electrical monthly component trending report NG-94-1169, dated April 22, 1994, on VALOP (MOVs) did not recommend corrective actions to address MOV failures/problems. The report stated that since there were no root causes identified in the Corrective Maintenance Action Requests (CMARs) reviewed, no additional action was required. However, during the same period, NRC MOV inspection findings as documented in report 93019 and the various licensee QA audits and assessments of the GL 89-10 MOV program identified numerous problems relating to MOVs. The inspectors determined that the licensee's program to transmit the Equipment Performance Monitoring Program weekly highlights via E-Mail was an effective method to keep personnel informed of important component and system problems.

10.0 Review of Design Control and Engineering Related Audits

The inspectors examined electrical and I&C related assessments, audits and surveillances performed in the last 2 years. In general, the audits and surveillances were comprehensive and identified various problems in the areas examined. However, several problem areas identified by the NRC during this inspection were not identified by the licensee's audits and surveillances. The inspectors noted that the electrical engineering auditor who performed electrical audits had been transferred to the GL 89-10 MOV team in the early part of 1993, consequently, no assessments of the electrical engineering areas nad been performed between August 1993 and April 1994.

The inspectors concluded that most of the engineering related audits reviewed were comprehensive in scope and depth. The inspectors also noted that few QA finding related QDRs remained open.

11.0 Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspectors, and which involve some action on the part of the NRC or licensee or both. Open item disclosed during this inspection is included in Section 5.0.

12.0 Exit Interview

The inspectors conducted an exit meeting on May 12, 1994, at the Duane Arnold Energy Center to discuss the major areas reviewed during the inspection, the weaknesses observed, and the inspection findings. NRC personnel and licensee representatives who attended this meeting are documented in Section 1.0 of this report. The licensee did not identify any documents or processes as proprietary. Subsequent to the initial exit, the inspector conducted an additional exit with the licensee by telephone on June 22, 1994, after the NRC uncovered additional information which affected the inspection results.